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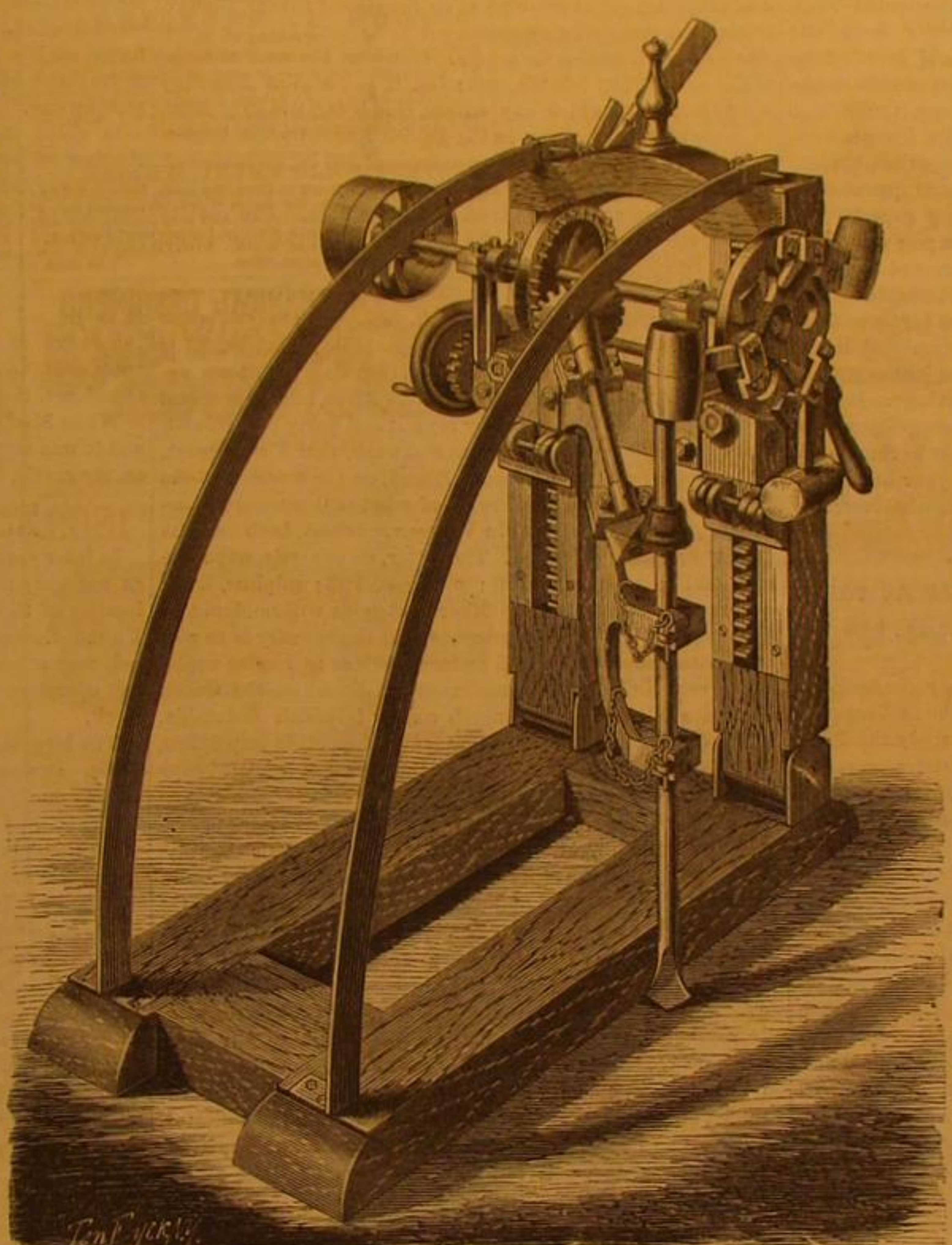
Improved Machine for Drilling Rocks.

The object of the machine represented in the engraving is to facilitate the laborious operation of rock drilling for blasting or splitting, which is frequently done by hand. The machine is portable and may be readily transported from place to place in an ordinary farm wagon. The base is a rectangular frame of timber, to which is hinged at one end a double upright, each side of which is longitudinally slotted and the two parts of which are connected at the top by a cross piece. To the other end of the base two quadrant guides are bolted, the other ends of which pass through ears on the cap of the upright which may with its appurtenances be inclined at any required angle, and held by pins passing through the ears and through corresponding holes in the curved guides.

All the operating machinery is sustained on the upright frame. A hollow headstock extends horizontally across the face of the upright and is held securely in place, at any required point from the ground, by bolts passing through the vertical slots, and clamped by cam levers on the back of the uprights. The headstock may be raised or lowered by turning a shaft passing through and having its bearings in the head stock and carrying two pinions that mesh into fixed racks seated in the uprights. But it may be fed downward by means of a ratchet on the same shaft and a lever and spring pawl, the ends of which are seen in the engraving above the top of the machine. The raising or lowering of the headstock and its connections is aided by friction rollers attached to projections on the lower side and bearing against the faces of the uprights.

Depending from the front of the headstock at a downward angle of about 45°, is an arm, forked at its lower end and formed into two boxes for receiving the drill. These boxes are hinged so as to be readily opened to receive the drill. The arm also carries a shaft on its inclined portion, to the upper end of which is attached a bevel gear meshing with a crown wheel on the driving shaft. At its other end is a block, preferably of an octahedron form, that lifts and partially rotates the drill by impinging on a rubber disk on the drill, thus presenting the lips of the drill at a different angle at each blow. The main shaft carries at one end a crank, or fast and loose pulley, as the machine is worked by hand or power, and at the other end a disk, on which are hung two, three, or four hammers, which in rotation strike the head of the drill, and the tangs of which, when the hammer slides off the drill, strike against rubber buffers, springs, or their equivalent. From the foregoing the construction and operation of this machine are sufficiently apparent. Patent ordered to issue June 15, 1869, through the Scientific American Patent Agency. All communications should be addressed to the inventor, Wm. F. Banks, Brookfield, Conn.



BANK'S AUTOMATIC ROCK DRILL.

Improvement in Car Trucks.

This invention does away with the whole category of friction wheels, plates, rollers, swinging bolsters, heretofore employed in various combinations to allow the car to adapt itself without strain to the curvatures of the track. With all such devices or any combination of them the tendency to spread the track when the truck and car pass curves has never been completely obviated. The rolling stock, as well as the permanent way, has suffered from this defect, which the inventor of this truck claims he has entirely overcome, securing at the same time greater simplicity of construction and consequently diminished friction.

In this truck the car bolster is suspended by swinging links in suitable brackets upon elliptical steel springs, attached to the car bolster as hereinafter to be described. By this arrangement the bolster may have a gentle radial as well as a slight lateral motion, so that easy adaptation to curves, and avoidance of strain and unnecessary friction between permanent way and rolling stock are secured.

A novel form of crown plate is also employed to facilitate lateral play of the car bolster, and a certain device within the axle box placed there to counteract the jar which is caused by the unevenness of the track, which device will be more fully described further on.

Fig. 1 is a perspective view of a four-wheeled freight-car truck. A is the car bolster; B, the upper or female crown-plate; and C, the lower or male crown plate. D is the frame of the truck; a portion being broken away to show fully the nature of the devices by which the car bolster is suspended. The brackets, E, may be made of cast-iron, and the method of applying the links between them and the springs is so plainly shown in the engraving that further description of this portion of the invention is needless. The springs are let into the frame, D, and are kept from lateral motion by stout guide plates, F, rising vertically from the frame between each pair.

Fig. 2, shows the device in the axle box above alluded to, the object of which is to counteract the jar from unevennesses in the road. It consists of spiral springs placed over the brass bearings in the axle boxes and secured between the bearing plates of the axle journals and upper seat-plates by means of flanged side plates, whose edges are turned over to engage with the folded or turned edges of flanges projecting from the bearing-plate and seat plate. The figure shows this part of the device very clearly.

Fig. 3 is a transverse section through the male and female crown-plates. It will be seen that they are oval in form instead of being cylindrical like the crown plates of ordinary car trucks. This allows lateral play or motion of the truck in the line of the axles.

The first thing that will attract the attention of practical men in regard to this truck is its extreme simplicity—the *sine qua non* in a good car truck. The principle of construction may be equally as well applied to six wheeled trucks, as to four-wheeled freight-trucks.

Security from sliding, should cars get off the track, and consequent precipitation down embankments, is secured by limiting the radial motion of the truck—a desideratum, it is claimed, not before attained. In short to those acquainted with the requirements of a good car truck the general and detailed advantages secured by this improvement will become at once apparent upon examination.

A patent was obtained upon this car truck February 16, 1869, by T. L. Wilson, assignor to Gyles Merrill and John W. Hobart. Further information can be obtained by addressing J. W. Hobart, St. Albans, Vt., or T. L. Wilson, Montreal, C.E.

Fig. 1

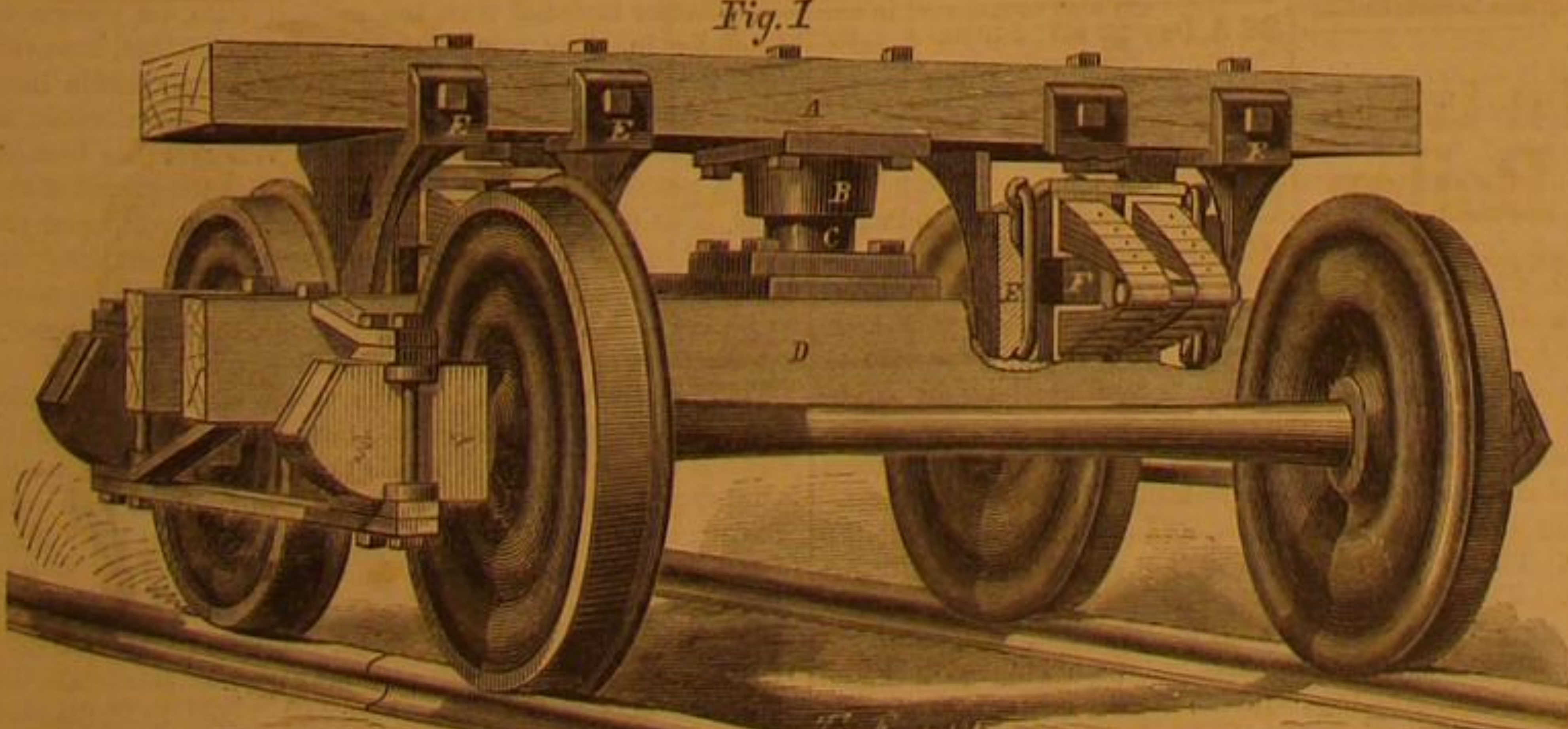


Fig. 2

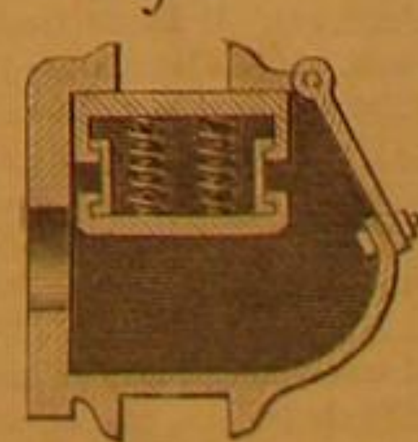


Fig. 3

WILSON'S ANTI-FRICTION LATERAL MOTION LOCK TRUCK.

Herbert Spencer on the Patent Right Question.

One of the ablest thinkers of the age is Mr. Herbert Spencer, whose writings have perhaps had as much influence upon modern opinion as those of any living author. He disposes of the patent-right question as follows:

As already remarked, it is a common notion, and one more especially pervading the operative classes, that the exclusive use by its discoverer of any new or improved mode of production is a species of monopoly, in the sense in which that word is conventionally used. To let a man have the benefit accruing from the employment of some more efficient machine, or better process invented by him; and to allow no other person to adopt and apply for his own advantage the same plan, they hold to be an injustice. Nor are there wanting philanthropic and even thinking men, who consider that the valuable idea orignated by individuals—ideas which may be of great national advantage—should be taken out of private hands and thrown open to the public at large.

"And pray, gentlemen," an inventor may fairly reply, "why may not I make the same proposal respecting your goods and chattels, your clothing, your houses, your railway shares, and your money in the funds? If you are right in the interpretation you give to the term 'monopoly', I do not see why that term should not be applied to the coats on your backs and the provisions on your dinner-tables. With equal reason I might argue that you unjustly 'monopolize' your furniture, and that you ought not in equity to have the 'exclusive use' of so many apartments If 'national advantage' is to be the supreme rule, why should we not appropriate your wealth, and the wealth of others like you, to the liquidation of the state debt? True, as you say, you came honestly by all this property, but so did I by my invention. True, as you say, this capital, on the interest of which you subsist was acquired by years of toil—is the reward of persevering industry: well, I may say the like of this machine. While you were gathering profits, I was collecting ideas: the time you spent in conning the prices current was employed by me in studying mechanics; your speculations in new articles of merchandise answer to my experiments, many of which were costly and fruitless; when you were writing out your accounts, I was making drawings; and the same perseverance, patience, thought, and toil, which enabled you to make a fortune, have enabled me to complete my invention. Like your wealth, it represents so much accumulated labor; and I am living upon the profits it produces me, just as you are living upon the interest of your invested savings. Beware then, how you question my claim. If I am a monopolist, so also are you; so also is every man. If I have no right to these products of my brain, neither have you to those of your hands; no one can become the sole owner of any article whatever; and 'all property is robbery.'"

ON THE COAL-FIELDS OF THE NORTH PACIFIC COAST.

Abstract of a paper read by Robert Brown, Esq., F.R.G.S., before the Edinburgh Geological Society.

The Pacific Railroad being now nearly ready for traffic, it becomes of importance to inquire what are the fuel supplies—on the Pacific coast—to be relied upon to supply the fleets of steamers and the branch railways which will soon strike off from the main line into almost every valley and to every little mountain town. No doubt, coal might be brought round Cape Horn, as hitherto much of it has been, or across the plains with the railway, but both of these means of supply must necessarily be limited on account of the expense. It behoves us, therefore, to inquire somewhat narrowly what are the extent and nature of the native coal-fields on the North Pacific coast. I must preface what I have to say by telling you that what notes I may have to lay before you, are the result of occasional observations in the course of my wandering in the greater portion of certain regions—explored and unexplored—between California and Alaska during portions of the years 1863, 1864, 1865, and 1866. Though I shall have occasion now and then to refer to general geological questions, yet for the main part what I shall have to say will almost entirely be looked at from a coal-supply point of view, and then as much with the eye of a physical geographer as that of a pure geologist.

Extending from the borders of California to Alaska are three coal-fields belonging respectively to the tertiary, secondary, and palæozoic ages—the latter being situated, as far as yet known, only in the Queen Charlotte islands, off the northern coast of British Columbia, the exact age being as yet undetermined, though the coal is anthracitic and in all probability palæozoic. The other two coal-fields are situated, as regards each other, from south to north in the order of their age. The tertiary extends from California northwards through Oregon and Washington Territory, impinging the southern end of British Columbia and Vancouver Island, and extending, with some interruptions, right across the Rocky Mountains—the Miocene coals of Missouri being apparently only a continuation of these same beds. The secondary beds, on the other hand, on the North Pacific are confined to the island of Vancouver, though in all probability they are also a continuation of the cretaceous strata of Missouri. The tertiary lignites of the North Pacific are throughout of Miocene age, and are associated with beds of sandstone, shale, etc. It burns freely, but leaves behind much slag and ash. It has been wrought at various places on the coast. 1. Mount Diablo, California. Here 59,257 tuns were mined last year from January to August, the coal selling for eight dollars per tun in San Francisco. At Benicia it was also mined, but has been discontinued. Its analysis is— carbon, 50; volatile bituminous matter, 46; ash, 4 2. Coose Bay, Oregon. Its analysis shows 46·44 per cent of carbon, 50·27 of volatile matter, and 3·19 of ash. Its percentage of coke is 49·73; but this is dark, friable, and of little value. It produces abundant gas, of low illuminating power. It is used to some extent in San Francisco, 7,759 tuns having been imported from January to August, 1868. 3. Clallam Bay, Washington Territory. Several attempts have been made here to get good coal, but have failed to a great extent owing to the want of a harbor. Analysis—carbon, 46·40; volatile matter, 50·97; ash, 2·63. 4. Bellingham Bay. Here the lignite has been mined for some years with success, though it is of no better quality than the others. From January to August, 1865, 5,680 tuns were imported into San Francisco. Analysis—carbon, 47·63; bitumen, 50·22; ash, 2·15. Coal crops out at various other localities—Fraser River, Burrard Inlet, islands of the Haro Archipelago, Sanetch Peninsula, the northern (Vancouver) shores of De Fucas Strait, etc.—but has not been worked; and I am of opinion that all these outcrops are of tertiary age, the secondary formation not appearing south of the Chemainos River. There are newer (Pleistocene, or perhaps recent) lignites in the cliffs of Useless Bay, Whidby's Island, associated with remains of the mastodon, a tradition of the existence of which animal still lingers among the Indian tribes. This lignite is in small quantity, and quite worthless for fuel. The whole coast of Vancouver on the east coast, north of Chemainos, is bounded by a belt of carboniferous strata, composed of sandstone, shale, and coarse gravelstone conglomerates, interstratified with which are beds of coal of a much superior character to any hitherto described. These beds from the contained fossils appear to be cretaceous. Everywhere the strata named form a characteristic accompaniment of the coal (especially this coarse conglomerate) and nearly everywhere it is underlaid by one or more seams of coal cropping out at some point on the circuit named, though it may reasonably be supposed yet to be found on the opposite shores of British Columbia. Outcrops are seen on some of the coast-lying islands, etc.; but it is only at Nanaimo where it is wrought to any extent, this being the only mine in Vancouver Island (or in the British North Pacific territories) exporting coal. Here is a village of 500 inhabitants and some fifty miners. Last year the company exported 43,778 tuns, and declared a dividend of 15 per cent. The coal is bright, tolerably hard, and not unlike some of the best qualities of English coal. It is used all over the coast for steaming and domestic purposes. It brings eleven dollars per tun in Victoria, and thirteen in San Francisco. An analysis gives carbon, 66·93; hydrogen, 5·32; nitrogen, 1·02; sulphur, 2.20; oxygen, 8·70; ash, 15·83. The fossil remains were then described. North of Nanaimo, on Brown's River, immense seams of coal have been discovered by myself and party; on Salmon River the Indians report coal; at Sukwash, near Fort Rupert, coal appears; and at Koskeemo Sound, on the western shore, are extensive undeveloped fields of what will ultimately, no doubt, prove the best coal in Vancouver Island, both from its quality and easy shipment. The latter, on analysis, gave carbon, 66·15; hydrogen, 4·70; nitrogen, 1·25; sulphur, 0·80; oxygen, 13·59; ash, 13·60. Other coal-fields will no doubt be discovered as exploration proceeds, but the country is so covered with dense forests and undergrowth as to render exploration very difficult. The anthracite is found on the Queen Charlotte Islands, off the north coast of British Columbia. The beds are much broken up by faults, felspathic trap dykes, and other disturbing influences, so that to work it will always be expensive and troublesome. Still, the value of the discovery is of the highest importance to the coast. The coal is associated with conglomerates, a fine hard slate, out of which the Hydah Indians carve the pipes and other ornaments so common in the European museums, and metamorphosed sandstones. On first sight I was inclined to believe it only debituminized cretaceous coal, but from the fossils recently discovered I am induced to change that opinion and to believe it of palæozoic age. An analysis gave—carbon, 71·20; moisture, 5·10; volatile combustible matter, 7·27: ash, 6·43. The only good or extensive coal-fields in the North Pacific are, therefore, within the English colonies of Vancouver Island and British Columbia, and in the possession of these coal-fields these States, at present so depressed, have a mine of wealth which, if judiciously managed, will ultimately render them the seat of busy industry.

From the Century.

SOMETHING ABOUT BELLS.

The origin of bells may be dated from the time of Moses. In the 28th chapter of Exodus, verses 33-35, "a golden bell" is mentioned as upon the hem of the robe of Aaron, in order that "his sound shall be heard when he goeth into the holy place before the Lord." Bells are also mentioned in the 14th chapter of Zechariah, verse 20, as being upon horses; and it is not improbable that Tubal Cain, the sixth in descent from Adam, "an instructor of every artificer in brass and iron," may have known something of the art of making them. The early historians inform us that the Greek warriors had small bells concealed within their shields, and when the captains went their rounds of the camp at night, each soldier was required to ring his bell in order to show that he was watchful at his post. Plutarch also mentions that nets, with small bells attached, were spread across the stream to prevent the inhabitants of Xanthus from escaping by swimming the river when the city was besieged.

Church bells originated in Italy, being formed by degrees out of the cymbals and small tinkling bells used in the religious ceremonies of the East, as a means of honoring the gods. Pliny states that bells were invented long before his time. They were called *tintinnabula*. Among Christians they were first employed to call together religious congregations, for which purpose runners had been employed before. Although first introduced in the fourth century, it was not until the sixth century that they were suspended on the roof of the church in a frame. The hours of the day were first ordered to be struck by Pope Sebastian in 605, to announce to the people the time for singing and praying.

In England large bells were first introduced in churches about the seventh century, and it is supposed that they gave rise to that feature of ecclesiastical architecture known as the Bell Tower.

Bells were often baptized and christened with great pomp and ceremony, and in the middle ages were much used as a part of the ceremonial of the church. The Sanctus bell, which is a small bell still used by one of the attendants of the priests of Roman Catholic Churches just before the elevation of the Host, was formerly a larger bell hung in the outer turret of the church, at the sound of which, all who heard bowed in adoration. The Ave Maria bell announced the hour for offering a supplication to the Virgin, and for beginning and ceasing labor. The Vesper bell was the call to evening prayer. The Passing bell was so named as being tolled when any one was passing from life, and it was ordered that all within hearing should pray for the soul of the dying.

From this custom is doubtless derived that of tolling the church bells at funerals, and also that which is practiced in some localities of tolling the bell immediately after a death, and indicating the age of the deceased by the number of the strokes.

The ringing of the Curfew bell was introduced into England from France by William the Conqueror. It was called the *couvre feu* (cover fire) bell, and when rung at eight or nine o'clock in the evening it was expected that all fire and light would be extinguished. It is to be remembered that at that early period houses were mostly built of inflammable materials, and the law of the Conqueror, though arbitrary, was intended to prevent conflagrations. The custom was enforced for less than fifty years, but there are many localities in England where, even now, "the curfew tolls the knell of parting day."

In olden times it was superstitiously believed that the ringing of bells would disperse evil spirits, check tempests, drive away infections and avert the lightnings. The most common of the old inscriptions upon the Latin bells were to this effect.

The use of bells to sound alarms in the event of dangers from fire, flood, and the enemy dates from an early period. It is related that in the year 610, when Sens was besieged, the Bishop of Orleans ordered the bells of St. Stephen to be rung, and the sound so frightened the assailants that they abandoned the siege.

When Macbeth shut himself in the forest of Dunsinnane, and it was announced to him that Birnam Wood was moving on the castle, he cried out in his desperation:

Ring the alarum bell! Blow wind! Come wrack!
At least we'll die with harness on our back.

In later years, the use of bells has become so systematized as not only to sound the alarm of fire, but to indicate the locality of the danger, and there are several cities in the United States in which, by means of electricity, every fire bell may at once announce this fact. Perhaps the most perfect operation of this system is to be seen in the city of New York.

The largest bell in the world is in Moscow—the City of Bells. It was cast by order of the Empress Anne, in 1653; is twenty-one feet four and a half inches in hight, twenty-two feet five and a half inches in diameter where the clapper strikes, and is believed to weigh from 360,000 to 440,000 lbs. Historians are in doubt whether this giant among bells was ever hung. Dr. Clark, who saw it about the year 1801, says, in his "Travels," "The Russians might as well have attempted to suspend a line-of-battle ship with all its stores and guns." Bayard Taylor, on the other hand, maintains that it was both hung and rung, "it being struck by the clapper," as Korb says in his diary, "fifty men pulling upon it, one half upon each side."

In 1837, the Czar Nicholas caused it to be disinterred from its bed of sand, where it is supposed it was lodged during the conflagration of 1737, and placed it on the granite pedestal where it now rests. It was then consecrated as a chapel, the entrance to the interior being through a large fracture near the mouth, the cause of which is also a subject of controversy.

It is recorded that at the casting of this bell nobles were present from all parts of Europe, who vied with each other in the value of the gold and silver plate, jewelry, and other votive offerings which they cast into the furnace. It is doubtless owing to this practice, which prevailed in olden times, that the existing notion is derived that ancient bells are of better material than the modern ones, on account of the silver in their composition. It may be added, however, that the idea is incorrect, since recent experiments have shown that its introduction causes a positive deterioration of the resonant quality of bell metal. Whoever has been in Russia recalls as chief among his memories the sounds of the great bells which form a part of religious worship, and are regarded by the Russians with superstitious veneration. In Moscow alone there are five thousand, and when they unite on festive occasions in one mighty chime, the effect especially at a distance, is said to be majestically grand.

There is now suspended in the tower of St. Ivan, at Moscow, a bell which weighs 144,000 pounds, and the diameter of which is thirteen feet. It is said that when it sounds, which is but once a year, "a deep, hollow murmur vibrates all over Moscow, like the fullest notes of a vast organ or the rolling of distant thunder."

The bell of Notre Dame Cathedral at Paris, cast in 1680, weighs 30,000 pounds; that of St. Peter's at Rome, weighs 17,000 pounds; that of Notre Dame Cathedral, Montreal—the largest in America—29,000 pounds; and that of the Parliament House in London, 30,000 pounds. When it is remembered that the largest bells heard in our American cities rarely weigh more than three or four thousand pounds, some idea may be had of the volume of tone which belongs to the monster bells above described.

The Chinese have likewise produced bells of colossal size, one of which at Pekin weighs 120,000 pounds, but the tone of their bells is said to be discordant and "panny" like that of their gongs.

Probably the most celebrated bell in this country is that known as the "Liberty Bell," which on the 4th July, 1776, announced the signing of the Declaration of Independence. It was cracked while being rung in honor of the visit of Henry Clay to Philadelphia, and since then has been on exhibition in that city, together with other revolutionary relics. The following inscription, taken from Leviticus xxv., 10, surrounds it near the top: "Proclaim liberty throughout the land, unto all the inhabitants thereof."

Nor are our own well-known St. Michael's chimes unworthy of notice in this connection. These bells—eight in number—were imported from England in 1764, at a cost of £581. On the evacuation of Charleston in 1782, Major Traille, of the Royal Artillery, took them down under the pretence that they were a military perquisite belonging to the commanding officer. The Vestry applied to Lieutenant-General Leslie to have them restored, on the ground that they were paid for by subscription, and private property was secure under the terms of the capitulation. No answer was returned. Sir Guy Carleton, at New York, however, anticipated the wish of the vestry, and ordered the bells to be restored. Meanwhile they had been shipped to England. The vestry then applied to the Secretary of War of Great Britain, but without success. They were sold; and being purchased by a Mr. Rhineu, were generously reshipped by him to Charleston in 1783. They chimed their hallowed music thenceforward until 1863 or 1864, when, for prudential reasons, they were removed to Columbia, S. C., and deposited in the State House grounds. Here, they were partially destroyed in the great Sherman conflagration of February, 1865. After the war, they were sent again to England, and, strange as it may appear, recast by the descendants of the original founders, and returned to this country. Once more St. Michael's chimes are in their place, marking the footsteps of the hours, and linking us, by every tone, with the tenderest associations of the past.

The Asparagus Beetle.---"Crioceris asparagi."

There is scarcely a vegetable raised in our gardens that is not preyed upon by one or more grubs, caterpillars, or maggots, so that, when we eat it, we have positively no security that we are not mingling animal with vegetable food. Two distinct kinds of maggots, producing two distinct species of two-winged fly, burrow in the bulb of the onion. Scabby potatoes are inhabited by a more elongated maggot, producing a very different kind of two-winged fly, and also by several minute species of mites. Turnips, beets, carrots, and parsnips are each attacked by peculiar larvæ. And as to the multifarious varieties of the cabbage, not only are they often grieviously infested by the cabbage-plant louse—a species which has been introduced from Europe into this country—but also by an imported caterpillar producing a small moth, and by several indigenous caterpillars producing much larger moths, some of which caterpillars, when full-grown, are over one inch long.

Up to about eight years ago asparagus formed a notable exception to the above general rule. There was no grub, caterpillar, or maggot peculiar to America that would touch it, and although there are several such that have long been known in Europe, none of them had hitherto found their way into this country. About 1860, however, the asparagus beetle was accidentally introduced into Long Island, N. Y., from the other side of the Atlantic; and in a very few years it had increased and multiplied among the extensive asparagus plantations in that locality, to such an extent as to occasion a dead loss of some fifty thousand dollars in a single county. In the year 1868 it had already crossed over from Long Island on to the adjoining main land; and thence there can be little doubt that it will gradually overspread the whole country, working westward at the probable rate of some twenty miles a year.

That our readers may recognize at once this pernicious insect as soon as they see it, we annex figures of it in its various stages. The perfect beetle, *a*, is of a deep blue-black color, with the thorax brick-red, and some markings of very variable shape and size on the side of its wing-cases. The eggs, (*b*, and magnified at *c*) are generally attached to the leaves of the growing asparagus, and are of a blackish color.

The larva (*d* and *e*, and magnified at *f*,) is of a dull ash color, with a black head and six black legs placed at the forward end of the body, the tail being used as a proleg in walking, as with the larvæ of most of the allied beetles. The species passes the winter under loose bark and in other such sheltered situations, in the perfect or beetle state; and in May, or soon after the season for cutting the asparagus for table use has commenced, it comes forth from its winter quarters and lays the first brood of eggs. These hatch out in about eight days, and by the middle of June the first brood of larvæ is large enough to be noticed, eating the bark off the more tender part of the young stems first, and in default of this consuming the tougher and harder bark off the main stalks. About the end of June they descend to the ground, and either going under the surface of the earth or hiding under any rubbish that may have accumulated there, form slight cocoons, and pass into the pupa state. From these pupæ there bursts forth, the same season, a second brood of beetles which lays its eggs as before; and produces about the middle of August a second brood of larvæ or grubs, whence in the same manner as before there comes forth, in September, the brood of beetles which is destined to pass the winter in the beetle state and reproduce the species in the following spring. Thus, as will be seen, the economy of this species is nearly the same as that of the three-lined leaf beetle, which preys so extensively on the potato plant in the Eastern States, except that our larva does not cover itself with its own dung, and instead of the asparagus beetle passing the winter under ground in the larva state, it passes the winter above ground in the perfect or beetle state. Entomologically, the two species are closely allied, belonging to different genera of the same small subgroup of the great group of leaf-feeding beetles (*Phytophaga*), and both are what are commonly called "double-brooded" insects: that is, there are two distinct broods every year, the one generated by the other.

According to Dr. Fitch, who published an excellent account of the depredations of this insect on Long Island up to the year 1862, one asparagus grower there had three acres out of seven "almost ruined;" and four others had asparagus beds so badly injured that they plowed them up. Throughout this entire region the general idea up to 1862 seems to have been, that if this beetle was not soon destroyed the asparagus would be; for every year the insect appeared to spread further and further, extending already for a distance of at least forty miles along the northern side of Long Island, and every year it got to be more numerous and more destructive. Lime, salt, potash, and a variety of other such applications, had all been tried and found ineffectual as remedies; domestic fowls, which as Dr. Fitch ascertained, feed greedily upon the beetles, could scarcely be used in sufficient numbers to clear fields of ten and twenty acres in extent; and as to hand-picking twenty acre fields, especially where the insect is so small, that would be too discouraging an idea to be entertained for a moment by any one.

But in the year 1863 a deliverer appeared in the form of a small shining black parasitic fly, probably belonging either to the *Chalcis* or to the *Proctotrupes* family. Whether this fly lays its eggs in the eggs of the asparagus beetle or in the larva of that insect, does not seem to be at present clearly ascertained; but if the accounts that we have received of it be correct, it must do either one or the other. In the former case the larva that hatches out from the parasitic egg will consume the egg of the asparagus beetle and entirely prevent it from hatching; in the latter case it will destroy the larva before it has time to pass into the perfect state. The result, in either event, will be equally destructive to the bug and beneficial to the gardener. Thus, as we are told, "although the asparagus beetle has not entirely ceased to trouble them upon Long Island since 1863, it yet has never since that year been of any very material damage there.

But the diminution in the numbers of the asparagus beetle is probably due in part to artificial as well as to natural causes. The asparagus growers upon Long Island have introduced a method of fighting the insect, which is founded upon correct principles, and seems to be followed by very gratifying results. Early in the spring, when the beetle has made its appearance and is ready to lay its eggs, "they destroy," as we are informed, "all the plants upon the farm except the large plants for market, hoeing up all the young seedlings that, as is well known, start from the last year's seed every spring upon the beds." Thus the mother-beetle is forced to lay her eggs upon the large shoots from the old stools; and as these are cut and sent to market every few days, there are no eggs left to hatch out into larvæ for the second brood of beetles.

At first sight we might suppose that it would be possible, by carrying out the above system rigidly to its utmost extent, to extirpate the insect entirely. But unfortunately this cannot be done. Asparagus, according to Dr. Fitch, has run wild to a considerable extent upon Long Island, "and slender spindling stalks of it may be seen growing in all situations there, by the roadsides, in the fields, and in the woods. Thus the asparagus beetle has such an abundance of food everywhere presented to it, and the insect is already occupying such an extent of territory, that there seems to be no mode by which it is now possible for us to effect its extermination."

To many persons, perhaps, such a crop as asparagus may seem of but very trifling importance, in a pecuniary point of view. But we have already seen upon how large a scale it is cultivated on Long Island, in the State of New York; and a writer in the *American Journal of Horticulture*, who hails from New Jersey, remarks as follows: "We plant asparagus in great fields of ten to twenty acres. Well planted, it will cost a hundred dollars to set an acre; but it will continue productive for twenty years: and if properly cared for each acre will clear two hundred dollars annually. There are men all around me who have made small fortunes out of this single article." —*The American Entomologist.*

WOOD ENGRAVING---IMPROVEMENTS IN THE ART.

The origin of wood engraving, the former processes employed in accomplishing the work, and in taking impressions therefrom, have been fully treated in a former number of this journal. To trace the various improvements in the art, and follow it in its progressive stages down to the present time, will be the main object of this article.

Wood engraving, or "Xylography," as it is technically termed, reached its various stages of perfection in Europe through the instrumentality of a few celebrated painters, who, it may be said, were the pioneers in giving to the civilized world, faithful copies of their own and the works of the great masters. Among the most prominent of these artists were Mark Antonio Raimondi, Titian, Caracci, Salvator Rosa, Claude, Guercino, and Canaletti, of the Italian school; Albert Durer, Holbein, Bloemart, Muller, Rubens, Vosterman, Rembrandt, Vandyke, Jacob Ruysdael, and Paul Potter, of the Dutch and Flemish schools; Garnier, Edelinck, Audran, LeClerc, Wille, and Vivares, of the French school; Woollett, Sir Robert Strange, Sir Christopher Wren, Vertue, and Hogarth, of the English school. The works of these artists, who all became celebrated as engravers on copper and wood, offered an incentive to hundreds of others to engage in the art, many of whom from time to time, added new improvements upon the style and execution of their predecessors. Still as the foundation was laid by the painters, it was comparatively an easy task for those who succeeded them, to rear the superstructure and thus perfect the work.

A great deal of time and labor were expended in completing fine wood engraving during the period to which we refer, which necessarily made the prices demanded for such beyond the reach of the masses, the demand being thus extremely limited. The gradual spread of education, and the general diffusion of knowledge, rendered further improvements necessary, among the foremost of which was a method by which the work could be facilitated, both in the engraving of the block and in the impressions taken therefrom. This was essentially necessary in illustrated books, as the impulse created by the increased demand for reading, as a sequence, intimately associated itself with the business of wood-cutting. To effect a large circulation of these works among all classes of people, it became necessary that a style of engraving should be adopted peculiarly applicable to cheap publications, with the view of placing these books, and other illustrated works, within the reach of all. To England belongs the honor of first introducing the improvement which ultimately led to this much desired result.

The principal feature in this improved style of xylography, was a bold method of cross hatching, first adopted by Sylvanus Jackson, of London, in 1833, at which time the *Penny Magazine* and the *Penny Encyclopedia*, afforded the people at large, through the auspices of The Society for Diffusion of Useful Knowledge, the opportunity of buying a valuable publication, in serial numbers, for the low price of one penny. After repeated experiments this artist succeeded in imitating, on wooden blocks, at one tithe the labor and cost, the admirable cross hatchings of the fine old copper plate engravings of Raffaelle Morgan, and other distinguished artists, whose copies of the works of the old masters are to this day considered models of artistic excellence. These cross hatchings require an entirely different mode of manipulation on wooden blocks compared to metal plates. It is the business of the wood engraver to leave all the lines upon the block which the draftsman has traced with his pencil, and to accomplish this he cuts away all the parts which form the spaces between the various lines of the drawing. The lines thus stand up in relief, and when ink is applied to the block by the printer, in the same way he applies it to metal types, the impression on the paper is taken by subjecting it to an adequate pressure.

Engraving on copper is performed by cutting away the lines representing the subject and leaving the intermediate spaces. When the ink, which is of a different kind from that used on wooden blocks, is applied to the plate, the lines, which represent so many gutters, become filled with it. The surface is then wiped off and cleaned with a roller, and the impression afterwards made on a graver's press, that portion being padded which comes in contact with the plate. When it is known that the plate has to be cleaned and polished after it is inked, at every impression, it will not be difficult to comprehend that, with the facilities afforded in steam printing, one hundred impressions can be taken from the wooden blocks in the same time it would take to print five from the metal plates.

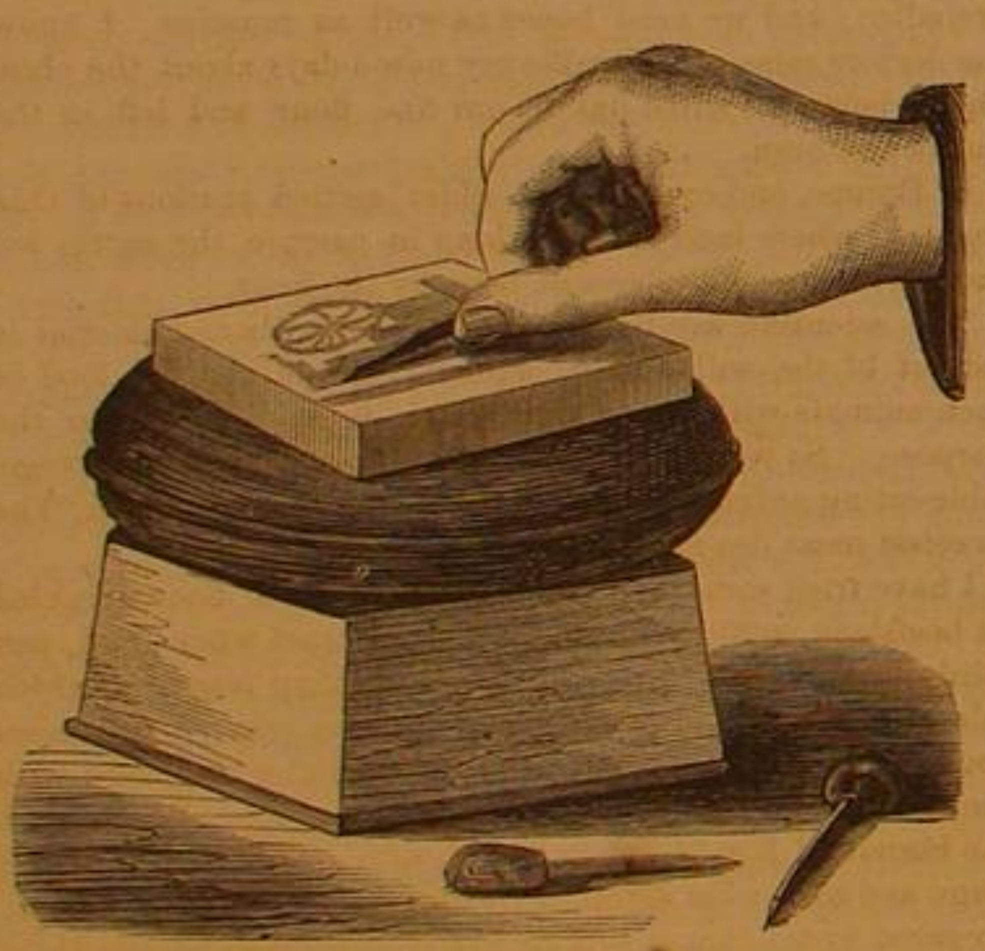
The reference to steam printing brings us forward to a still later improvement in xylography; namely, the process of adapting the engraved blocks to the uniform printing, to be effected by the revolutions of a rotary or cylinder press—the latest and most approved style of press for expediting the work of printing now in use. This process consists in lowering the surface of the wood wherever light tints are required to be produced. This is effected by scooping out the wood, like an inclined or shelving trench, from the edges of the shadows, and afterwards engraving the hatched lines upon the lowered surface, the surface of the block thus being accommodated to the action of the revolving cylinder. This process is technically termed scooping (or scauping) and trenching. By this mode of lowering the lights upon the block, the artist is sure that if ordinary care is used, at every impression of his performance on a cylinder press, the lights and shadows will be equally perfect. This great improvement, which has progressively been pursued of late years in wood engraving, and the immense reduction of the cost of their manufacture, are mainly attributable to this process. In connection with the appliances above named for taking the impression, this feature of mechanical art, which is based solely upon scientific principles, will not only lead ultimately to a high state of perfection in wood engraving, but will readily adapt itself to the continually-increasing demand for cheap illustrated literature.

We have already shown that through its means an immense number of any illustrated work can be executed with the greatest rapidity at a comparatively small cost. We will now refer to still further improvements, which have so far elevated the business of wood engraving as a branch of art, that it has at length, by common consent, been dignified as one of the fine arts. We look upon a finely executed engraving with evident pleasure, and, as connoisseurs, we know certain requisites are necessary to enable the artist to produce it. For example: correctness of drawing and design, vigor, freedom and facility of execution, clearness in the lights and transparency in the shadows, texture, and mechanical skill. In limning the human form, animals, etc., a knowledge of anatomy is superadded. In a landscape the engraver must also possess a creative talent, first, to conceive his composition, second, to imitate nature to that degree that his lines, produced by the graver, become capable of express-ing character, quality, sunshine, moonlight, storm, morning, evening, distance, chairoscuro, grace, beauty, and the most difficult of all, color. In producing the latter the engraver uses his brain and his burin, while the painter is greatly assisted by the use of various pigments, which of themselves resemble the natural hues perceptible in a landscape. To be able to invest his work with these several requisites the engraver must be a thorough artist, and, as the art has now reached this stage of perfection, it is properly classified among the *fine arts*. We come now to

THE PRACTICE OF THE WOOD ENGRAVER.

To describe in detail everything connected with the business of wood engraving, and to follow the artist from the beginning to the completion of a picture, would occupy more time and space than can be devoted to a newspaper article. All, therefore, the readers can reasonably expect in this treatise is an outline of the *modus operandi*.

The wood which is chiefly used for the purpose of engraving is that of the box tree, a considerable quantity of which is imported into this country, the best being obtained from Odessa. The blocks for engraving are cut directly across the grain, few logs furnishing pieces sufficiently large for wood cuts of any size, in which case two or more pieces are fitted together with great exactness. Other woods are also used for commoner work, such as pear, bay, mahogany, maple, and white pine. Box is invariably preferred for fine work from the fact of its being less porous, and its adaptability to the finest lines that a graver is capable of executing. Cut into blocks, it is the dearest of all the woods used in the business the price being from two and a half to ten cents per square inch. Maple is worth from two to three cents; mahogany, one cent; pear, one and a half, and white pine one dollar and twenty-five cents per slab of twenty-eight to thirty-two inches. Blocks for illustrated newspapers and books correspond in thickness to the length of the metal types used in printing. For separate engravings they are proportioned to the size of the work. It is a popular fallacy to suppose that chemicals are resorted to, to corrode the spaces between the hatched lines of a wood engraving; aquafortis and other chemical agents are only used in etching and in mezzo tint and aqua tint engravings. The art of xylography consists simply in producing a design upon a wooden block by incision only. Early writers upon the subject, many of whom never saw an artist at work, entertained certain pet theories which they ventilated in their histories, corrosion applied to wooden blocks being the most culpably fallacious among them. In the process of wood engraving the use of corrosive agents is strictly interdicted for the obvious reason that wood, being of a porous nature, would absorb all powerful chemical agents,



and however often the surface of a block might be cleansed after the parts to be removed are eaten away, such is the insidious nature of the chemicals employed that the lines left standing would be also affected, the fiber of the wood thereby weakened, and the engraving in time destroyed by a slow but sure decay. Even with the box wood, the least porous of all the kinds used, the chemical acid, secreted in the pores, would eat into the softest part of the fiber, leaving the harder parts for a time intact, thus rendering the lines unequal and imperfect.

The design is drawn upon a block, which presents a perfectly smooth surface, with a fine pointed black lead pencil. This part of the work is done by a draftsman, whose profession is distinct from the engraver. The drawing upon the block, like that of any other kind of engraving, is the reverse of the impression made from it, in the same way that a mirror reflects a reversed view of any object in front of it.

The engraver rests his block upon a flat circular cushion filled with sand; this is about seven inches in diameter, controlling the block with his left hand as he operates with his right. For very fine work he uses a magnifying glass for the minute lines, even with the aid of this a true eye, a steady hand, and the utmost care are indispensable.

The tools used in wood engraving, under the general name of gravers, are thus classified: First, *square tools*, for cross hatching; second, *lozenge tools*, for foliage and ground work; third, *tinting tools*, for producing the various tints; fourth, *gouges*, or *scaupers*, for cutting out the dead wood; fifth, *flat chisels* for lowering the edges.

These tools vary in size and shape; some have a triangular point and edges; some are pyramidal with irregular sides, others sharp pointed, square, and oval. They are all made of the finest steel, and when occasion requires it, are sharpened on an oil stone. The best tools now in use are those manufactured by Rénard, of Paris, the Messrs. Stubbs, of London, and Nixon, of this city.

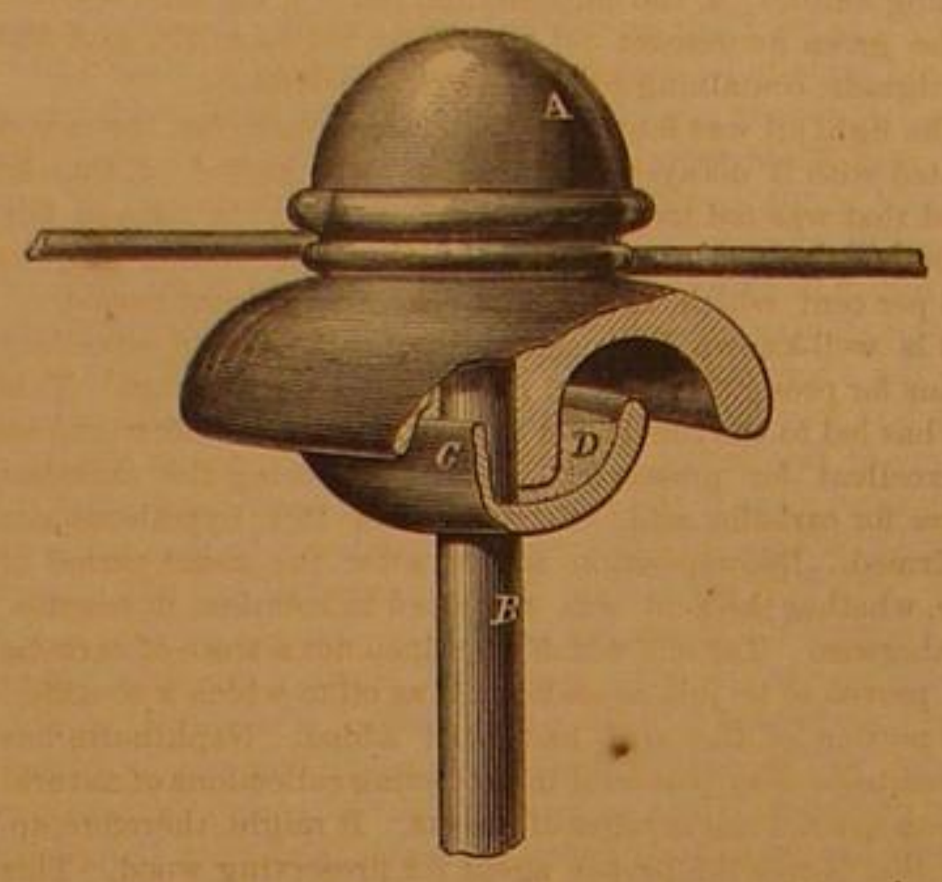
Where wood engravings are to be introduced in books or newspapers, they are incorporated in the form with the metal types, and, presenting a like flat surface, receive the ink from the roller, when impressions on paper, dampened previously for the purpose, are thrown off with the same rapidity as any ordinary printed matter from the type alone.

In conclusion, we cannot too highly commend the efforts of Linton, and a few other celebrated engravers of the present day, for their indefatigable zeal in advancing the art of wood engraving to the pre-eminence it now enjoys. They have not alone labored long and faithfully to improve and perfect the art, but they have taught us its great utility and importance, and we are now made to perceive that xylography bears the same relations to design and painting that typography bears to written language.

A NEW TELEGRAPHIC INSULATOR.

It has long been settled that insulation does not depend upon the mass of the non-conducting material as much as upon extent of surface, and the protection of the surface from

Fig. 1



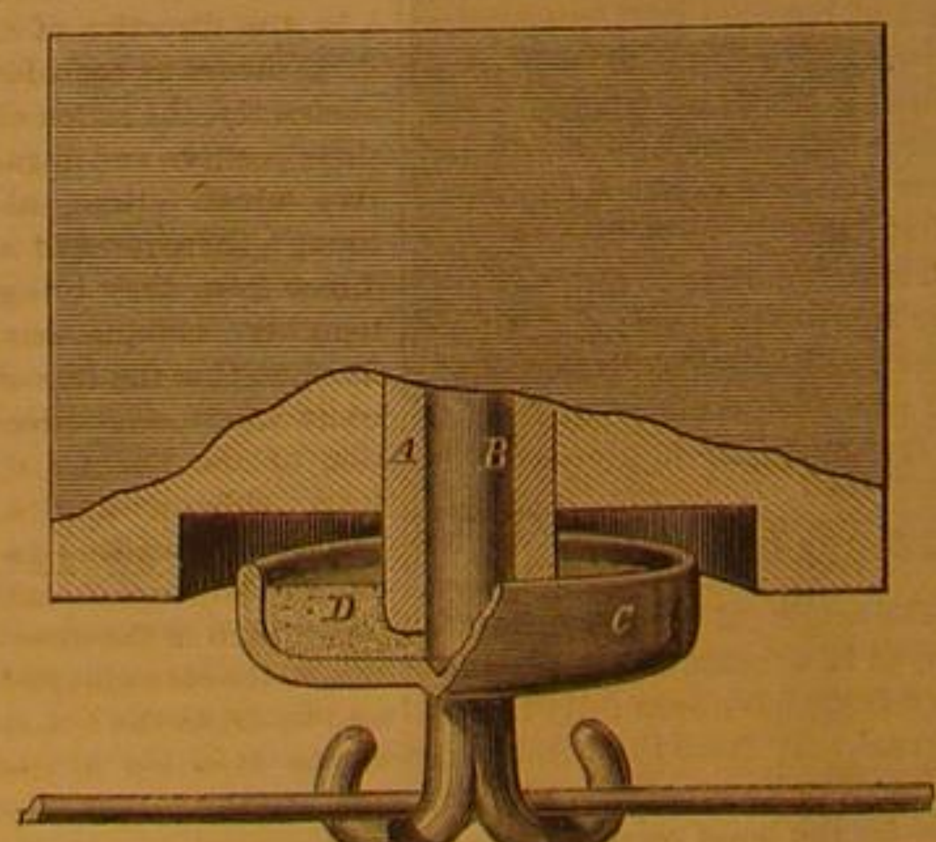
deposition of moisture, or any substance calculated to decrease its insulating power. That insulator will therefore prove the most efficient that takes most fully into account these acknowledged facts.

The invention herein described and illustrated, has for its object the attainment of such an insulator, by simple means, and to produce not only as near as may be a perfect insulator, but a cheap and durable one. There are two classes of insulators in common use. The first is supported on a standard or peg, Fig. 1, and the second, Fig. 2, often called the hook insulator supports the wire by means of a hook, the shanks of which is screwed or otherwise fastened into the insulator proper which in its turn is fastened into a wooden block or iron casing or some substitute therefor.

In the description of this insulator, we shall letter corresponding parts in both forms of the insulator similarly and describe them together. A is the insulator proper, made of glass, hard rubber or other suitable material; a section of the hook insulator and a sectional elevation of the other variety being presented.

To these insulators the wire is attached in the ordinary manner. B is, in Fig. 1, the peg or standard supporting the insulator proper, A, and in Fig. 2, the shank of the hook screwed into the insulator proper, A; these supports being preferably made of malleable iron. Each of these supports

Fig. 2



has cast upon it or otherwise attached a cup, C. The insulator, A, is screwed down on the standard, B, Fig. 1, or the shank, B, Fig. 2, so that it either touches, or nearly touches the bottom of the cup, C. The top of the cup, C, is shielded by the peculiar form of the insulator proper, A, Fig. 1, or by a recess cut in the under side of the block which sustains it Fig 2. The cup, C, extends out towards, but does not touch with its upper edge, either the insulator proper, A in Fig. 1, or the exterior of the recess cut in the supporting block, Fig. 2. Into the cup, C, is poured either melted paraffine, D, or any other insulating substance, paraffine being preferred as being both well suited to the purpose and cheap.

Thus a large extent of insulating surface is obtained between the line and the metallic supports, while at the same time the surface of the paraffine contained in the cups is protected from deleterious atmospheric influences.

This insulator has claimed for it the following advantages over those hitherto employing paraffine, as well as those not employing this insulating material:

First a greater surface of paraffine can be presented, thereby securing more perfect insulation.

Second, the dispensing with outside iron caps which invite lightning discharges.

Third, the placing of the paraffine in a cup right side up instead of bottom side up, and thus preventing all danger of the running out of the paraffine when melted by the heat of the sun, in hot weather.

Fourth, greater protection from atmospheric influences.

Fifth, general applicability to all common insulators.

Sixth, this insulator does not sensibly increase the cost over the ordinary insulator.

Should experience prove that these advantages are obtained as claimed, at no expense of other valuable principles such as strength, durability, etc., this improvement will be one of great scientific interest and practical value.

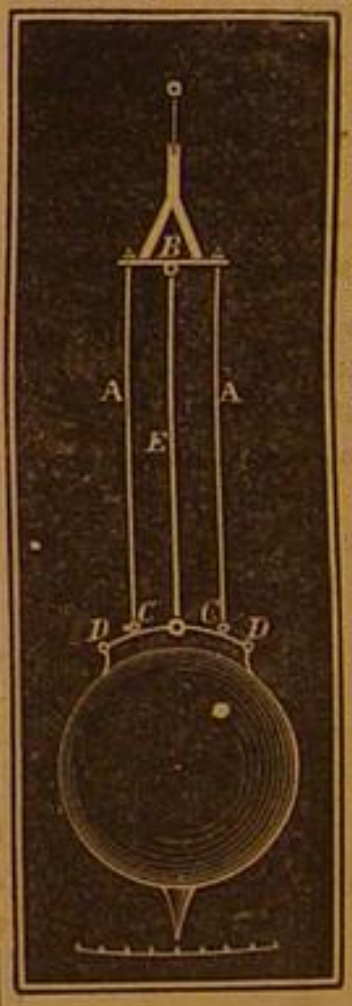
This invention was patented June 29, 1869, by W. E. Simonds, whom address for further information, at 345 Main st. Hartford, Conn.

Industrial Production of Hydrogen Gas.

MM. Tessie du Motay and Marechal have lately indicated a new and interesting process for the industrial production of hydrogen gas. Alkaline and alkalino-earthy hydrates, such as hydrate of potash, of soda, of strontia, of barytes, of lime, etc., mixed with charcoal, coke, anthracite, coal, peat, etc., and, heated with these fuels to a red heat, are decomposed into carbonic acid and hydrogen gas without any further loss of heat than what is required to produce the carbonic acid and hydrogen. During this operation the hydrogen is developed without the production of steam, and may be manufactured without the use of boilers, and within simple retorts, which, not being acted on by the vapor of water, are not liable to corrosion or accidents. The hydrogen gas may thus be made cheaply and quite as practically as is now done by the distillation of coal or other hydrocarbons.

Compensating Pendulum Rod.

Mr. S. T. Mason, of Sumpter, S. C., sends us the accompanying design for a compensating pendulum rod, which is a form



we have not seen, and seems at once simple and effective. Two bars, A, of steel are attached to a cross bar, B, and pivoted at C, to two curved arms, D. The arms, D, are pivoted in their inner ends to a central rod of brass, E, having its upper end fixed to the cross bar, B. The exterior ends of the bars, D, are pivoted to supports arising from the bob of the pendulum. As brass expands more by heat and contracts more by cold than steel, it follows that an adjustment can be made so that when the three rods expand, the supports of the bob will be relatively raised as much as the steel rods are lengthened, and *vice versa*, so that the center of oscillation may be maintained in a constant position [for all temperatures. This form of pendulum rod may have been employed before, but if so we have not met with it.

Preservation of Wine by Heating.

A long memoir, first published in the *Annales de Chimie et de Physique*, for September, 1868, and which is condensed in the last number of Dingler's *Polytechnic Journal*, furnishes the report of a committee named by the French government to examine into the merits of a method proposed by Mr. Pasteur, for the preservation of wines, especially for such qualities as are destined for distant markets or for embarkation on board of vessels of war.

The elaborate report in question is very favorable to the efficiency of the process.

We present a short summary of the final results.

1. Wine may be kept without altering in quality for an indefinite period of time, in all climates, after having been first submitted to the action of artificial heat.

2. The temperature to which it must be raised is from 131° to 140° Fah.

3. If the wine does not contain naturally more than 10 or 12 per cent of alcohol, it is best to add 1½ per cent more before the shipping of it.

4. The wine is to be heated by steam, and artificially cooled.

Production of the White Pine Mines.

Official figures of the production of the White Pine mines for three months show how largely the richness of the mines has been over-rated, as well as their capacity for production. Only twenty mines were worked, only 960 tuns of ore were reduced, and the aggregate yield was less than $275,000. The average was just about $275 a tun. The rate of yield from the larger mines was from $390 a tun down to $57·50 a tun. One mine returned its yield at the rate of $6,847 a tun, but it took out only 548 pounds, and there seem to be good grounds for doubting the entire accuracy of the return. It is now said that the White Pine district is not extraordinarily rich, but the fact that its ores are simple chlorides and easy to be worked, makes them specially valuable.

IMPROVEMENT IN HORSE COLLARS.

The collar shown in the engraving is made of wood, cushioned or upholstered on its inner surface, A. At B is a stout leathern hinge, which, in connection with a piece shown at C, and in detail at the upper left-hand corner of the engraving, renders the collar adjustable to suit the form and size of

the horse's neck. The collar can be made larger or smaller by using a larger or smaller piece of this kind, and a fit is thus obtained. This piece is held in place by dowels and strap, D, buckled and attached, as shown in the engraving The traces are attached at E, and the hold-back straps at F in the usual manner.

A strong adjustable and easy collar is thus obtained without hames. The exterior of the collar may be covered with leather, and otherwise ornamented to present a tasteful appearance, and if proper materials are used a very durable collar can be made in this manner.

Patented through Scientific American Patent Agency, July 20, 1869. Address, for further information, Jacques Meyers, 90 Columbia street, New York city.

On the Glass Used for Light-Houses.

The special composition of the crown glass used for the light apparatus for light-houses was, until quite recently, kept a secret by the manufacturers of Saint Gobain, in France, and some firms in Birmingham, which had the monopoly of this branch of trade.

From the researches of David M. Henderson, C. E., published in *Dingler's Journal*, we are able to furnish the recipes for both of these.

The French glass is composed of:

Silicic acid	72·1 parts
Soda	12·2 "
Lime	15·7 "

Alumina and oxide of iron, traces.

In Birmingham it is made from the following mixture:

	cwts.	qrs.	lbs.
French sand	5	—	—
Carbonate of soda	1	3	7
Lime	0	2	7
Nitrate of soda	0	1	0
Arsenious acid	0	0	3

The best qualities of this glass are at present produced in the Siemens furnace.

Wire Grass Brooms and Brushes.

M. Heuzé, inspector general of agriculture for the French Government, read a paper before the last meeting of the "Société d'Encouragement" on the plants used for manufacturing what are known as wire grass brooms and brushes. The substance employed is collected in Italy, and grows in the sandy soil of the shores of the Adriatic, between Ancona and Venice, and principally about Reggio. It is cultivated and harvested in a similar manner to madder. Two distinct plants, the *Chrysopogon grillus,* which gives fine white filaments, and the *Andropogon ichnéum,* which produces the coarser material, are the producers of this substance. The root alone is employed, after having been barked and boiled in water. It is shipped to market in small bundles. The quantity sent annually to France alone is about 400,000 pounds, the cost of which varies, according to quality, from one fourth to one half of a dollar in gold per pound.

No doubt can be entertained that these plants might be profitably cultivated in the deep sandy regions of our Southern States.

Heavy Modern Machinery.

A mass of metal of a tun weight was unknown before the Christian era. Now those in cast iron up to 150 tuns, in wrought iron to 40 tuns, and in steel or bronze to 25 tuns, are made in any desired form, and turned or bored with the most perfect accuracy. Two years ago I saw the largest lathe in England, which swings 22 feet, and will take in a shaft 45 feet long. Six months ago I saw one in this country which swings 30 feet, and will take in a shaft of 50 feet. There are planers which will plane iron 50 feet in length; others of 18 feet in width; others of 14 feet in hight, taking off metal shavings of two and a half inches in width and a quarter thick.—*W. J. McAlpine.*

Correspondence.

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

Coal Tar and its Products as Preservatives for Wood.

Messrs. Editors:—In referring to an article with the above heading, in your issue of June 12th, it is not my intention to enter into a history of the various trials with the products of the destructive distillation of carboniferous bodies belonging to the coal series. Your correspondent's paper is very elaborate in this respect. My purpose is simply to relate some experiments not recorded by him, and which were undertaken by Mr. Rottier, Professor of Chemistry at the University in Ghent, Belgium, in order to determine what ingredients of coal tar are most effectual in protecting wood from rot. An account of these experiments may be found in the *Breslauer Gewerbeblatt,* of 1865, page 152. Rottiers' experiments extend over the following constituents of coal tar: 1, The light oil; 2, the oil containing phenic or carbolic acid; 3, the oil containing aniline; 4, the naphthalized oils; 5, the solid residue; 6, the green fluorescent oil distilling between 275 and 320 Centigrade, containing pyren and paranaphthalin.

The light oil was found to be of no avail, for the wood treated with it decayed within the same period of time as wood that was not treated at all. The delay in time in the decomposition produced by the aniline oil amounted only to 6·66 per cent, which, indeed, is a very insignificant period.

It is well-known that carbolic acid affords an excellent means for preserving animal matter from putrefaction. This fact has led to the conclusion that the heavy tar oils would be as excellent for preserving wood, they being the chemists source for carbolic acid. Rottier found this hypothesis not confirmed. Decomposition set in after the usual period of time, whether the acid was employed in solution, in benzine, or otherwise Tar oils which contained not a trace of carbolic acid proved to be just as ineffectual as oil to which a considerable portion of the acid had been added. Naphthalin has proved to be very powerful in protecting collections of natural objects against the ravages of insects. It might, therefore, appear that it was the proper agent for preserving wood. This is not the case, it being too volatile to be adapted for the purpose in question where time and external agencies play such an important part. However, quite favorable results were obtained with the greenish fluorescent oil that comes over at the last stage of the distillation. Direct trials with pyren and paranaphthalin did not yield successful results. It must, therefore, be concluded that it is the green fluorescent oil to which the preserving action of coal tar must be attributed. "Is the same contained in sufficient quantities in the latter as to justify its employment for preservative properties?" I am inclined to answer this question in the negative rather than in the affirmative sense. Adolph Ott.

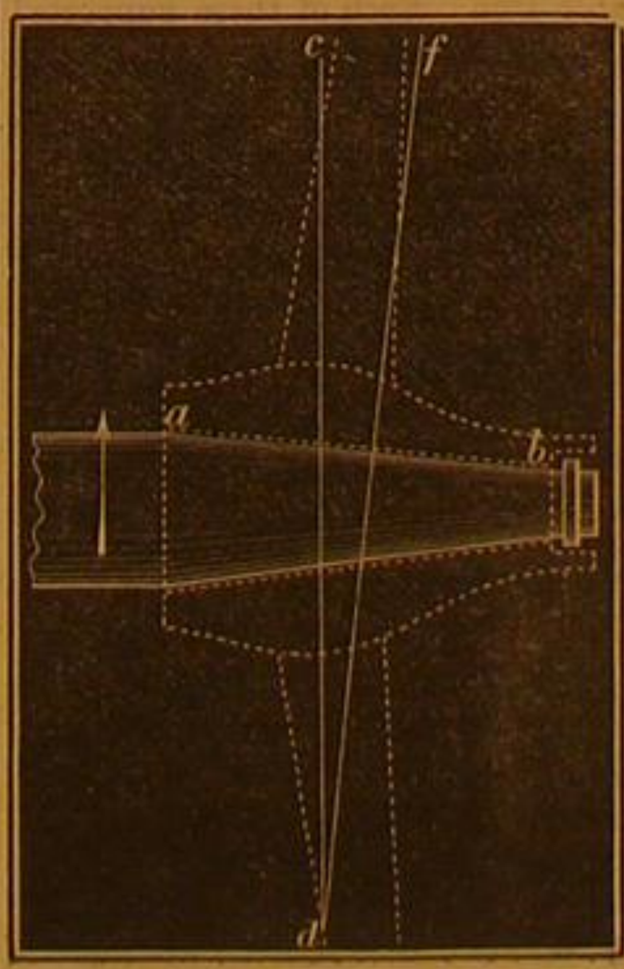
New York city.

"Gather" in Wagon Wheels no Fallacy.

Messrs. Editors:—I notice that some one, in a recent number of the Scientific American, expresses the belief that what is usually called "gather," in the position of wagon wheels, is a fallacy.

The following diagram will, I think, show that the inward inclination given to the front part of the wagon wheel, is required by correct mechanical principles. The diagram shows a tapered spindle without "gather," as seen from above.

Suppose the wagon to be drawn by force applied to the axle, in the direction of the arrow. It will then be seen that



the propelling power and the resisting force meet upon the line, *a*, *b*, in the direction of *c*, *d*. Now let us consider abstractly, the action of these positive and negative forces. Here, although these meet in a direct line, they bring together oblique surfaces, so that the line of contact, *a*, *b*, and direction of the forces, *c*, *d*, form oblique angles. Hence, the surfaces incline to slip upon each other, each in the direction of the obtuse angle, and to drive the wheel in the direction of the line, *d*, *f*. Or, to be less scientific, the bevel on the front of the spindle, when pressed against the opposite bevel on the inside of the hub, tends to work the axle out of the wheel and the wheel off the axle.

If the spindles have no taper, or if the wagon can be propelled without forward pressure upon the axles, then we require no "gather." But so long as wagons are made with tapered spindles, and drawn by force applied through the axle, the wheels should have "gather" just in proportion to the taper of spindles.

The "gather" makes the angle of contact of wheel and axle less oblique, and, by the inclination it gives the wheel to the line of travel, it causes it to "crowd on," and thus counteracts the effect of what bevel still remains on the front of the spindle. E. S. Wicklin.

Keokuk, Iowa.

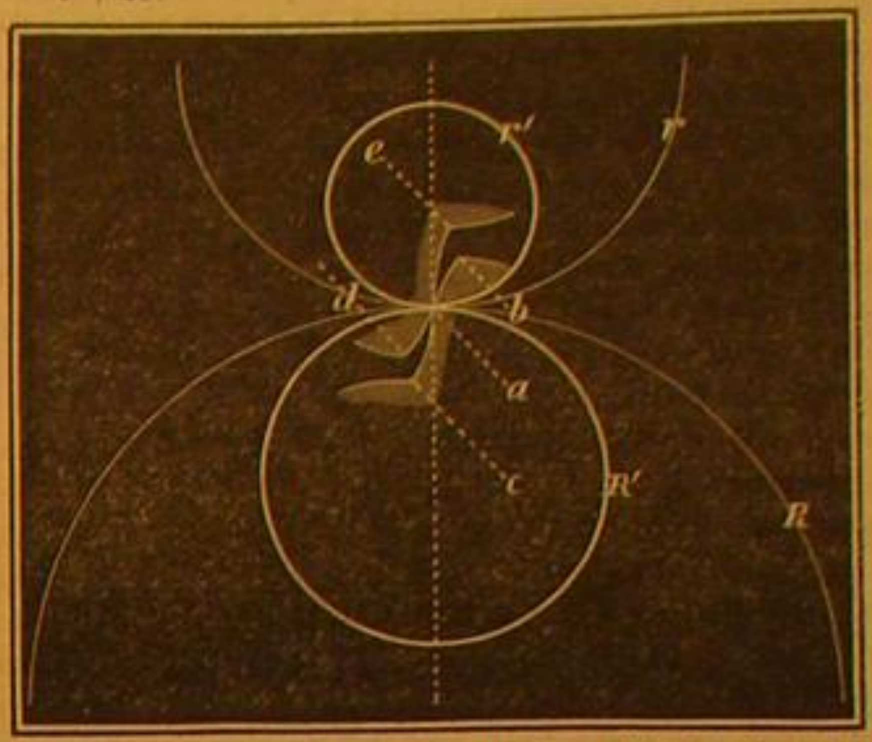
Laying Out the Teeth of Wheels.

Messrs. Editors:—The laying out of gear teeth has somewhat been discussed by correspondents on pages 165 and 229 last volume, Scientific American, but neither has given a definite rule determining the proper epicycloidal and hypocycloidal curves of teeth for wheels of different diameters.

The following formula I have found to be correct in practice, particularly so when the difference in diameters of two wheels working in each other is great:

$$ab \cdots \frac{R+r'}{R+2r'}P \qquad ae \cdots \frac{R-R'}{R-2R'}P$$

$$ad \cdots \frac{r+R'}{r+2R'}P \qquad ae \cdots \frac{r-r'}{r-2r'}P$$



In the diagram let R r represent the radii of pitch lines of the wheels.

P, the pitch.

R' r', the radii of two circles attached in which R' is indefinitely less than $\frac{1}{2}$ R and also r' indefinitely less than r.

c a b, tooth of wheel R.

e a d, tooth of wheel r.

a b and a d are epicycloidal curves, and a e and a c hypocycloidal curves. The center of these curves are on the pitch line of the wheel to which they are attached.

Newport, Ky. George Horning.

Bone Flour.

Messrs. Editors:—Why not use bone flour as an article of diet? There can be no possible prejudice against it when manufactured expressly for culinary purposes, and not kept too long before using. We all eat more or less bone sawdust in the meat we get from the butcher without a thought of prejudice; and we need bones as well as muscles. I know the doctors raise considerable cry now-a-days about the phosphates being all sifted out of our fine flour and left in the shorts and bran.

In Europe, and even in the older settled portions of this country, where land has been long in pasture, the cattle fed there will chew old pieces of bone by the hour.

The scientific say that in such cases the bone material is fed out of the soil, and recommend sprinkling the food of such animals with bone flour, which is said to answer the purpose. So we see the article is digestible, even by vegetable-eating animals. How often we hear the expression "The sweetest meat lies nearest the bone."

I have tried some experiments. Nice bone flour spinkled on beefsteak, sufficient to make a thin crust when fried, certainly improves the flavor. Also, in making biscuit in which saleratus was used, I mixed about three or four parts of bone flour to one part of the saleratus used, mixing the bone with the saleratus in hot water. The bone was well dissolved in the biscuit (if I may use such a phrase) giving it a brownish tinge and somewhat altering the flavor. Though I am not prepared to say that it was decidedly improved, yet the flavor was certainly not injured. I am, however, of opinion that I did not use enough bone by half at least.

I see no reason why, by proper experiment in cooking, bone flour could not be made a profitable and palatable article of diet.

Any one wishing to experiment can get the bone flour by sawing a nice fresh bone (beef bone preferably) in thin slices, with a fine-toothed saw, until sufficient sawdust is obtained for the purpose. M. W. G.

La Salle, Ill.

Serrated Edges of Sickles.

Messrs. Editors:—In the volume just closed, appeared several articles on the bad workmanship on farm implements. There is one thing not mentioned therein to which I would like to call attention, namely, the serrated or barbed-edge sickle of reaping machines. Why are they not found in mowing machines? Simply because they will not cut fine grass at all, especially after being ground a few times, so that the edge of sickle and face of guard tooth are separated one sixteenth to one eighth of an inch. That such a sickle cuts off the stalk of grain I deny. It tears them off, I admit. A merchant tears off shirtings and calico; why does he do it? Because he can do it easier and quicker than to cut them off. Is this the reason that the barbed-edge sickle is generally found in reaping machines? No; grain can neither be torn off quicker nor easier than it can be cut off. Then why are they made? Why are they the exception among all instruments intended as cutting instruments? The barber, even the poorest to be found, aims to have a smooth edge on his razor, the butcher aims at a smooth edge for his knife, the backwoodsman knows that his axe chops far better with a smooth edge, and the shoemaker, after whetting his knife on a rough stone, whets it on his bench in order to give it a smooth edge. It is an insult to every American mechanic that such an absurdity should exist, except in a museum, to show the folly of by-gone generations. If the papers generally would take up the subject and ridicule it as it deserves, or at least to the extent of driving it out of the country, they would receive the heartfelt thanks of a large class of the community. I have conversed with numerous farmers in regard to the barbed-edge sickle, and have never found one that said he preferred it, showing conclusively that they were bought from necessity instead of choice. After the subject is fairly brought to the notice of parties manufacturing such sickles, and they continue such manufacture, their friends ought to see that they are either put into a lunatic or an idiot asylum.

Nebraska, Ohio. A. K. Smith.

[If our correspondent will take the trouble to examine the finest edge of a razor or lancet through a microscope, he will find that the chief, though of course not the only difference between it and that of a mill saw, is in the size of the teeth. All cutting edges are, strictly speaking, saws, and the question to be decided in regard to the selection of a proper cutting edge for any kind of work, is whether a fine edge is better than a coarse one for the work. Saws do not tear if they are properly filed and set, the smoothness of the cut being determined by the fineness and sharpness of the teeth. Our correspondent may be right, however, in his view that a fine edge is better than a very coarse one for cutting grain.—Eds.

Curious Phenomena.

Messrs. Editors:—I have a glass jar that will hold about half a pint that has an almost imperceptible crack across the bottom. In this jar I keep sweet oil. Now, when the jar is placed upon a black-walnut bench, the oil exudes from the jar, and in the course of a few hours there is quite a quantity of the oil on the bench, say one half to a whole teaspoonful; but, on the contrary, if the jar is placed on a painted board, or on a hard pine board, no oil will escape! I have tried it several times, consequently I know the above to be a fact.

J. F.

[Can any one give a reason for this peculiarity?—Eds.

Steam Lead.

Messrs. Editors:—Among all the various points in practical steam engineering, perhaps there is none more talked and written about than the proper lead to give the induction valve, and none upon which there is a greater diversity of practice and opinion.

Nor is it at all singular that there should be this diversity of opinion and practice, since the condition, structure, weight of reciprocating parts, speed, strength of bed-plates, and foundations, are as diverse as are individual engines, and the care and qualifications of persons in charge of them.

The writers on the subject are obscure, usually giving their directions in algebraic signs and formulæ, keeping others from knowing how little they know themselves.

Again, this diversity of opinion and practice does not surprise us, when we know that steam lead, *per se*, is a fallacy. Here we will say that a properly-constructed engine does not require it, on the contrary it tends to its destruction, and is a cormorant of fuel.

This broad assertion, however, is only worth its value as an assertion. Let us see if we can show data to confirm it. Now why do we require steam lead? The reason given is, to arrest the momentum of the reciprocating parts of the machine, take up the lost motion of the joints, thereby preventing a shock or thumping when the direction of the reciprocating parts is brought to a state of momentary rest, and started on a reverse direction. The amount of lead to effect this is, as before stated, dependent on speed, condition, weight of reciprocating parts, curve, etc.—very nice points, seldom if ever capable of being fully complied with in practice.

Suppose, then, we discard steam lead; what shall we substitute for it, when we concede the necessity of some mode to arrest and reverse motion?

We will substitute a cushion by closing the exhaust sufficiently early to fill the passage ways and clearance with the exhaust steam, by compressing it to, or nearly to, the initial pressure in the cylinder at the commencement of the return stroke. By this cushioning we gradually arrest the momentum of the reciprocating parts and store it for the return stroke. We do more; we fill the space between the closed steam valve and the piston with the exhaust steam, and consequently do not have to call on the boiler for it. We do more still, the piston, instead of meeting near the termination of the stroke a force equal to the initial pressure, *plus* its momentum, suddenly, like the impact of a battering ram, meets the thin vapor and compresses it gradually without a shock, thereby saving oil, heating, pounding, wearing of brasses, breaking of cranks, connections, and all their concomitant evils, of which many owners of steam engines and others interested have had *quantum sufficit*.

The important saving effected by filling the steam passages from the valve to the piston with the exhaust steam, will be shown by the following circumstances: We indicated an engine which had a cylinder 24″ diam × 60″ stroke, making 30 revolutions (60 strokes) per minute. The area of the passage ways from the closed valve to the piston, when on the dead center, was equal to 3·7″—equal to 1-16th and 0·21 of 1-16th of the stroke; then every 16·21 strokes we make, if we call on the boiler to supply the steam to fill this clearance, we lose (unless we use expansion) one cylinder full of steam or two cylinders full per minute.

The engine spoken of is a beam engine of the marine pattern, and notwithstanding its great percentage of clearance, is working very economically in consequence of its superior cut-off and cushioning on the exhaust. It has no steam lead, on the contrary the piston moves a short distance on the return stroke before it gets steam.

The ordinary three-ported slide valve cannot so well be managed to get compression on the exhaust without interfering with the induction. In this case a compromise may be made by giving sufficient length to lap, say at three-quarter stroke, and close the exhaust the same, more or less, according to the pressure of steam in the cylinder, always being careful that the compression is not greater than the cylinder pressure. The indicator alone reveals this.

New York city. F. W. Bacon.

SPIDERS' SILK.

If you can picture to yourself a mass of pure and yellow gold, which not only reflects the light as from a smooth and polished surface, but which has all the depth and softness of liquid amber, you may realize in some degree the wonderful appearance of a sheet of spiders' silk as seen in the sunshine; and even in the shade its luster is greater than that of gold. But to compare the silk with gold is to tell only one half of the story; for the same spider yields silver as well, so that you may draw from its body a thread of gold or a thread of silver, or both threads together; their union giving silk of a light yellow color.

These two differently-colored silks are drawn from two different parts of the spinning organ, which will be described hereafter; and not only are their colors thus distinct, but also their other physical properties; for the yellow is elastic, and may be stretched slightly and regain its former length, while the white is inelastic, and at once crinkles up when tension is removed during the process of drawing it from the spider. The two kinds of silk are employed also in the construction of different parts of the web; but that has been sufficiently described elsewhere.

Beauty and strength are natural partners, and we do not look in vain for the latter quality in spiders' silk. It is indeed something prodigious as compared with even the strength of metals. A bar of iron one inch in diameter will sustain a weight of twenty-eight tuns; a bar of steel fifty-eight tuns, and, according to computation based upon the fact that a fiber only one four-thousandth of an inch in diameter will sustain fifty-four grains, a bar of spiders' silk an inch in diameter would support a weight of *seventy-four tuns.*

DISADVANTAGES OF SPIDERS' SILK.

Aside from its excessive fineness, the only thing to be said against the silk is the small quantity which a single spider will yield, as compared with the production of a silk-worm. And when it is admitted that the latter spins a big cocoon which yields, upon an average, three hundred yards of silk, weighing about three grains, while the average length which can be reeled from a spider at one time is only one hundred and fifty yards, which is so much finer as to weigh but one-twentieth of a grain, our quantitative comparison looks rather discouraging and lessens the satisfaction we had derived from the previous comparison of quality.

But there are several other facts to be considered which tend to greatly reduce this discrepancy between the production of the two insects; some of these relate directly to the one and some to the other.

Let us first reduce the silk furnished by the worm from its apparent to its real amount. Three grains represents the average gross weight of silk yielded by one cocoon; but the fiber is so covered with gum which would materially interfere with its manufacture that it has to be cleansed by prolonged boiling in soap and water, which process costs each cocoon one quarter of its weight, leaving the real amount of available silk supplied by each worm, two and a quarter grains; but even this is forty-five times the yield of a single spider, and any practical inquirer will not gain much comfort from the comparison. Having now placed the worm's production in its true light, what can we say of the spider to increase the statement of its yield? So far from being destroyed, as is the worm, for the sake of one cocoon, and thereby being prevented from further service in way of laying its eggs, the spider is not at all injured by the reeling process and after a day or two of rest, is ready to yield us a second hundred and fifty yards, more or less, and then a third and a fourth, until it has been reeled from, say twenty times in the course of a month, nor is this probably the limit of their capacity, under favorable conditions, but it will be seen that, even granting it to be so, and its season to be limited to a month, the spider of a whole season is twenty times as valuable as the spider of a single day, and the total yield would be about three thousand yards weighing just one grain. Now, the worm yields only two and a quarter times as much as this, and that is the end of it. Like the swan, it expends all its life in a last effort; but the spider, like the canary, does something every day, and when no longer able to produce silk, can provide for future generations by laying five hundred or more eggs.

Admitting then that a worm yields two and a quarter times as much as a spider, what is the number of each required for a piece of woven silk? A yard of silk varies greatly in weight, and somewhat too in quality, and of course in cost; the quality we cannot here consider, but as to weight and cost, a cheap silk at two dollars and fifty cents weight from one half to three fourths of an ounce per yard. A rich silk at from six dollars to ten dollars weighs two ounces or a little over. And between these two, the ordinary grades in which the majority of people are interested cost from three dollars to five dollars per yard, and weigh from one to one and a quarter ounces.

An ounce is four hundred and thirty-seven and a half grains (avoirdupois), and as each spider yields one grain, it will require, in round numbers, four hundred and fifty to produce a yard of silk; or fifty-four hundred for an ordinary dress-pattern of twelve yards. The number of worms required for the same is to be ascertained by dividing those figures by two and a quarter, which makes, in round numbers, two hundred worms for a yard, and twenty-four hundred for a dress.

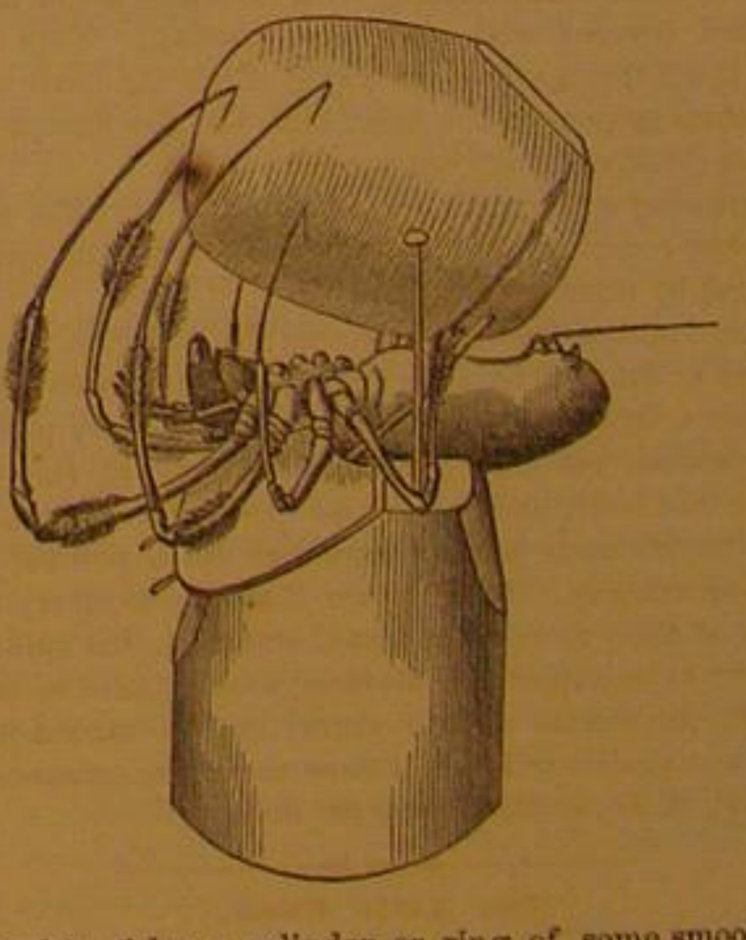
And now supposing (for the sake of comparison) that each spider costs as much time and trouble and money as a worm, and that, therefore, a fabric of spiders' silk costs two and a quarter times as much as one of ordinary silk, that fact by no means indicates that the former is not worth having.

Honey costs more than molasses, but every body of taste thinks it worth the difference; a steel knife is all very well, but a silver one is worth the difference in cost to all who can afford to pay it. A cotton or woolen dress is not to be despised by any one, but every woman prefers a silken gown, and counts the increased price as small compared to the greater satisfaction it affords; and now, so far at least, as we can judge, as honey is to molasses, as silver to steel, as silk to cotton, so is the product of our spider to that of the worm; and the superior beauty, and elegance, and delicacy of the fabric will, no doubt, more than compensate for the difference in its cost.

MACHINERY.

First catch your spider, is a necessary preliminary, and although this matter properly belongs to the last division of our subject, it may be well to quiet the apprehensions of any one who suddenly recollects the big body, and long legs, and sharp jaws of the *Nephila plumipes*, as elsewhere figured, and fears that it is an untamable creature which will resist an attempt to abstract its silken stores. I will leave the complete removal of this apparent obstacle until we come to consider the spider itself in all its relations, and merely say now that it seldom tries to escape or to bite; that you have only to get its body between thumb and finger so that two legs are turned backward, to be perfectly safe from injury by its jaws.

After many trials, the contrivance which I have adopted consists of two large corks, a bent hair-pin, two large common pins, a bit of card and a bit of lead. One cork serves as a base. Its bottom is loaded with the lead, and one half its top is beveled off at an angle of forty-five degrees; upon the oblique surface so formed is fixed the piece of card, its upper edge projecting an eighth of an inch; into the remaining half of the upper end is cut a broad and shallow groove, and upon each side of this groove, at the middle of its length, the two pins are stuck into the cork, so as to be about an inch apart; and now when the insect is held with the legs behind the back and laid upside down into the groove, the projecting shoulders of the abdomen bring up against the edge of the card, and the legs are kept in front of the two pins. The upper cork is rounded and smoothed at its smaller end, and a hair-pin is pushed obliquely through the lower corner of the larger end so as to form an angle of forty-five degrees with the lower side; one or two tacks will retain the pin in its place; at the distance of a quarter or third of an inch from the cork, the pin is bent outward on both sides so as to double its width, and then straightened. Now push the ends of the pin down between the card and the first cork, with the rounded end of the second cork projecting over the card. This may be done with the left forefinger, while the first cork is held between the second finger and thumb; the spider's abdomen is now put through the opening formed by the pin on each side, the cork above, and the cork below; its abdomen rests in the groove, the shoulders come against the card, the upper cork is pressed down so that the narrow part of the pin embraces the pedicle; the legs being set free, fly up and embrace the rounded upper cork, the lower one is fixed upon a screw, turned around so that the abdomen of the spider points to the right; and we are ready to begin the reeling process.



The reel is either a cylinder or ring of some smooth substance as hard rubber, or consists of a set of radii set into an axle, and having their ends bent at a right angle and enameled so as to present an even surface to the delicate silk. The reel I used had radii about three inches in length; this made the whole diameter six inches, and of course at every revolution eighteen inches of silk were reeled upon it; the motion could be quite rapid, and if steady, one or even two feet of silk could be drawn each second, so that a very few minutes would suffice to exhaust the day's supply of a spider.

The thread of a single spider cannot be drawn from a reel In order to obtain a compound thread of such size as to permit us to unwind it from the reel, we have only to arrange a large number of spiders, and carry their combined threads upon the reel; by well-known mechanical contrivances the reel itself (which must not be a slender spindle) may be made to revolve in two directions, so as to twist the thread properly, and then there seems to be nothing to hinder carrying the silk directly from the spider's body to the sewing machine or the loom, for there is no gum to be removed, and its natural colors are beyond the capability of art.

The spider can retard the flow of silk from its spinners by strongly pressing them against each other, but if the reeling is regular it cannot wholly prevent it.

Under the head of disadvantages we must include two very unpleasant facts; 1st, that the young devour each other to such an extent that, as a rule, only a very few out of the several hundred hatched in every cocoon ever reach the age when they separate and build isolated webs; and, 2d, that the female spider is apt to devour her partner sometimes before, but more often after the impregnation of the eggs.

The latter fact is not of so much consequence; for the females are the spinners, and are always in the majority, not only in the number but also in the size of the individuals (the female being about 125 times as large as the male), and the males can be easily protected.

But the terrible destruction which, in a state of nature, seems necessary in order that a portion shall grow at all, is a very serious obstacle in the way of any increase of the species. This killing of each other, however, is not, apparently, from malice but from hunger, and both experiment and inference indicate that it may be almost entirely prevented by supplying the young and growing spiders with suitable food. Each cocoon spun by the parent spider contains from five hundred to a thousand eggs, all of which hatch, generally in the course of a month. For several days, and even weeks, they remain huddled together in the cocoon, and whatever growth they have during that time, aside from absorption of moisture from the air, must be at the expense of the community; nor can it be well prevented. But after this time has passed, and they begin to come forth, either singly or in parties, and spin their little lines over the leaf to which the cocoon is attached, they may be in a great measure prevented from further cannibalism by putting in their reach drops of blood or crushed flies, or very minute flies, or bugs of almost any kind.

If large numbers of them are to be reared, a special apartment should be arranged for them; each cocoon should be attached to the top of a wire frame of, say a foot in hight and nearly the same diameter, which must stand in a shallow dish of water, lest the spiders travel about the room and collect in great numbers at the top, where they could not be cared for. They will spin at first an irregular common web, and eat together from whatever food falls upon it. As they grow larger they may be separated by inverting another frame over the first; for they always ascend.

After several weeks, they suddenly change their instincts; and from living together in some sort of fellowship, which really does not seem to be incompatible with their peculiar style of eating each other up, they attempt to isolate themselves, and to make each for itself its own web, which is now geometrical, like that of the full-grown spiders; and as they now need more room, and will jealously resent any trespassing upon their particular territory, it is time to remove them to the frames, which will be described in the following section.

It is impossible to say how large a percentage may by this plan be reared from one cocoon; but the fact that two or three out of every hundred have been saved at a first trial, under very favorable conditions, show what may be expected of a plan like the above systematically conducted upon a large scale.

As to the food of the young, there are some substances which breed the smaller kinds of flies, and which could be kept in a place communicating with the outer air in another room; but covered with fine wire netting. This would exclude the larger species, but would admit the little ones to deposit their eggs upon the meat, etc.; and the flies produced therefrom could enter the apartment.

The growing spider, like the worm, casts its skin several times before reaching its full size, and in both the operation is attended by some danger.

It is, no doubt, a disadvantage, that the spider, in moulting, is obliged to draw eight such very long legs from their old skins; but although the legs may be occasionally pulled off in the process, yet they generally separate at the second joint from the body, and thereby no blood is lost; and, moreover, although each pair of legs has its appointed office, they act vicariously. To offset the liability to injury in consequence of their more complicated structure, the spiders are not known to be subject to diseases, such as have so terribly destroyed the worms of late years; but we cannot be sure that some maladies will not follow their domestication.—*B. G. Wilder, M. D., in the Galaxy for July.*

The Ixtle Fiber.

The following is a letter from Hon. J. McLeod Murphy to the Commissioner of Agriculture, accompanied with three skeins of the ixtle fiber, *Bromelia sylvestris*, each produced from a single leaf, of which a single plant might average twenty. We extract the substance of this letter from the "Report of Department of Agriculture" for May and June.

"First of all, before I describe the plant and the method of its cultivation, I beg to call your attention to the extraordinary length and strength of the individual fibers, their susceptibility of being divided almost infinitesimally without breaking, their flexibility without kinking, and the readiness with which they receive and hold vegetable or chemical dyes without being impaired. Since my return from Mexico, I have had little or no opportunity of testing this plant practically; but some samples, such as I send you, were given to an old and experienced maker of fishing tackle, and he does not hesitate to pronounce the ixtle fiber as superior, in every respect, for the manufacture of trout and other fishing lines, not only account of the readiness with which it can be spun, its extraordinary strength, but its perfect freedom from kinks when wet. The only secret, if there is one, consists in the preliminary precaution of boiling the fiber (as you have it here) before twisting it. In this one respect it will supersede the use of silk.

"Apart, however, from its use as a thread, I hazard nothing in saying that it forms the best paper stock that can be obtained. I speak now in reference to the imperfect, withered, rejected, and dried leaves, from which the fiber cannot be conveniently extracted by the indifferent mechanical means that the Indians employ. Although I have no samples of paper made from this source just now at hand, yet I can assure the department that several magnificent samples of paper for banking and commercial purposes have been made by manufacturers in the Eastern States, from the dried leaves of the ixtle plant, brought from the neighborhood of Tabasco.

"The samples of fiber I send with this were obtained by the most primitive means, viz., by beating, and at the same time scraping, the leaf of the plant (in a green state) with a dull machete. Then, after the removal of the glutinous vegetable matter, it is combed out and rubbed between the knuckles of the hand until the fibers are separated. The next step is to wash it in tepid water and bleach the skeins on the grass. This is the method pursued by the Indians on the isthmus of Tehuantepec; and the average product for the labor of a man is from four to five pounds per day.

"It is scarcely necessary to tell one so well informed as yourself, that this spontaneous product is the *Bromelia sylvestris*, which differs, in some respects, from the *Agave Americana*, the *pulque de maguey*, and *Agave sisalana*, of Campeche; a difference arising solely from soil and climatic influences. The name *ixtle* is given to that species which is characterized by the production of the long fiber; and chiefly because the leaf, being shaped like a sword, has its edges armed with prickles, similar, in fact, to the weapon formed from *itzli*, or obsidian, used by the Aztecs. Hence the term. The *pita*, on the other hand, although obtained from a variety of the same plant, is a coarser and shorter fiber, which grows in the *tierras templadas*. The name comes from the word *pittes*, which is given to the plantations of the pulque plant in the uplands of Mexico. But the peculiarity of the ixtle is, that it grows almost exclusively on the southern shore of the Mexican gulf, or in what is known as the 'sota vento,' that is to say, between Alvarado and Tabasco, and extending as far inland as the northern slopes of the dividing ridge which separates the Atlantic from the Pacific. The points generally selected for its cultivation are the edges of a thick forest, for which the small undergrowth is removed by cutting and burning. The roots of the plants are then set out at a distance of five or six feet apart; and at the end of a year the leaves are cut and 'scraped.' The chief object is to obtain a constant shelter from the rays of the sun, which would otherwise absorb the moisture and so gum the fibers together as to make them inseparable.

"The average length of the leaf is six feet, and the time to cut it is clearly indicated by the upward inclination it makes. In other words, the radical leaves cease to form curved lines with their points downward, but stiffen themselves out at an angle, as if to guard the source of efflorescence. When the ixtle is young its fibers are fine and white, but as it grows in age they become longer and coarser; and in a wild state the thorns are very numerous, but by cultivation they are diminished both in size and number, and in many instances there are none at all. Where any quantity of leaves require to be handled, a pitchfork would be very useful, especially if gathered for paper stock. A few days after cutting, the sun would dry them out, the thorns would drop off, and then they could be easily baled. Independent of the great value which the ixtle has for textile fabrics, and for paper, it possesses many valuable medicinal properties, to which I need not allude. It requires no labor to cultivate it, and no insect is known to feed upon it. It grows everywhere in the primeval forests of the Gulf coasts, and, in my opinion, is far superior to any of the textile fabrics. But as yet no mechanic has succeeded in devising a means of effectually extracting the fiber, and until this is done, I presume that its real commercial value will remain unappreciated.

"You will readily discover the superiority of the ixtle over the *jenequin* of Cuba, or the hemp which comes from Sisal and Campeche."

Ocean Telegraphy.

Telegraphy may, with propriety, be considered one of the branches of engineering, and is peculiarly of modern development. A clever writer says that it may be read by each of the five senses. On land lines each signal is made by suspending the flow of the electric current for two different intervals of time, called "dots and dashes"—the use of which in different orders, constitutes the alphabet of the telegraph. When they are printed they are read by sight, but ordinarily the operator reads them by sound, as easily as the musician reads the letters of the scale by the same sense. If the operator has no instrument he will grasp the wire in his hands, and read the signals by feeling the intermissions of the flow of the electric current. In like manner, by placing the wire across his tongue, he can "taste" the same intermission (but this is a dangerous experiment). And it is said that the electricity can be made to dissolve a chemical and produce a pungent odor in the telegraphic alphabet, which can be read by "smelling," but for this I do not vouch. I believe that the method of signaling through the Atlantic cable is known in detail to but few persons. The operation is exactly reversed from that on the land lines. The gutta-percha covering of the copper wires, under the pressure of a great depth of water, becomes an absorbent of the electricity which is being sent through them to the extent of 90 per cent. The first portion of the electric wave of 10 per cent crosses the ocean (1,700 miles) in two seconds, and it would be followed by a succession of waves, from the restoration of that portion of the electricity which has been absorbed by the gutta-percha in impulses, and the signal would be repeated like echoes, and produce not only confusion but great delay. To remedy this, Proffessor Varley introduced a key, which sends alternate currets, positive and negative, at such intervals as allow the first wave of 10 per cent to pass forward, and then that portion absorbed by the covering is neutralized by its opposite, and the cable is cleared for the transmission of a second pair of currents. The battery used is a very small one (three of Daniells cups), and the signal being only 10 per cent of this small current, is powerless to move any of the other instruments in use on land. The instrument used consists of a minute polarized needle, suspended on a single strand of a spider's web, or one from the silk worm. In the middle of this minute needle is placed an almost microscopic mirror, which reflects a single ray of light from a powerful lamp. The currents of electricity effect this needle alternately to the right and left, for a space of time corresponding to that occupied in the signal on the land line, the same kind of alphabet being used in both cases. The receiver (not operator) sits in a dark room, and the small mirror reflects the ray of light upon a piece of white paper before him, on which a black line is drawn, to the right and left of which the light is alternately reflected. The receiver reads these signals by "sight," and transmits them to another person, placed outside of the dark room, by means of an ordinary instrument. A short time since, General Reynolds told me that he had sent a message, without either wire or cable, ninety-two miles, across an arm of Lake Superior, by means of the Heliotrope or mirror, and on the return of his messenger (who had been sent with a written copy) he found that the Heliotrope message had been received, understood and obeyed. He had two assistants, who had been telegraphic operators, who had for a whole summer been amusing themselves in talking to each other with these instruments, though they were stationed ten, twenty or thirty miles apart. When the rebel General Morgan made his great raid through Indiana and Ohio he captured one of my operators, and compelled him to telegraph in Gen. Lew Wallace's name, to Cincinnati, asking how many regular troops there were in that city. Morgan read by "sound," and therefore the operator did not dare to intimate that he was under duress, and could only venture to add an extra initial to his own signature. The receiving operator at Cincinnati knew that Morgan was in that neighborhood and suspecting, from the extra initial letter, that all was not right replied, greatly exaggerating the force of regulars; and the consequence was that Morgan changed his route to a circuit of twenty miles beyond the city, and thus saved it from a sack, and the probable loss of millions of dollars.—*W. J. McAlpine.*

Moving Machinery Represented by Photographic Projection.

All persons who have recently attended the higher classes in our public schools know how much teaching has been facilitated by the frequent use of photographic projections with the electric, or Drummond, light. Thanks to this process, says *Appleton's Journal*, the most delicate objects, whether microscopic or telescopic, can be faithfully represented to an entire audience; and it was supposed, in arriving at these results, that perfection was certainly attained. M. Bourbouze, however, in explaining the gas machine of M. Hugon, experienced many difficulties not before anticipated, while demonstrating the relative movements of the slide and pistons; and was obliged to repeat, several times, the same design, with the organs in different positions, with only a partial degree of success. In studying to remedy this defect, we are glad to say he has entirely succeeded, having invented a process that will completely revolutionize the art of projection. He constructs his photographs in movable parts: but turning a small winch, the whole design is correctly demonstrated; the pistons and slides repeat successively the different relative positions taken by the real machine, and consequently all difficulties in explaining disappear. This elegant result has been obtained by the ingenious inventor by means of a very simple arrangement; each movable organ is photographed on a special glass, and these different glasses are arranged in a frame which contains, on a fixed glass, the photography of the fixed parts of the apparatus represented. The movable glasses are each fixed to a connecting rod moved by a single winch; the length of each connecting rod being calculated in such a way as to produce accurately the movement required.

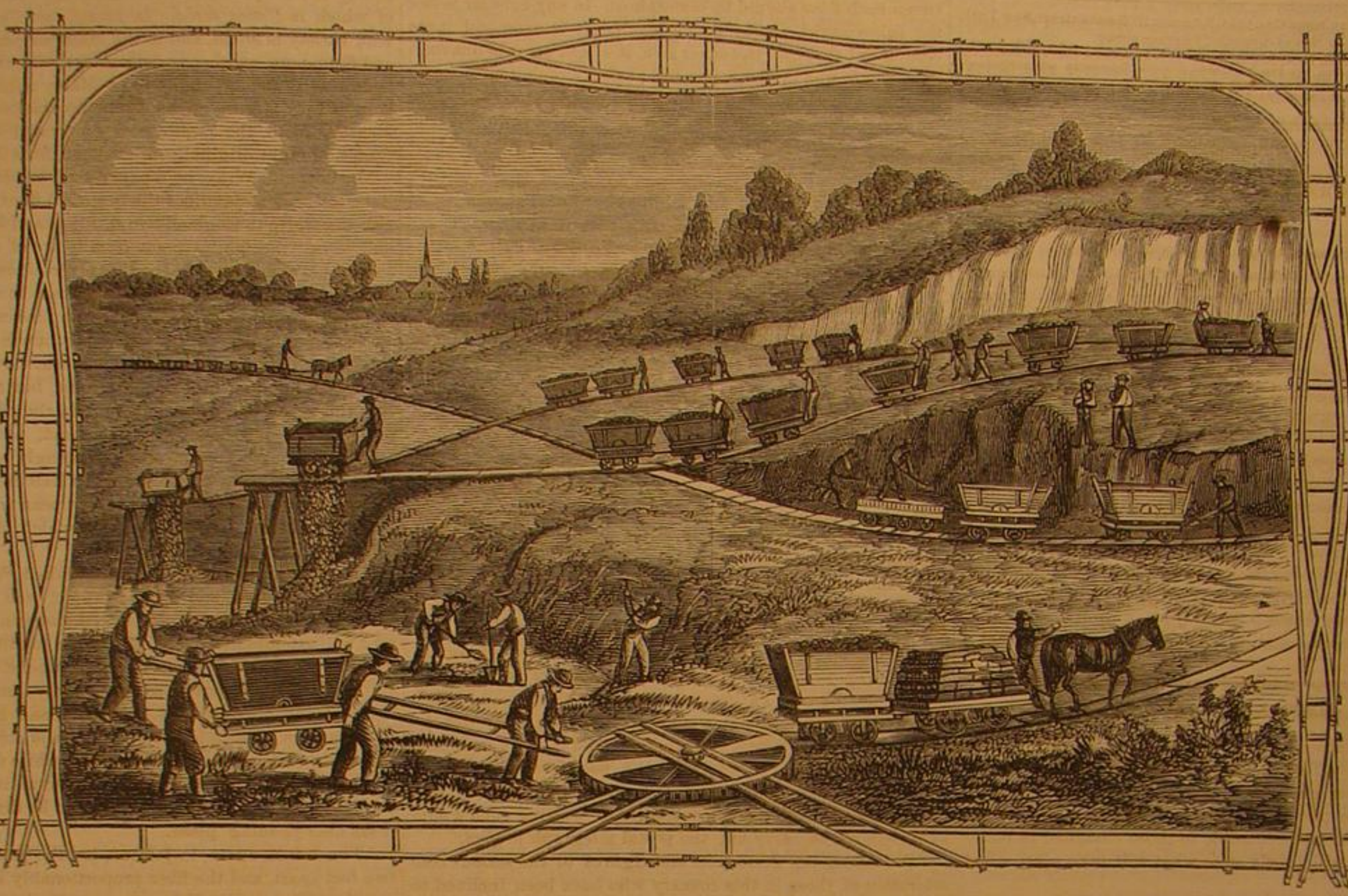
A RECENT discovery in the Département de la Dordogne, France, of human skeletons coeval with the mammoths, and undeniably appertaining to the earliest quaternary period, presents features of such unusual interest that the French government has sent M. Larter, the palæontologist, to make a report on the subject. He reports that the bones of five skeletons have been discovered, and that they belong to some gigantic race whose limbs, both in size and form, must have resembled those of the gorilla. But the similar origin of man must not be inferred from these analogies, as the skulls, of which only three are perfect, afford testimony fatal to this theory, having evidently contained very voluminous brains. The skulls are now in the hands of a committee of savants, who are preparing an exhaustive craniological report.

SOME dentists recommend silk floss fo r cleaning the spaces between teeth, but we know from experience, that No. 8 gum rings are superior. The rings are not only more convenient to handle but they slip through the spaces easier.

Improved Portable Railroad.

The invention herewith presented is so simple that at first sight it might strike the mind as puerile. Its practical value is, however, second to few inventions claiming the attention of the public at this time, as has been demonstrated in the large saving effected by its use.

It consists of a series of wooden rails connected together in pairs at suitable distances apart to form sections. These sections are connected to each other by simple fastenings, such as hook catches and eyes, so that they can be readily taken apart or connected as desired.



PETELERS' PORTABLE RAILROAD.

With these wooden rail sections are connected turn-outs, turn-tables, switches, frogs, bridges, and other parts necessary to form a complete railroad. All these parts are made principally of wood, and so light that they can be readily handled by a few men. The sections are twenty feet long with iron straps riveted upon them.

The bridges and rafts are composed of ordinary wooden rail sections supported by boards laid crosswise or lengthwise, so that such sections or bridges, when laid on marshy or soft ground, will be prevented from sinking in, and will be capable of sustaining the weight of the cars passing over them.

The cars are so constructed that their contents can be readily dumped, and are so low that the operation of loading them is materially facilitated.

The track thus constructed readily adapts itself to the formation of the ground on which it is laid, as indicated in the engraving, and the great advantage of the invention will be best understood from a case where it has been applied.

In Prospect Park, in Brooklyn, N. Y., large quantities of earth have been moved to fill up sunken places, in excavating lakes, etc. The cost of moving by this method was thirteen cents per cubic yard, against twenty-seven cents by carts, for even a short distance. In Greenpoint, N. Y., 2,500 feet of the portable railroad was laid, and over this road twenty-three trips were made in ten hours by each horse, three horses being employed, each drawing five cars, so that three hundred and forty-five loads of earth were dumped in ten hours, each load being equal to one cubic yard. Twenty men and only three horses were employed, and the saving was over fifty per cent. From this example the great advantage of this portable railroad will be apparent in all operations, such as leveling streets, filling in sunken lots, constructing docks, making excavations, building ordinary railroads, mining, brick manufacture, etc.

We take pleasure in calling the attention of the public to this meritorious and labor-saving invention. It will be found of great service in making a road quickly over soft and marshy ground, and so convenient is it to handle that one thousand feet have been laid in a single hour, by a small force of laborers.

For military purposes, as well as for the objects already mentioned, it must prove valuable. Over $60,000 worth of rights have been already sold.

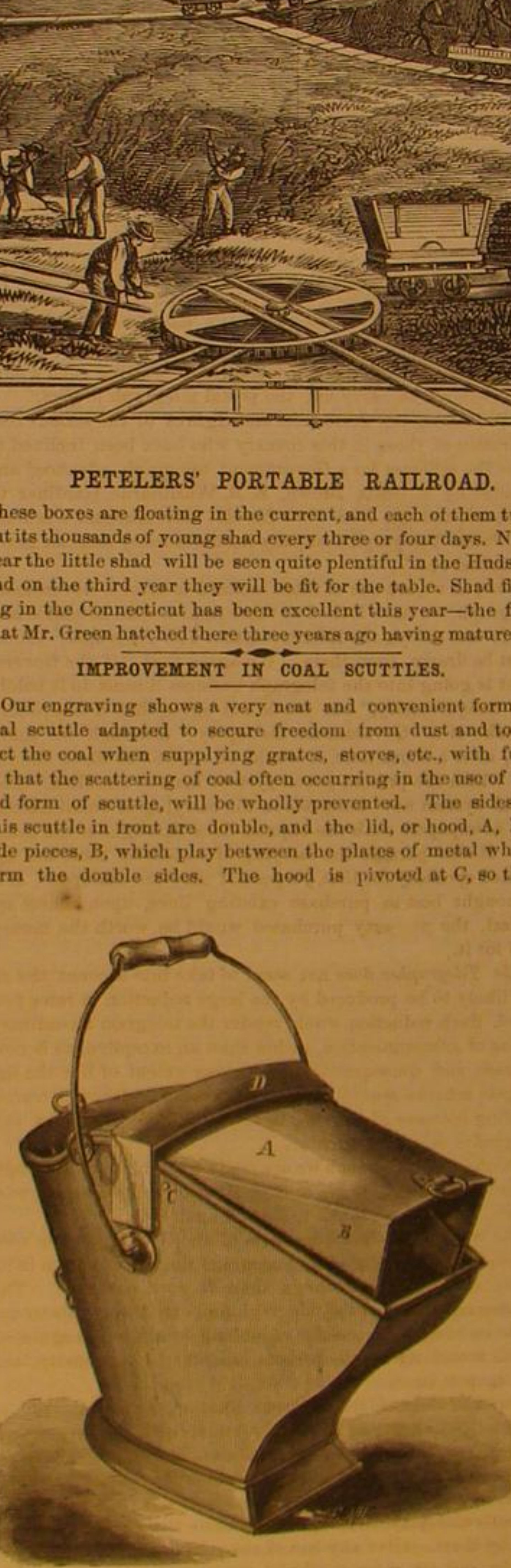
Patented through the Scientific American Patent Agency, Sept. 4, 1866, by A. Peteler, New Brighton, N. Y. For further particulars address A. Peteler & Co., at the same place.

Shad Propagation.

Intelligence from the Hudson received daily is most encouraging as to the propagation of shad there, under the direction of Seth Green. Mr. Green has lately returned to Rochester and left the work under the direction of his brother, Munroe A. Green who is also very successful. The nets are hauled some two miles from Coeyman's, and the propagating party are fortunate in finding as many of the kind they require as they can well use. They are hatching millions of fishes, which are put into the river. The spawn of these fish would of course be otherwise wasted. The success in this operation has far exceeded the expectations of the Fishing Commissioners and of Mr. Green. M. A. Green is now in charge of ninety of Seth Green's patent boxes, in which the process of hatching takes place. These boxes are floating in the current, and each of them turn out its thousands of young shad every three or four days. Next year the little shad will be seen quite plentiful in the Hudson, and on the third year they will be fit for the table. Shad fishing in the Connecticut has been excellent this year—the fish that Mr. Green hatched there three years ago having matured.

IMPROVEMENT IN COAL SCUTTLES.

Our engraving shows a very neat and convenient form of coal scuttle adapted to secure freedom from dust and to direct the coal when supplying grates, stoves, etc., with fuel, so that the scattering of coal often occurring in the use of the old form of scuttle, will be wholly prevented. The sides of this scuttle in front are double, and the lid, or hood, A, has side pieces, B, which play between the plates of metal which form the double sides. The hood is pivoted at C, so that



when the scuttle is canted forward in the act of filling a grate, the pressure of the contained coal throws the hood out in the position shown in the engraving, where it is held by a stop. When the scuttle is set down, the hood readily falls back and excludes the efflux of dust. The scuttle is supplied, back of the handle with a second lid, which, when raised, allows it to be filled with coal, when the lid is closed, and the dust confined. The scuttle is strengthened and stiffened by an arch of metal, D, passing across under the handle, and firmly attached to the sides as shown.

We consider this one of the most useful and tasteful forms for a coal scuttle that we have seen.

Patented May 25, 1869, by John L. Ellithorp and Peter Sloan, whom address, at Canajoharie, N. Y.

Drying Effect of Fir Trees upon Soil.

A remarkable instance of the effect of pine trees on the soil in which they grow has been published in the "Woods and Waters Reports" of the north of France. A forest near Valenciennes, comprising about eighteen hundred acres of scrub and stunted oak and birch, was grubbed up in 1843, and replaced by Scotch firs. The soil, composed of silicious sands mingled with a very small quantity of clay, was in some places very wet; it contained two or three springs, from one of which flowed a small stream. The firs succeeded beyond expectation, and large handsome stems now grow vigorously over the whole ground. It was in the early stages of their growth that the remarkable effect above referred to was noticed. The soil began to dry; the snipes that once frequented the place migrated to a more congenial locality: the ground became drier and drier, until at last the springs and the stream ceased to flow. Deep trenches were dug to lay open the source of the springs, and discover the cause of the drying up; but nothing was found except that the roots of the firs had penetrated the earth to a depth of five or six feet. Borings were then made, and six feet below the source of the spring, a bed of water was met with of considerable depth, from which it was inferred, the spring had formerly been fed. But in what way its level had been lowered by the action of the firs could not be determined, and is still a matter of speculation. But the fact remains and may be utilized by any one interested in tree culture. For years it has been turned to account in Gascony, where the lagoons that intersect the sandy *dunes* have been dryed up by planting the *Pinus maritimus* along their margin. Hence we may arrive at the conclusion that while leafy trees feed springs, and maintain the moisture of the soil, the contrary function is reserved for spine or needle bearing trees, which dry the soil and improve its quality.

Nocturnal Hailstorms--Hailstones of Singular Form.

A correspondent from Pittsburgh, Pa., gives an account of a nocturnal hailstorm which occurred in August, 1851 or 1852, at 11 P. M. The hail fell in great abundance, covering the ground to the depth of several inches. The stones were of enormous size, some of them being two inches in diameter. They were shaped like an unripe tomato, slightly concave on one side, and considerably flattened. This storm occurred in Alleghany county, Pa., about eighteen miles from Pittsburgh.

Another correspondent writes us from Germantown, Ind., that on the evening of the 8th inst., a violent hailstorm occurred at that point, commencing about 9 P. M., doing much damage to buildings and crops. The stones were the size of hickory nuts, and round, with the exception of a little sunken hole on one side.

Another correspondent writes us from Illinois, stating that although he has never witnessed a nocturnal hailstorm, he has seen three hailstorms in that State, remarkable on account of the size and peculiar shape of the stones. These stones killed chickens, pigs, and other small animals. In one of the storms the hailstones were, as he represents it, "square chunks," or approximate cubes—a form of hailstones we have never seen described before. These communications settle all doubts of the occurrence of nocturnal hailstorms.

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Contents:

(Illustrated articles are marked with an asterisk.)

ON CIRCULATION IN BOILERS.

Certain communications, lately received, in reference to boiler construction, lead to the inference that the importance of securing proper circulation in boilers is imperfectly comprehended on the part of some of our readers. In order to make this subject comprehensible to those unskilled in boiler construction, we will briefly state what will take place when water is boiled.

First, the heating of water to 212° Fah., its boiling point under atmospheric pressure, at the sea level, is not synonymous with boiling, for if water be taken to lower levels, as in deep mines, it will not boil, on account of increased atmospheric pressure, till a higher temperature has been reached. In all steam boilers, when condensation is not employed to remove atmospheric pressure from the exhaust, a greater pressure than that of the atmosphere must be maintained, to give an effective pressure in the cylinder. It follows that in such boilers the temperature at which steam escapes from the surface of the water in such force as to cause ebullition or boiling must be higher than 212° Fah., by an amount corresponding to the pressure maintained.

The violence with which the boiling of water takes place, when the proper temperature is attained, depends not only very much upon the shape of the containing vessel, but in an almost equal degree upon the point at which the heat is applied to it. Water, contained in a long, straight, and narrow tube, closed at the bottom, may be quietly and entirely evaporated if the tube be held in a gas flame, obliquely, so that the heat shall be applied successively to the uppermost strata as evaporation proceeds. If, on the contrary, the tube be so held that the bottom stratum receives the heat first, the water will either be thrown out of the tube, or the bottom will be blown out. But a tube might be so formed and adjusted that heat applied at the highest point would also force out the water. A tube, bent into the form of the letter *U*, filled with and having its lower ends immersed in water, would be such a tube.

All violent ebullition in a boiler not only tends to render it unsafe, but also uneconomical from foaming or priming. If we were addressing our remarks to experts, we should not need to say that the amount of water required to feed a boiler is no index of its evaporative power. Water thrown out unconverted into steam is not evaporated. It performs no work in the cylinder of the steam engine unless converted into steam by what is called superheating.

As water does not boil until steam is generated in sufficient volume, and as this event depends, all other things being equal, upon the amount of surface pressure, it follows that in high-pressure boilers a much greater increment of heat must first be imparted to the water than in low-pressure boilers, and that priming is more likely to occur in them on account of the higher temperature and greater activity of the steam. Previous to boiling, the contained water circulates quietly, the heated particles rising as fast as heated, and giving place to colder ones, until the temperature of the mass is raised to the point at which steam is rapidly generated. When this takes place, every particle of water converted into steam occupies some three hundred times the space which it filled in the liquid state, so that, in escaping to and through the surface, it requires a very much larger and freer passage than before. If this is not provided, the water will be violently upheaved, and dashed about, spray will be produced, and wet steam become a certain result.

Such was the case in the now discarded suspended tubes employed some years since in the earlier forms of portable engines. These tubes, suspended in the fire box, made no adequate provision for circulation, and, of course, were found to be inefficient as well as dangerous.

The form of boiler which, of course, will give the freest circulation of any, is the plain cylinder, without tubes or flues. But such boilers give only a small heating surface in proportion to the amount of water they carry, and on other accounts are not economical. It will be found generally better to pass the fire through tubes or flues surrounded by water, than the converse. And it is also necessary that a proper distance between such flues should be maintained. In any tubular boiler the tubes ought not to be too small. It is safer and more economical to err on the other side, if slight error is unavoidable, and to provide for a free and perfect circulation.

Circumstances which determine the proper proportions, are very numerous, and ought to be well considered, in the construction of every flue or tubular boiler. He who, without posting himself upon the results of modern experience and investigation, expects to achieve much success, will be doomed to disappointment.

THE PROPOSED POSTAL TELEGRAPH.

Our able and spirited cotemporary, *The Telegrapher*, has from the first looked with disfavor upon the proposition to establish a Government postal telegraph in this country. In its issue of the 3rd of July it devotes a leading article to the subject. It says:

"By recent telegraphic advices by cable, we are informed that the cost to the British Government for the purchase of the telegraph lines of the country, will be £6,500,000, equivalent to $32,000,000 in gold. For this enormous expenditure the government gets only the lines and equipments as at present established and in use. An additional large amount will be required to extend the wires, and establish offices as proposed by the postal telegraph advocates. When this is done the system cannot be as cheaply worked as by private enterprise, and there is no doubt but that for some years to come there must be an annual loss, not only of the interest on the capital invested, but also on the actual working expenses. These facts are having a decided effect on the minds of the members of Parliament, and they seem to be in no hurry to appropriate the money necessary to carry out the bargains of the Disraeli Government, and it is by no means certain but that the schemes of the postal telegraphers in England may yet come to grief from the disinclination of any government to take the responsibility of wasting such a sum as is required to carry out the postal telegraph project.

"We commend these facts and figures to the serious consideration of those in this country who have been inclined to favor the schemes for a Government telegraph, advanced and directed by B. Gratz Brown, E. B. Washburne, Gardiner G. Hubbard, and the *New York Herald*. Mr. Hubbard's scheme of a Postal Telegraph Company is an absurdity and can never be carried out."

Now, as we are one of those inclined to favor a Government telegraph, we have looked at these figures with attention and we do not accept the inferences that *The Telegrapher* thinks must be drawn from them. We agree that "if the Government is going into the telegraph business it must do it boldly and unequivocally," but we do not agree that *it is necessary* to make it a "Government monopoly" although we think that, after a short time, it would be wise to do so, to the extent which the present postal system may be so called. The postal system now competes in the carrying of small parcels and newspapers with the express lines throughout the country. It also permits the carrying of letters by those not appointed specially for that purpose, if they are stamped. If it is thought best to purchase existing lines, upon honest appraisal, the property purchased would be worth the money paid for it.

The Telegrapher does not seem to take into account the effect likely to be produced by the large reduction in rates proposed. Such reduction would render the telegram an ordinary means of communication, rather than an exception, as is now the case, and consequently for a given extent of line the aggregate returns would be greatly increased without a corresponding increase of expense in the working of the lines, and the profits would be greater.

Having said this much we are ready to admit that although there is something to be said in favor of a Government telegraph, there is also much to be said against it.

The way in which the business of the Government is now transacted, does not greatly encourage the wish to place in its hands any wider patronage than it now possesses. The chances are that were the telegraph property of the entire country to be bought up, a series of jobbing would be inaugurated which would enrich the present holders of the property, and rob the people.

The interests of the different lines as well as the public would, we believe, be so greatly enhanced by a large reduction in present rates of transmission, that all thought of change would be at least for a considerable period, banished from the public mind. The present rates over many lines are preposterously exorbitant, and of course their business is limited by them. Give any one of these lines all the business it can do, and the rates might be made extremely small, compared to current charges. We believe the converse would also be found true; and that were the prices of transmission very much reduced, both business and profits would be enormously increased.

Whether competition brings this about or not, one thing is certain, the public will not long be deprived of cheap telegraphic communication.

HEAT never performs work except in passing from one body to another. It is then only partially converted into work.

LITTLE KNOWN FIBROUS PLANTS.

There has been of late a considerable search after plants producing fibers that could be advantageously used in the arts of paper making, rope making, and the manufacture of textile fabrics. Some of these materials have been discovered in North and South America, but a large majority of those claiming the attention of manufacturers are found in Southern Asia, more particularly in India.

Among these stands most prominently a plant of the nettle family called by the natives "*Tchuma*," the botanical name of which is *Urtica nivea*. In Assam both a cultivated and wild variety is found, and in the Malayan peninsula, Panang, and Singapore, another variety grows wild, the fiber of which is unusually strong. This has a Malay name, "*Ramee*," and is in botany known as the *Urtica tenacissima*. This plant is identical with the ramie, now cultivated in the Southern States, brought originally, we believe, from Java.

Mr. Leonard Wray, in a paper read before the Society of Arts, in London, describes the beautiful fiber of the "Rheea" as being worth in England two shillings and four pence per lb., and says, "the fabrics made from it are of so strong and so lustrous a character as to be in universal demand. Pity, indeed, is it that this splendid fiber can be obtained only in such small quantities. No other supplies can be looked for, except from China, nor can we expect much from that country either. Its growth and preparation have been tried by most intelligent Englishmen in India, but they found, first, that the separation of the fibers from the plants was a most difficult and laborious operation; and, secondly, that the yield per acre per annum was exceedingly small. Indeed it is said to yield only one to one and a half cwt. of fiber to the acre—a fact which forbids any European from entertaining hope of cultivating it at a profit, which is much to be regretted."

Mr. Wray also believes the plants called *Pederia fœtida*, the "*Jettee*," "*Moorva*, and the pine apple, each and all of them, hold out the promise of amply remunerating any European who will attempt in a judicious manner to utilize the beautiful fibers they contain. Their fibers are fine, silken, and strong. He says, "The *Pederia fœtida* certainly has the most silky and lustrous fiber any one can desire, and its being only in lengths from joint to joint seems the sole objection to it. Still, these joints are often 12 inches apart, while the finest Sea Island cotton is not more than one inch to an inch and a half in staple. Attention ought, therefore, to be directed to this lustrous fiber-yielding plant.

"The Jettee, again, is jointed, but the joints are sometimes two feet apart, and the fiber proportionably long. It is a most excellent fiber, and will be sure to make its way.

"The pine apple, with its beautiful fiber, exists in thousands of acres in the Straits of Malacca, and may be had at Singapore in any quantity for the trouble of gathering, yet no one seems to regard it."

Another important fiber-producing plant is the *Bromelia penguin*, from which the surprisingly beautiful Manilla handkerchiefs are made, as well as the celebrated "Pigna" cloth, an Indian fabric commanding always an extreme fancy price. This is a kind of wild pine-apple said to be exceedingly abundant.

The late Mr. Temple, formerly Chief Justice of British Honduras, some years since exhibited a quantity of this fiber to the Society of Arts, calling it silk grass.

Mr. Wray says we may search the world through and not find another plant capable of yielding so rich, so abundant a supply of a fiber which in quality cannot be excelled, and that it is a plant which we may look to, to provide us with a large amount of the very best quality of fiber.

The fiber alluded to can be grown exceedingly cheap, and it is asserted that the manufacture involves no difficulty. The fiber is said to be separated by a machine constructed somewhat on the principle of the thrashing machine, the plant being passed at a slow rate along a platform having a yielding surface, through rollers and beaters; and, when this is done with the plant in a green state, it comes out at the other end of the machine very good fiber, which is improved by repeating the operation. A stream of water is used to wash the pulp away as it is expressed from the fiber.

Among cordage fibers there is the nettle and the canna; the latter often growing fourteen feet high. The whole stalk and leaf are said to be one mass of fiber, and the root furnishes a species of arrowroot said to be the most nutritious of all the starches.

It is thought that some if not all of these plants can be grown in Europe, and if so they ought to thrive in parts of the United States. It is not a just inference that because a plant is a native of a tropical clime it will not thrive in temperate climates. Though this may be the rule, there are numerous exceptions. Our Commissioner of Agriculture would do the country a service by obtaining and distributing the seeds of these plants in sections most favorable to their growth, if he has not already done so. We are far from believing the vegetable kingdom contributes to the wealth of mankind all, or nearly all, it is capable of doing. It is within the memory of yet young men, that the tomato was considered a useless vegetable, yet to-day there is probably no fruit grown in this country, if we except the apple, more generally used and esteemed. It is quite probable that many plants indigenous to our soil, possess fiber which would be of great service, if properly worked. Among those which seem most promising are some of the "*Asclepias*" family, popularly known as "milkweeds," "silkweeds," and so forth. The plants are large, rapid, and thrifty growers, and their pods contain a large amount of cotton-like fiber, which, though it might not be sufficiently strong for textile fabrics would make, we think, excellent paper stock. We are not aware that any experiments have been made with this fiber, although we have often heard it spoken of by manufacturers, as likely to prove serviceable, could it be producad at a cheap rate. We cannot of course say what amount of fiber could be produced upon a given quantity of land, but as it grows wild with great luxuriance, it would seem that a large crop might be expected on rich soil under cultivation.

THE FORTHCOMING ECLIPSE.

On the 7th of Aug. next a total eclipse of the sun will occur, visible in the United States, at the following points:

BEGINNING AND ENDING OF THE TOTAL PHASE.

	Begins. h. m. s.	Ends. h. m. s.
Lincoln, Iowa	4.29 3	4.32 3
Des Moins, Iowa	4.44 1	4.47 0
Iowa City, Iowa	4.53 8	4.66 2
Burlington, Iowa	4.56 9	4.59 9
Keokuk, Iowa	4.56 3	4.59 0
Rock Island, Ill	4.63 3	5.00 8
Peoria, Ill	5.04 0	5.06 1
Quincy, Ill	4.57 4	4.59 7
Springfield, Ill	5.04 8	5.07 6
Alton, Ill	5.05 5	5.06 2
Terre Haute, Ind	5.15 1	5.17 4
Vincennes, Ind	5.15 9	5.18 6
Louisville, Ky	5.25 1	5.27 6
Frankfort, Ky	5.28 8	5.31 0
Lexington, Ky	5.40 5	5.32 7
Abingdon, Va	5.42 4	5.44 3
Wytheville, Tenn	5.45 7	5.47 3
Greeneville, Tenn	5.39 5	5.41 3
Knoxville, Tenn	5.36 4	5.39 4
Raleigh, N. C	5.57 4	5.58 5
Wilmington, N. C	6.01 7	6.04 6
Newbern, N. C	6.05 8	6.08 0

The average duration of the total phase will be about two minutes. Some of the prominent central points will be Springfield and Rock Island, in Illinois; Terre Haute, in Indiana; Louisville and Frankfort,in Kentucky; Abington,in Virginia; and Raleigh and Wilmington, in North Carolina; and Des Moines, Iowa.

Coming, as it does, so to speak, on the heels of the great discoveries of last year, this eclipse will attract unusual interest, and be observed with great care.

We learn that the Government has ordered three astronomers, from the Naval Observatory, to proceed to Des Moines, and two others to Behring Straits. The Coast Survey, also, will send a detachment of observers to Des Moines, and another to the Missouri River, five hundred miles beyond Sioux City. Observations will be made at Burlington, Iowa, by the Superintendent of the Nautical Almanac, and Louisville, Ky., will be visited by Prof. Wilson, of Cambridge. Prof. Hough, Director of the Dudley Observatory, at Albany,will,we understand, go to Des Moines; and Prof. Peters, of Hamilton College will also make his observations at the latter place. He will be accompanied by Prof. William A. Rogers, of Alfred Center, N. Y., and Isaac H. Hall, of New York.

The *Post* informs us that ample preparations have been made by Prof. Peters, at an expense of about twelve hundred dollars, the funds being provided by Mr. Edwin C. Litchfield, of New York, the liberal founder of the Astronomical Department of Hamilton College. It states that the theory of the constitution of the sun has been for years a special object of study at the Hamilton Observatory, and many special points bearing upon that theory will be determined by observations of the coming eclipse.

The extreme rarity of this event, also, adds much to its interest, there having been only two total eclipses, visible in any large part of the United States during the present century: those of 1806 and 1834. Annular eclipses are far more frequent, but their observation is not likely to be so fruitful of discovery as that of total eclipses.

We wish the observers, each and all, a cloudless sky, and success in their arduous undertaking.

THE ART OF PYROTECHNY.

We have often been puzzled to account for the delight with which popping, and frizzing, and blazing, on the Fourth of July, seems to fill the minds of boys and even men. Whatever may be the cause, the recent display gives no indication of diminished taste for such sports.

However, as the art of pyrotechny is an industry involving the employment of considerable capital, ingenuity, and artistic taste, it may not be amiss to give our readers an outline of the means employed to produce the effects so much admired by most people.

The word pyrotechny signifies the art of employing fire for useful or other purposes. It consists, first, in the combination and admixture of different materials so that they shall produce, when burned, certain colors, explosions, etc., and also so arranging them that they shall represent a preconceived design, or impart, by their explosive force, motion to wheels, rockets, etc.

The little that is known in regard to this art seems to indicate that the Chinese had a very early knowledge of it, if they were not the first to originate it. And they are still, perhaps, as skilled in it as any other nation.

One of the chief materials employed is gunpowder, the nature and composition of which are varied somewhat according to the purposes to which it is applied. It is unnecessary to dwell upon its composition, as our readers are already well informed in regard to it, as well as the method of manufacturing it; and doubtless some of them have received, during the late celebration, practical demonstration of the impossibility of restraining its force. In such attempts, hands and arms rarely are found equal to the emergency.

Niter is also a material of the greatest importance in this art. It is obtained in the common form in which it is sold in large establishments, and purified by solution, filtration, and recrystallization. The composition of this salt is one equivalent of potash and one of nitric acid. At a red heat it is decomposed, giving off its nitrogen and oxygen, the latter of which constitutes nearly one half the weight of the salt. Being so rich in oxygen its presence in connection with a sufficiently heated combustible affords, by its decomposition, a supply of oxygen to support vigorous combustion, and hence its general use in the art of pyrotechny.

Sulphur, charcoal, steel dust, and iron filings, are also largely used. A material called "iron sand," made by pulverizing cast iron, is also employed. This iron sand is often prepared so as to keep without rusting, by partially combining it with sulphur, in order to coat the grains with a sulphide of iron. It is slowly sifted into melted sulphur, and thoroughly stirred till the mass is cold, when it is finely pulverized, and the extraneous sulphur sifted out. The granules of iron sand give most beautiful sparks when burned. Oil of camphor, benzoin, salts of strontium, antimony, copper, and other metals which impart brilliant colors to flames when burning, glass dust, brass dust, ivory raspings, amber raspings, chlorate of potash, Ethiop's mineral, chalk, orpiment, nitrate of barium, and many other ingredients, are employed. A few recipes will give a clue to the method in which these materials are used to obtain colors.

STARS FOR ROCKETS.

1. *Purple.*—Chlorate of potash, 42 parts; saltpeter, 22 parts; sulphur, 22·5 parts; black oxide of copper, 10 parts; Ethiop's mineral, 2·5 parts.

2. *Lilac.*—Potash, 50 parts; sulphur, 25 parts; chalk, 22 parts; black oxide of copper, 3 parts.

3. *Green.*—Nitrate of barium, 62·5 parts; sulphur, 10·5 parts; potash, 23·5 parts; orpiment, 1·5 parts; charcoal, 1·5 parts.

4. *Yellow.*—Nitrate of soda, 74·5 parts; sulphur, 19·5 parts; charcoal 6 parts.

5. *Crimson.*—Chlorate of potash, 17 parts; nitrate of strontium, 55 parts; charcoal, 4 parts; sulphur, 18 parts.

The coloring principles of the above mixtures are, in No. 1, the oxide of copper and Ethiop's mineral; in No. 2, the chalk and the copper; in No. 3 the nitrate of barium; in No. 4, the nitrate of soda; in No. 5, the nitrate of strontium. In all of them the sulphur modifies the color more or less, and when burned alone it gives a blue flame.

Black pitch gives a dusky flame, like thick smoke; sal ammoniac and copper salt, a greenish flame; raspings of amber, a lemon yellow; powder of metallic antimony a russet; raspings of ivory, a beautiful silvery flame; steel dust, very brilliant silver-colored spangles.

Rockets and wheels are propelled by the reaction of suddenly generated gases, discharging from cases of strong pasteboard. The motion of serpents is produced by a small piece of paper, or its equivalent, attached to the middle of the case, which, by its resistance upon the air produces the erratic motions of these amusing fireworks.

Gerbes, or fountains, a species of firework, which throws up a sparkling jet of fire, resembling somewhat the shape of a water spout, are made of thick paper or pasteboard, partly filled at the bottom with clay through which a priming hole is bored. Roman candles are very nearly like the gerbes. Between their layers of composition, balls or stars are placed, which vary the effect produced.

Rockets are strong paper cylinders filled with a composition rammed hard. They may have attached to them "heads" of gunpowder, sparks, stars, serpents, etc., as fancy may dictate. The stick attached to them acts as a rudder to keep their flight in the proper direction.

The composition with which rockets are filled varies with the weights. For one and two ounce rockets the ingredients may be one pound of gunpowder, two ounces of soft charcoal, and one and a half ounces of saltpeter. For four-pound rockets, gunpowder one part, saltpeter thirty parts, sulphur four parts, charcoal twelve parts. All the materials are pulverized except the gunpowder, and the mixture thoroughly incorporated by sifting. The composition is then rammed hard into a case made by cartridge paper upon a brass former, with paste between the laminæ. The sticks being attached properly the rocket is completed.

To give a more minute description of the details of this art would extend this article too much. Suffice it to say, that the recipes and compositions above given are by no means the only ones by which similar effects may be obtained. To give them all, with all others used in the art, would require a volume.

MANUFACTURE OF IRON AND LEAD PIPES.

Whoever will examine the various methods of supplying modern cities with water cannot fail to contrast the modern water-main with the ancient aqueducts. Generally speaking, we lose nothing by the comparison. The man of sentiment may deplore the innovations which displace the well or fountain, but the practical, matter-of-fact man or woman will yield more to comfort and economy. A windlass or pump-handle looks well in a rustic picture; at the same time, they are suggestive of labor, while our hydrants, to employ a Hibernicism, "do their own pumping."

Has it ever occurred to the reader to inquire how pipes—common water and gas pipes—are made? In every large city in the Union there are miles upon miles of large and small pipes under ground. Nearly every resident of a large city is aware of the fact that these pipes are made of iron, but we question if one in a hundred knows how they are made. They are taxed for their construction, taxed for their connections, taxed for every gallon of water and every foot of gas which courses through them, yet further than that they know nothing about them. Here in brief is the process:

1. A hollow spindle, or tube, the length of the pipe required, is covered with a rope composed of straw, and the latter covered evenly with loam about the consistency of mortar. 2. This spindle, thus prepared, is next placed in a drying oven, dried thoroughly and washed carefully with a composition which prevents the loam from adhering to the metal. At this stage it is now termed the "core," around which the pipe is to be cast. 3. A large iron flask, corresponding in length with the "core," in the form of a cylinder, constructed in such a manner as to open and shut as a hinge is opened, is placed on end (the sides being held together firmly with clamps), an iron pattern corresponding in size with the diameter of the pipe inserted, and the intervening space filled with sand. 4. The iron pattern or shaft is then withdrawn, the mold washed with the composition already described, and the flask placed in a drying oven. 5. When thoroughly dry, the flask is placed on end in a pit, the "core" placed exactly in the center, and the boiling metal poured in from the top, as in the method of casting bells. 6. The spindle around which the "core" is formed and the metal flask being perforated, permits the heated air and gas generated in the pouring process to escape. The purpose served by the straw rope will be better understood when we explain that all metals shrink or contract in cooling. If the metal were cast around a perfectly solid cylinder, whether composed of stone, iron, or dry sand, it would crack from end to end, or burst into fragments on cooling, from which it will be seen that the straw serves as a cushion which accommodates itself to the strain brought to bear upon it. When the metal has remained a sufficient length of time in the mold or flask, the latter is taken from the pit, the clamps removed and the pipe turned out. The "core" is afterward pulled out, and the pipe is complete.

The pit alluded to is about twelve feet deep. As the iron flasks alone weigh from seven hundred to four thousand pounds, the reader will naturally be curious to know how they are lifted in and out of the pit when full of sand and metal. It sometimes happens that the total weight exceeds eight or nine tuns. This is accomplished by means of a number of cranes or adjustable windlasses, which raise, lower, and move the flasks from one spot to another as easily as a man moves his arm. Operated by a small steam engine, the cranes perform the work of a regiment of men every day, and are absolutely indispensable. "Swinging around a circle," they hoist, lower,or draw toward or push away from themselves the most prodigious weights with a celerity truly marvelous. They even do their own cleaning, for as the pits become full of sand, or dirt accumulates in their vicinity, the moment it is shoveled into a huge barrow, they lift it up and "dump" it at a respectable distance.

Those who are unacquainted with the principles which govern liquids may inquire, "Why not use earthen or wooden pipes under ground, or something less costly than iron?" Why, dear sir or madam, it would not stand the pressure. To illustrate this matter, we will state that by placing a small iron tube of a given hight in the strongest cask or barrel and filling the same with water, you can burst the latter into fragments at the imminent risk of breaking your ribs. The majority of the iron pipes under our streets sustain from fifteen to thirty pounds pressure to the inch, so, to avoid those accidents which flood your streets with a sheet of water in winter, and make ice entirely too cheap for comfort, all the pipes are subjected to a pressure of from two to five hundred pounds to the inch.

We presume there are not ten readers of this magazine who have any idea of the manner in which our common lead pipe is made. We are satisfied that if their lives depended upon it, they would never guess the real process. Time was (in the 18th century and until 1820) when lead pipe was cast and drawn in a manner similar to the process of wire-drawing. Now, however, it is forced through a cylinder between a "core" and dies, *when in a solid state.* A hollow cylinder is constructed in such a manner as to admit a steel die in one end with an opening of the shape and diameter of the outside of the pipe required. A solid piston or ram fits this cylinder evenly without friction. Attached to this piston is a long, movable "core" or spindle, of the diameter of the inside of the pipe.

The cylinder is filled with melted lead, allowed to "set," and the piston pressed into it by a hydrostatic press. When the pressure is applied, the lead is forced forward and out between the orifice in the die and the steel spindle or "core," which accommodates its movements to the action of the lead in forming the pipe. Still another and better plan is the introduction of a stationary spindle, which produces a superior and more uniform article. As the lead is forced through the dies in the form of a pipe, it falls over a large pulley or drum, where it is caught by a workman with heavy gloves and guided upon a roll, where it is coiled up and set aside. Lead pipe is pressed out at the rate of a mile an hour. All sorts of bar lead are made in the same manner. The pressure exerted in the manufacture of bar lead and pipes is enormous, varying from two to three tuns to the square inch.—*Once A Month.*

The French Academy of Science has been considering the subject of burial grounds, and one of its members, Mr. Chas. de Freyemet, recommends that vaults composed of stone or brick, should be abolished, as they have a tendency to intensify the mephitic exhalations. All coffins should be deposited in the earth, which, in a short time, will absorb all the noxious gases. Every burial ground should be thoroughly drained and thickly planted with trees, which purify the atmosphere by the vast amount of oxygen which they produce; and finally, no new cemeteries should be allowed to be opened within a regulated distance from any town or village.

The Chinaman as a Railroad Builder.

It is a significant fact, says the *San Francisco Times*, that at the laying of the last rail on the Pacific Railroad, John Chinaman occupied a prominent position. He it was who commenced, and he it was who finished the great work; and but for his skill and industry the Central Pacific Railroad might not now have been carried eastward of the Sierras. The experience of this undertaking has proved that the Chinaman is an admirable railroad builder. His labor is cheap, his temper is good, his disposition is docile, his industry is unflagging, his strength and endurance are wonderful, and his mechanical skill is remarkab.e. There are Chinamen in the employ of the Central Pacific Company who are more clever in aligning roads than many white men who have been educated to the business, and these Mongols will strike a truer line for a longer distance with the unassisted eye than most white men can with the aid of instruments. A good deal of nonsense has been talked about the Chinaman's want of stamina, and his inferiority to the white laborer in point of strength and capacity for work. The Central Railroad has pretty thoroughly settled that point; for numerous experiments have been made during its construction, with a view to test the respective capabilities of the two races. On one occasion a party of Irishmen and a party of Chinamen were pitted against each other in blasting a hard rock for a tunnel. Bets were freely made that the white men would come out winners; but at the end of the day, when the work of each party was measured, it was found that John Chinaman had burrowed further into the rock than his antagonist, and was, moreover, less fatigued.

The bands of Chinamen now organized by the Central Railroad Company are as fine railroad builders as can be found anywhere. The officers of the Union Pacific road were amazed at the work these fellows did, and it is by no means improbable that our Eastern friends will endeavor to secure some of these trained gangs for the next railroad enterprise in which they may engage. Many of the Chinese bosses, or heads of gangs on the Pacific Railroad are very intelligent men, and a few days since we were present when one of these entered a car and engaged in a conversation then going on, speaking good English, and showing an extensive acquaintance with railroad matters. It is well that we should bear in mind the great assistance that the Chinese have afforded to the Pacific Railroad, and that we should remember the difficulties which their presence dissipated. The training they have received on that road has given to California a large body of men peculiarly adapted to this description of work, and it has rendered comparatively easy the carrying out of other enterprises of the same character. They will probably be largely employed in the construction of the California and Oregon Railroad, now about to be entered upon; and, while they do not prevent the engagement of white men, they will facilitate enterprises which might be impracticable, lacking their aid. The Chinaman is a born railroad builder, and as such he is destined to be most useful to California, and, indeed, to the whole Pacific slope.

Ballooning in California.

In a large hall, near San Francisco, a small steam balloon has lately been tried, with so much success as to excite enthusiasm among the stockholders, and make them think that the great problem of aerial navigation has been solved. We are assured that the first packet of a regular line of aerial steamships will start from California for New York within a very few weeks.

We should be glad if there were any reasonable basis for this expectation, but we find none whatever. Substantially the same forms of balloon and machinery have before been tried, always with apparent success on the small scale in still air; always with failure when subjected to atmospheric currents. Experience shows that the attachment of wings, tails, and wheels to balloons, tends more to impede than to assist their progress.

Aerial navigation will never be reduced to a regular commercial system until some one shows us how to dispense with the unwieldy gas balloon, and replace it with an effective method of generating the requisite buoyant power. The subject is one of great importance, and worthy of diligent study on the part of all inventors. Glorious fame and princely fortune await the successful discoverer.

We copy from the San Francisco *Times* the following account of the recently tried Aerial Carriage:

The carriage, which is merely a large working model, is a balloon, shaped like a cigar, both ends coming to a point. It is 37 feet long, 11 feet from top to bottom, and 8 feet in width. These are the measurements at the center of the balloon, from which point it gradually tapers off toward either end. Around the balloon, lengthwise, and a little below the center, is a light framework of wood and cane, strongly wired together and braced. Attached to this frame, and standing up as they approach the front of the carriage, are two wings, one on each side. They are each five feet wide at a little back of the center of the carriage, and do not commence to narrow down until they approach the front, where they come to a point. These wings are made of white cloth fastened to a light framework which is braced securely by wires. The main frame is secured in place by means of strong ribbons, which go over the balloon, and are attached to corresponding portions of the frame on the other side. To the frame at the hind part of the carriage is attached a rudder, or steering gear, which is exactly the shape of the paper used in pin darts, four planes at right angles. This, when raised or lowered, elevates or depresses the head of the carriage when in motion; and when turned from side to side, guides the carriage as a rudder does a boat. At the center and bottom of the balloon is an indentation, or space left in the material of which it is built, in which the engine and machinery are placed on framework.

The engine and boiler are very diminutive specimens, but they do their work handsomely. The boiler and furnace are together only a little over a foot long, four inches wide, and five or six inches in hight. Steam is generated by spirit lamps. The cylinder is two inches in diameter, and has a 3-in. stroke. The crank connects by means of cog wheels, with tumbling rods which lead out to the propellers, one on either side of the carriage. The propellers are each two-bladed, four feet in diameter, and are placed in the framework of the wings. The boiler is made to carry eighty pounds of steam. When not inflated, the carriage weighs eighty-four pounds. The balloon has a capacity of 1,360 feet of gas. When inflated and ready for a flight it is calculated to have the carriage weigh from four to ten pounds.

An engineer's private trial trip was first made in the presence of the constructing engineers, several of the shareholders of the Aerial Steam Navigation Company, a number of the employees and residents in the neighborhood. The morning was beautiful and still—scarcely a breath of air stirring. The conditions were favorable to success. The gasometer was fully inflated, and the model was floated out of the building. In six minutes steam was got up—the rudder set to give a slight curve to the course of the vessel—and the valves opened. With the first turn of the propellers she rose slowly into the air, gradually increasing her speed until the rate of five miles an hour was attained. The position of the rudder caused her to describe a great circle, around which she passed twice, occupying about five minutes each time. Lines had been fastened to both bow and stern, which were held by two men, who followed her track, and had sufficient ado to keep up with her at a "dog trot."

As she completed describing the second circle, a pull given to the head line, unintentionally, caused the rudder to shift to a fore-and-aft position when the model pursued a straight flight about a quarter of a mile; she was then turned round, and retraced her flight to the point of departure; whence, being guided, she entered the building. The fires were drawn, and the first extensive flight of a vessel for aerial navigation was accomplished. The total distance traversed was a little over a mile. The appearance of the vessel in the air was really beautiful. As seen in the building she looks cumbrous and awkward. The change of appearance as she is circling gracefully through the air, is equal to that of a ship when first seen in the water. The moment of opening the steam valve was one of suspense; as the vessel rose and forged slowly ahead, the suspense was scarcely dissipated; but in a very few seconds her speed increased—in obedience to the rudder she commenced to swing round the curve—the men at the guys broke into a trot, and cheer upon cheer rose from the little group of anxious spectators.

The public exhibition was attended by some slight accidents, but elicited much enthusiasm from the audience which had assembled in a hall where the trial was made. The wind was so violent and irregular without, that it was considered unsafe to risk the model beyond the shelter. The carriage mounted near to the roof with a firmness and steadiness equal to the movements of an ocean steamer on smooth water. The guests cheered long and loud, and many fairly danced with delight at the success. The trip back and forth across the hall was performed several times with success.

Within a few weeks the first large vessel will be completed by the Aerial Steam Navigation Company—one calculated to carry four persons—and the principles involved in its construction will then be fully tested. The projectors consider that the model carriage has developed two facts of the greatest importance. First, the effective power developed by the propellers is greater than the estimated power according to the formulæ of aero-dynamics; and, second, the atmospheric resistance encountered by the vessel was less than had been calculated. Consequently the speed attained was higher than was estimated, and at the next trial, when the effective heating surface of the boiler will be increased, a further considerable increase of speed will be attained. Some doubt had been entertained as to the facility of steering the vessel. That is shown to be the easiest part of the business. She obeys the deflections of the rudder with extreme sensitiveness, and is under the most complete control.

Enamels.

The fine enamels of trade are generally prepared by fusing at high temperatures, silica, oxide of tin, and oxide of lead, and spreading the mixture over the surface of a sheet of copper, of gold, or of platinum.

The objections to these enamels are, in the first place their high cost, and, secondly, the impossibility of giving them a perfectly flat surface.

Mr. E. Duchemin has advantageously replaced them by the following economical and efficient compound: Arsenic, 30 parts by weight; salpeter, 30; silica (fine sand), 90; litharge, 250. This is spread on plates of glass of the required shape and size, care being taken, however, that the kind of glass employed be not inferior in point of fusibility to the enamel.

Enameled glass prepared from the above substances may be drawn or written on as readily as if it were paper, and in less time than one minute the writing may be rendered indelible by simply heating the plate in a small open furnace or muffle.

Drawings, autographs, legal acts, public documents, historical facts and dates of importance, labels for horticultural purposes or destined for out-of-door exposure, coffin plates, signboards, show-case signs, etc., may thus be cheaply made, which will resist atmospheric influences for ages.

First-class photographs, either negatives or positives, may be taken on such enamels without collodion, by using bitumen, or citrate of iron, or perchloride of iron and tartaric acid, or bichromate, or any other salt.

A good solution for this purpose is, water, 100 parts by weight; gum, 4 parts; honey, 1 part; pulverized bichromate of potash, 3 parts. Filter the liquid, spread it over the enamel, and let it rest, after which:

1. Expose it to the camera.
2. Develop the image by brushing over it the following powder: Oxide of cobalt, 10 parts by weight; black oxide of iron, 90 parts; red lead, 100 parts; sand, 30 parts.
3. Decompose the bichromate by immersion in a bath formed of: Water, 100 parts by weight; hydrochloric acid, 5 parts.
4. Wash it in clean water and dry it.
5. Vitrify the proof on a clean piece of cast iron, the surface of which has been previously chalked. One minute will suffice for indelibly fixing and glazing the photograph, which must be carefully and slowly allowed to cool.

Photographs on enamel of any size, taken in this manner, are perfectly unalterable under all atmospheric conditions, and may consequently and aptly be called "everlasting photographs."

Editorial Summary.

THE following ingenious method of keeping beer on draft excluded from air, and thus preventing it from turning sour, has recently been devised. A slate cistern is formed, having a wooden lid, fitting accurately, floating on the surface of the liquid. The sides of the lid are beveled, so that a sharp edge is presented to the walls of the cistern, and along this edge a strip of india-rubber or canvas is attached, which forms with the bevel on the upper side a V-shaped space, into which wet sand or other suitable material is packed, in order to keep the canvas in close contact with the cistern and exclude the air from its contents. A hole is formed in the lid, provided with a stuffing box, through which a pipe passes into the liquid, and the connection to the beer engine is made in the usual way. The end of the pipe in the liquid is not open, but has perforations at about an inch from the extremity—an arrangement which prevents any sediment from escaping with the fluid. The action of the device is very simple: Atmospheric pressure acting on the lid forces it to descend as the liquid is removed from under it, and thus a constant flow is obtained by means of the engine. By letting the cistern into the ground, the temperature of the liquid will remain nearly uniform the year round.

THE New York *Times* says that about two years ago several Japanese silk worms were imported and placed on some alanthus trees in Washington street. The result is that this year the alanthus trees are overrun with Japanese silk worms. This fact accounts for the huge dark-colored, broad-winged insects that are to be seen flying in almost all parts of Brooklyn.

PROF. LOOMIS, with a party of six or seven other savants, are going to start, *via* Norfolk, for western North Carolina, for the purpose of witnessing and making observations with regard to the eclipse which takes place next August. They intend sojourning in the neighborhood of Ashville, or the elevated regions about Middle Springs, and afterwards purpose returning home by way of Tennessee, Virginia, etc.

S. T. CLEMENTS, D.D.S., writes to the *Dental Cosmos* that although wax and resin, shellac varnish, and liquid silex are recommended for mending plaster models, neither, in his experience, can compare with sandarac varnish. Saturate the broken surfaces thoroughly, and press them well together. Allow it to dry, and the model will stand all the manipulation required.

PATENTEES of car-heating devices will be glad to know that a law exists in Ohio that every railroad in the State shall, when necessary to heat any of its cars, do so by heating apparatus so constructed that the fire in it will be immediately extinguished whenever the cars are thrown from the track and overturned. The same law provides that cars shall be lighted by candles only.

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.*

J. D. S., of Conn.—It is impossible for us to assign a cause for the spoiling of the water in the tube of your pump under the circumstances as described by you, although it would doubtless become apparent upon inspection. There is no reason why the outside of a tube should affect the water differently than the inside, if all other circumstances are similar.

S. W. A., of Pittsburgh.—Nothing short of an extended and abstruse article would give a satisfactory answer to your queries about modelling hulls of vessels. The peculiarities of the model you mention cannot be isolated from other considerations, which have an important relation to the subject.

T. R. M., of Ohio.—The idea of propelling vessels by ejecting water from the stern is old.

R. S., of Ill.—Rubber corks for chemical apparatus although somewhat expensive, are for many purposes excellent. You can obtain them of any dealer in chemical apparatus.

C. D. M., of Tenn.—The "watermark" is given to paper in the process of manufacture. It is made by a figure woven upon the wire cloth upon which the pulp is deposited. These figures leave the paper thinner where they occur.

A. H., of Conn.—The cables of the proposed East River Bridge will be made on the spot, in the position they will occupy when the bridge is completed. Their construction will require extensive preparation and machinery. Such cables could not be transported after they were completed.

A. E. B., of Miss.—The washing of binoxide of lead, prepared by Fresenius' method, is a tedious process, and will require patient manipulation.

E. P. W., of Wis.—Dampness in cellars is frequently caused by want of proper ventilation. From your description we judge this to be the difficulty with your cellar.

G. R. M., of Mich.—A pair of pincers with platinum points will enable you to hold the substances named in a very hot flame, without damage to the pincers.

T. E. D., of Pa.—You can reduce the friction on your two wood surfaces without oil by black-leading them. It will not need frequent renewal.

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.

Send for Agents' Circular—Hinkley Knitting Machine Co., 176 Broadway.

Scientific Books to order. Macdonald & Co.,37 Park Row,N.Y.

A valuable patent for sale. For particulars inquire of, or address D. P. Keator & Co., Kingston, N. Y.

Wanted—A second-hand portable engine, six to ten-horse power. E. Q. Dutton, Cato,Cayuga Co., N. Y.

For sale cheap—One No. 3 Pump,Andrews' patent,nearly new. Oliver & Co., 35 Liberty st., New York.

A rare business chance.—For sale, the goodwill, recipes, stock, fixtures, etc., of a business that will make a fortune to an enterprising party. May be turned into a Stock Company. Address Chemist, Box 111, Carlisle, Pa.

R. T. Bradley & Co., Cincinnati, Ohio, buy and sell patent rights. Send stamp for particulars.

Wheelwright wanted—To take charge of a shop. A first-class man, thoroughly acquainted with all kinds of work, may apply to Post-office Box 850, New York city, stating terms and past experience.

For 50c. we mail, prepaid, a combined ruler, blotter, and paper cutter, indorsed as excellent by Munn & Co. C.Jones, Box 6721, N.Y.P.O.

Makers of Wheelbarrows and elm cheese-boxes send address to Box 6721, New York Postoffice.

Wanted—$3 to $5,000, and experience, to engage in Cotton Man'f'g. Inducements unsurpassed. Isaac Sharp, Evening Shade, Arks.

Peck's patent drop press. For circulars, address the sole manufacturers, Milo Peck & Co., New Haven, Ct.

New Machine for Grinding Tools,etc., great saving of files and labor by their use. Address American Twist Drill Co., Woonsocket, R. I.

If you have a Patent to sell,or desire any article manufactured or introduced, address National Patent Exchange, Buffalo, N. Y.

To Manufacturers or Patentees.—Wanted—By a responsible hardware house, long established in the city of New York, the agency or the right to manufacture,some good patented article in their line of trade. Address P. D. & Co., Postoffice Box 3,317.

Continental Screw Company's Stock wanted. Address J. C. Clark, 66 Leonard st., New York.

For sale—A valuable Patent Right for an effective army and cotton worm destroyer. 20 bales of cotton saved in one day. Address Charles Steinmann, Napoleonville, La.

Mill-stone dressing diamond machine, simple, effective, durable Also, Glazier's diamonds. John Dickinson, 64 Nassau st., New York.

Leschot's Patent Diamond-pointed Steam Drills save, on the average, fifty per cent of the cost of rock drilling. Manufactured only by Severance & Holt, 16 Wall st., New York.

Tempered steel spiral springs made to order. John Chatillon, 91 and 93 Cliff st., New York.

The Tanite Emery Wheel—see advertisement on inside page.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Machinists, boiler makers, tinners, and workers of sheet metals read advertisement of Parker's Power Presses.

Diamond carbon, formed into wedge or other shapes for pointing and edging tools or cutters for drilling and working stone, etc. Send stamp for circular. John Dickinson, 64 Nassau st., New York.

Manufacturers requiring a mechanic Superintendant or Business Manager, please address Engineer, care W. E. Church. 14 Wall st.,N.Y.

The paper that meets the eye of manufacturers throughout the United States—The Boston Bulletin. $4·00 a year. Adv's 17c. a line.

Winans' boiler powder, 11 Wall st., N. Y., removes Incrustations without injury or foaming 12 years in use. Beware of imitations.

Recent American and Foreign Patents.

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

Grain Binder.—E. H. Clinton, Iowa City, Iowa.—This invention has for its object to furnish a convenient and effective machine for attachment to a reaper, which shall be so constructed and arranged as to receive the cut grain from the reaper platform and securely bind it into bundles. It consists in a novel and ingenious arrangement of mechanism, by means of which the binding cord is passed around the grain and tied automatically in an ordinary bow knot, after which the cord is cut, allowing the sheaf to drop from the machine. The entire mechanism is simple and compact.

Atmospheric Tanning Apparatus.—J. E. Kauffelt, Shrewsbury, Pa.—This invention consists in applying atmospheric air to the processes of liming, bating, and tanning hides, for the purpose of producing a mechanical action upon the compound in the leaches and vats.

Apparatus for Planking Ships.—Peleg Staples, Stockton, Me.—This invention consists in the application of various mechanical powers to the process of bending planking, so as to make it conform to the curve of a ship's side at the time the planking is attached to the ribs, among which powers may be enumerated the windlass, the screw, the pulley, and the wedge, conjoined with certain clamps for holding the planks so bent,whereby a very laborious manual operation is converted into a very easy mechanical one, and a vast amount of time and labor saved.

Ironing Machine.—Louis Ringler, New York city.—This invention relates to a new machine for ironing pantaloons and other garments, and for smoothening the sewed seams of the same. The invention consists in the application of two smoothening tubes, of which one is made to revolve while the other can be moved in its slotted bearings.

Vapor Burner for Lamps.—Joseph H. Melick, New Germantown, N. J. —This invention relates to certain improvements on that class of lamp burners in which the vaporized hydrocarbon escapes through small apertures from the burner, the jets thus produced being ignited.

Lantern.—P. J. Clark, West Meriden, Conn.—This invention relates to a new manner of securing the canopy or cap of a lantern to the guards of the same, in such manner that it can readily be taken off and put on, and that when put on it will be securely fastened. The invention consists in making the guard wires in pairs, and in connecting the upper ends of each pair by a cross piece, which, at its junction with the guard wires, forms a catch, to which a hook projecting from the canopy can be locked.

Steering Gear.—Henry York, Smith's Landing, N. J.—The object of this invention is to provide a simple and effective steering apparatus for vessels.

Adjustable Bracket.—J. H. Davis, Chillicothe, Mo.—This invention relates to a new clock bracket, which is so arranged that it can be readily attached to the wall without marring the same, and that it can also be readily removed and adjusted to bring its surface level.

Blast-Heating Furnace.—Homer Hamilton, Youngstown, Ohio.—This invention has for its object to construct a simple and effective device for heating the air that is carried to a blast furnace; and consists in such an arrangement of pipes that the air will be in thin sheets exposed to heated surfaces, and that expansion and contraction of the pipes will not injure the apparatus. The device will therefore operate successfully, and will not readily get out of order.

Blast Furnace.—George Atkins, Sharon, Pa.—This invention has for its object to so construct a blast furnace that the waste gases escaping from the ore may be utilized and carried back to the ore, together with steam, hot air, or superheated steam. The invention consists in the arrangement of gas pipes, which lead from the upper part of the furnace down to the tweers, through which the blast is injected.

Weaving Loom.—Wm. Gadd and John Moore, Manchester, England.—This invention consists in the method of giving motion to the "lay," "picker shaft," and other moving portions of the loom, whereby the construction of the loom is greatly simplified, and the cost much reduced as compared with ordinary looms.

Elastic Tackle Block.—J. E. Jones, Wirtown, N. J.—The object of this invention is to construct a tackle block, which is more particularly to be used on ships, and which is to be yielding to sudden motions of the sails, to prevent jars and the consequent injuries to the sails, masts, and rigging.

Out-Haul for Booms.—Thomas O'Neill, New York city.—The object of this invention is to so construct the out-haul for a boom that it can be operated from the deck on fore-and-aft booms, and that the apparatus by which it is worked can be applied to the inner part of the boom.

Wagon Brake and Lock.—John T. Bennett, Lenora, Minn.—The object of this invention is to provide a simple and effective arrangement of devices for braking and locking wagons.

Velocipede.—Henry Wolfkill, Millcreek P.O., Pa.—This invention relates to a new mechanism for propelling three and four-wheeled vehicles, and also to certain improvements in the steering apparatus. The invention consists chiefly in the application of adjustable chains, which transmit the power to the driving axle from the crank axle, with the requisite degree of speed. The invention also consists in so notching the steering levers that they are held in place by their guides when not used.

Endless Blackboard.—William H. Joeckel, New York city.—The object of this invention is to provide a blackboard for schools, lecture rooms, etc., which can be adjusted, so that marks made upon its lower part can be elevated to be in sight of the whole audience, and so that such marks which are not used at a certain time may be concealed on the back of the board, to be brought forward whenever desired for future reference and without shifting the frame.

Balanced Cylindrical Slide Valve.—J. G. Millholland, Harrisburgh, Pa.—This invention has for its object to improve the construction of balanced slide valves in such a manner as to make the steam pressure perfectly uniform and equal on all sides.

Weighing Vessels' Cargoes.—William O. Reim, Springfield, Ohio.—This invention consists in a device for indicating the weight of a vessel's cargo by measuring the depth to which the vessel, when loaded, sinks into the water.

Paint Mill.—Wm. R. Axe, Rockton, Ill.—This invention, which is an improvement upon the device patented by Samuel J. Goodwin, April 2d, 1867, No. 63,502, consists in combining with said Goodwin's invention a lower grinding disk, revolving in a direction opposite to that of the hopper, and an adjustable and detachable spindle step of peculiar construction, all arranged and operating in connection with the frame and motive apparatus.

Cockle Separator.—S. W. Andrews and L. Godfrey, Greenville, Tenn.— In this invention the impure wheat is fed through an adjustable hopper so as to fall between a gum roller and a hard roller. The two rollers being put in motion, the cockle and wheat are pressed between them, and the cockle is thereby caused to adhere to the gum roller, and to be carried round and dropped into a receptacle prepared for it, while the pure wheat falls directly from the rollers upon a screen which separates the small kernels from the large.

Spring Fan Attachment.—John Carey, Victoria, Mo.—This invention relates to improvements in spring-propelling fan attachments for chairs, beds, and other places, the object of which is to provide an improved attaching apparatus adapted to support the fan in any required position for directing the blast; also an improved arrangement for propelling springs calculated to give a more steady and uniform motion and to continue the motion a greater length of time.

Pipe Cutter.—Edward Clarkson, Carbondale, Pa.—This invention relates to improvements in pipe-cutting tools, and consists in the double-clawed shank made in two parts, adjustable relatively to each other, to open or close for large or small pipe, one jaw having a sliding cutter working in a recess to or from the other jaw, and a feeding screw working longitudinally through the stock for forcing the cutter against the pipe.

Washing Machine.—Moses A. Page, La Crosse, Wis.—This invention relates to improvements in washing machines, and consists in a vertical oscillating frame arranged with a tub provided with vertical rollers around the interior wall, against which the clothes are rubbed by the oscillating frame, the latter is operated by hand through the medium of a lever and suitable gearing.

Car Coupling.—Joel E. Simpson, Malden Bridge, N. Y.—The object of this invention is to provide a car coupling, so arranged that when a car is thrown from or runs off the track, and the coupling parts thrown out of line to a materially greater extent than occurs when on the track, it will become self-uncoupling and thereby save much of the damage both to passengers and cars in cases of running off, due to dragging the cars over the ties and rough places.

Excavating Machine.—J. A. Bailey, Detroit, Mich.—This invention consists in arranging the scoop upon pistons working in cylinders, wherein water or air may be used to force the scoop back and forth in performing the excavating or dredging operation. It also consists in the combination with the said cylinders, of guides or rails whereon the supporting arms of the scoop slide to and fro in the operation of the machine. It also consists in the combination of the said cylinders and supporting arms with a walking beam or frame, for elevating the scoop when loaded, and for lowering it again to the working position. It also consists in the combination with the said walking beam of a water or air cylinder and piston for elevating and lowering the said walking beam, whereon the weight of the apparatus is mainly supported, and which constitutes the axis of horizontal oscillation. It also consists in an arrangement of devices for dumping the scoop and restoring it to the working position. It also consists in certain details and modifications thereof, for the adoption of the apparatus for use, either as an excavating or dredging machine.

Auger Handle.—S. T. Peat, Florence, N. J.—This invention relates to improvements in auger handles, such as are used for holding shanks of various sizes and form, and adapted for readily attaching and detaching the same and consists in certain improvements designed to cheapen the construction, and provide a more reliable holding device.

Ice Planes.—Wm. F. Pough, Esopus, N. Y.—This invention relates to improvements in ice planes, and consists in an improved arrangement of knives whereby the cutting is made easier. Also an improved method of securing the cutters to the framing or runners, and, also, an improved arrangement of means for adjusting the knives to vary the depth of cutting.

Mathematical Books.—F. B. Wells, Fishkill, N. Y.—This invention relates to improvements in mathematical and other books, the object of which is to provide such books with leaves, or sheets of silicated paper, for convenience in working out examples, the said silicated leaves or sheets being adapted for reuse, as slates; and, it consists in combining the said silicated leaves with the said books, either by binding them together with the leaves of the book, pasting or otherwise securing them to the surface of blank leaves or to the covers, or in any preferred manner of accomplishing the same.

Necktie or Collar Holder.—Samuel A. Fite, Philadelphia, Pa.—This invention consists of an arrangement of small wires or flat springs for attachment to the stud or shirt button and adapted to impart a vertical pressure to the collar and on the folds for stiffening it, also to press the collar or necktie snugly to the neck, and to prevent the collar or tie from disconnection from the stud.

Spice Can.—Edwin Norton, Brooklyn, N. Y.—This invention relates to improvements in packing cans, for spices, having for its object to provide a simple and cheap arrangement of the same, whereby the contents may be permanently and securely inclosed as long as required for shipment and for storage, and by a slight change readily made, the said cans may be adapted for the delivery of the contents through a perforated cover, in a separating and distributing way as is required for ordinary purposes.

Can Opener.—M. E. Davis, Folsom, Cal.—This invention relates to improvements in implements for opening tin cans by cutting a circular piece out of their ends, whereby, by the employment of a peculiarly formed knife, arranged to be adjusted to cut holes of any size on a radial arm having a center pin for thrusting through the can, to serve as the fulcrum around which the knife is caused to rotate on the said radial arm, it is designed to provide a simple and cheap implement which will accomplish the work with greater facility than can be done with those now in use.

Tongs.—M. C. Heptinstall, Enfield, N. C.—The object of this invention is to provide an improved construction and arrangement of fire tongs that will prevent the legs from having lateral play at the griping ends,as is common with tongs as at present constructed, especially when worn at the joint.

Combined Collar and Harness.—F. Jones, Burlington, Iowa.—This invention has for its object to simplify and cheapen the construction of harness collars and hames, and at the same time to make them more convenient and effective in use.

Feed Cutter.—Felix Sims, Ridgeville, Ind.—This invention has for its object to furnish a simple convenient, durable, and effective feed cutter, by means of which more cutting can be done in a given time and with more ease than is possible with cutters constructed in the ordinary manner.

Gate.—William H. Goodale, Colton, N. Y.—This invention has for its object to furnish an improved gate, simple in construction, durable, and easily and conveniently operated.

Recording Desk or Table.—W. B. C. Stirling, Batavia, Ohio.—This invention has for its object to remedy the difficulty heretofore experienced in writing in large record books of several hundred pages, from the unavoidable elevation of the fore arm above the top of the desk or table.

Carriage Spring.—George R. Groot, Cincinnati, Ohio.—This invention has for its object to improve the construction of the springs of what are known as three-spring carriages, to make them easy riding without too much weakening the side or parallel springs.

Cork Extractor.—Charles G. Wilson,Brooklyn, N. Y.—This invention has for its object to furnish a simple and convenient machine for extracting the corks instantly from beer, wine, and other bottles, withqut the necessity of previously removing the wires or capsules from said bottles.

Portable Field Fence.—William Wilson, Jr., Raymond (Sidney P. O.), Ill.—This invention has for its object to furnish a simple, cheap, strong, durable, and substantial fence, and which shall be so constructed and arranged that any of the panels may be easily adjusted for use as a gate.

Potato Digger.—W. W. Coleand T. McGhee,Eudora, Kansas.-This invention has for its object to furnish an improved machine for digging potatoes, which shall be simple in construction, easily operated, and effective in operation.

Baking Drum.—George F. Reinhardt, Lincoln, Ill.—This invention relates to a combined baking and heating drum for stove pipes or pipe flues through which a current of heated air or gas is passed.

Power Door Clamp.—H. O. Hooper, Diamond Springs, Cal.—This invention relates to a new and improved device for clamping doors, and similar articles, by means of horse, water, or other power than hand or human power.

Saw Buck.—Erastus H. Clark, Appleton, Wis.—This invention relates to a new and useful improvement in saw "bucks," or saw "horses," for holding wood in sawing, by which improvement the wood is firmly held while it is being sawed and clamps supported for holding the saw while the saw is being filed.

Lightning Rod.—Leland D. Vermilya, Dayton, Ohio, and William S. Reyburn and Edmund A. W. Hunter, Philadelphia, Pa.—This invention consists in covering twisted angle iron with sheet copper, whereby the stiffness and tensile strength of iron is combined with a broad surface and superior conductive power of copper.

Window Sash Supporter.—William Stanfield, Flora, Ill.—This invention relates to a new and improved method of supporting and operating th sashes of windows.

Wire Cutter.—Henry Axtell, Yreka, Cal.—This invention relates to a new and improved implement for cutting wire or bolt iron of the smaller sizes, whereby much time and labor is saved.

Velocipede.—Richard C. Hemmings, New Haven, Conn.—This invention relates to a new and improved method of constructing and operating velocipedes, whereby they are made more durable and at less expense than than heretofore, and it consists in rotating the rim of a traction wheel, by means of a traversing wheel bearing on its inner surface and revolved by the operator within the rim of the wheel.

Fence.—Thos. Barnes, Wayne, Mich.—This invention relates to improvements in fences, designed to provide a simple, cheap, and durable construction of the same adapted either for permanent or portable fences.

Stove.—Isaac J. Baxter, Peekskill, N. Y.—This invention relates to a new and useful improvement in stoves, whereby they are rendered convertible for different uses.

Vehicle.—J. R. McAlister, Heuvelton, N. Y.—The object of this invention is to provide a front coupling for vehicles which is simple and durable.

Water Wheel.—Jeremiah Barney, Perry's Mills, N. Y.—This invention has for its object to furnish an improved water wheel, which shall be so constructed as to utilize both the head and weight of the water for the propulsion of the wheel to a greater extent than is possible with wate wheels constructed in the ordinary manner.

DECISION BY THE COMMISSIONER OF PATENTS.

In the matter of the application of Ira D. Warner for letters patent for improvement in Catarrhal Douche.—The applicant claims "a nasal douche, or syringe, having a tube with reversed curves, S and C, substantially as described." The invention consists simply in giving a double curve to the tube so that the nasal ducts are readily reached, and, at the same time, the syringe and hand of the operator are removed from the front of the mouth, where they would obstruct, more or less, the admission of the light. This is quite simple, but it is very useful, and, I think, presents a fair example of one of the cases in which form is patentable. Curvatures and angle become of importance in plowshares, water wheels, rotary pumps, engines, and blowers; and generally in all cases, when, by change of form, a new and useful result is produced.

In the present case the result is useful; and, although the catarrhal douche is old, the present form was not thought of until applicant devised it.

The decision of the Board of Examiners-in-Chief is reversed.

(Signed) S. S. Fisher, Commissioner of Patents.

July 12, 1869.

Facts for the Ladies.

NEW PUBLICATIONS.

ARCHITECTURE. Designs for Street Fronts, Suburban Houses, and Cottages. Including Details for both Exterior and Interior of the above classes of Buildings. Also, a great Variety of Details not included in the Designs. Illustrated by Elevations, and containing in all over 1,000 Designs and Illustrations. Edited by Cummings and Miller, authors of "Modern American Architecture." A. J. Bicknell & Co., Publishers, Troy, N. Y., and Springfield, Ill.

The peculiar features of this large and handsome quarto volume, which render it of great value to practical men, are the prominence given to details, the omission of plans, and the representatives of designs by elevations solely. The justification for the omission of plans is that these are generally modified when a general design is adopted, to suit the ideas of persons for whom the building is to be erected; and it is justly inferred that it is useless to cumber a book with what can be so readily supplied. Much valuable space is thus economized, which is filled with details drawn to a large scale, and a much more perfect idea obtained of the beauty of a design than when such details are omitted. The work thus becomes of great service when it is not convenient to secure the services of a competent architect, and gives owners and builders in such localities ready means of supplying themselves with good designs. The elevations given are such as may be appropriately selected for all classes of structures except public buildings. Rural architecture receives a full share of attention. The illustrations are of a high order, and the work is well calculated to elevate taste in architecture.

WE are in receipt of the first number of the "American Horological Journal," a new monthly published in this city, devoted to the interests of marine chronometer, watch, clock, and mathematical, astronomical, nautical instrument makers, repairers, and dealers, and the cognate branches, directly or remotely connected with these industries. It is a welcome addition to the industrial literature of the United States, and we wish it the success which it merits.

WHITLOCK EXPOSITION RECORDER.

The Whitlock Exposition Association have commenced a semi-monthly publication of a handsome quarto newspaper to be mostly devoted to illustration and description of such wares and new inventions in the machinery line as are on exhibition and for sale at their rooms. The first number presents a creditable appearance. Published at 35 Park Place.

APPLICATIONS FOR EXTENSION OF PATENTS.

MACHINE FOR MAKING ENVELOPES.—E. W. Goodale, of Clinton, Iowa, has petitioned for an extension of the above patent. Day of hearing, September 20, 1869.

SEWING MACHINES.—(Numbered 13,662).—Isaac M. Singer, of New York city, has petitioned for an extension of the above patent. Day of hearing, September 20, 1869.

DUST DEFLECTORS FOR WINDOWS OF RAILROAD CARS.—James M. Clark, of Boston, Mass., has applied for an extension of the above patent. Day of hearing Sept. 27, 1869.

FAUCET.—Albert Fuller, New York city, has applied for an extension of the above patent. Day of hearing September 27, 1869.

ENVELOPES.—E. Harmon, of Gettysburg, Pa., has petitioned for the extension of the above patent. Day of hearing, October 25, 1869.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING JULY 13, 1869.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT OFFICE FEES:

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

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

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92,415.—MATCH MACHINE.—Emery Andrews and W. Tucker, Portland, Me.

92,416.—FINISHING AND DRESSING SHEEP SKINS FOR LEATHER.—Robert Andrews, Milwaukee, Wis.

92,417.—UTERINE SUPPORTER.—A. D. Angell, Coldwater, Mich.

92,418.—RAILWAY CAR SEAT.—Arthur Barbarin, New Orleans, La.

92,419.—DRILL.—Hamilton Bates and D. L. Bates, Dayton, Ohio.

92,420.—CANE SCRAPER.—L. A. Bringier, Ascension parish, and N. B. Trist, New Orleans, La.

92,421.—MACHINE FOR MAKING LEVEES.—E. J. Brown, Carroll parish, La.

92,422.—ROTARY HARROW.—M. B. Champion, Sturgis, Mich.

92,423.—CIGAR TIP.—Jonas Clark, Lowell, Mass.

92,424.—MACHINE FOR SETTING, FITTING, AND TEMPERING SPRING PLATES.—J. B. Cleveland and Henry C. Gulldersleln, Hackensack, N. J.

92,425.—MEANS FOR REFRESHING HORSES WHILE IN HARNESS.—Wm. Compton, Newark, N. J.

92,426.—DUMPING CAR.—J. G. Conlon, New Orleans, La.

92,427.—MANUFACTURE OF TOBACCO PAPER.—P. M. Consuegra and Ramon Antiguedad, New York city.

92,428.—CURTAIN FIXTURE.—John Crandell and P.W. Smith, Chicopee, Mass.

92,429.—BEER COOLER.—H. C. Dart, New York city.

92,430.—AUTOMATIC GATE.—B. F. Dickey, Marshall, Mich.

92,431.—MACHINE FOR GRINDING THE CUTTERS OF MOWING MACHINES.—Henry Dodge, Washington Mills, N. Y.

92,432.—SPOOL.—M. F. Doran, Philadelphia, Pa.

92,433.—SPRING FOR STEADYING THE MOTION OF MILLSTONES.—J. J. Doughty, Lake City, Minn.

92,434.—HORSE HAY FORK.—J. A. Eberly and Henry Wechter, Reamston Station, Pa.

92,435.—HARVESTER.—Ezra Emmert, Franklin Grove, Ill.

92,436.—AUTOMATIC GRAIN-WEIGHING SCALE.—Henry Fairbanks, St. Johnsbury, Vt.

92,437.—POTATO DIGGER.—E. T. Ford, Stillwater, N. Y.

92,438.—CARRIAGE WRENCH.—E. T. Ford, Stillwater, N. Y.

92,439.—BUNG CUTTER.—Andrew Goetzinger, Cincinnati, Ohio.

92,440.—PLASTER SOWER.—E. J. Gordon, Greenville, Mich.

92,441.—MUSQUITO SCREEN.—John M. Griswold, Auburndale, Mass.

92,442.—FENCE.—H. A. Grover, North Cohocton, N. Y.

92,443.—ROCKING CHAIR.—Edson Hartwell, Hubbardston, Mass.

92,444.—FEED RACK FOR ADDRESSING MACHINES.—Wm. H. Henderson and W. H. Snider, Lena, Ill.

92,445.—SADIRON HEATER.—Gardner Herrick, Albion, Mich.

92,446.—NEEDLE SETTER FOR SEWING MACHINES.—J. M. Hoadley, Derby, assignor to Weed Sewing Machine Company, of Hartford, Conn.

92,447.—COAL BOX.—Charles Hœfinghoff (assignor to himself, C. C. Winchell, and J. T. Sargent), Cincinnati, Ohio.

92,448.—DOUBLE-FOOTED PLOW STOCK.—J. L. Hood, Floyd county, Ga., assignor to himself, J. F. Martin, and J.S. Black.

92,449.—ASH SIFTER.—B. F. Horn, Boston, Mass.

92,450.—POTATO DIGGER.—James M. Hotchkin, Prattsburgh, N. Y.

92,451.—FENCE GATE POST.—Elijah Humphreys, Samsville, Ill.

92,452.—PROCESS FOR COATING AND BEAUTIFYING THE SURFACE OF BILLIARD BALLS, KNIFE HANDLES, ETC.—J. W. Hyatt, Jr., Albany, N. Y.

92,453.—SASH CORD SHEAVE.—W. T. Jaquith and Robert Calhoun, Allegheny, Pa.

92,454.—CURRY COMB.—L. P. Jenks (assignor to H. A. Hall), Boston, Mass., and J. A. Minott, New York city.

92,455.—APPARATUS FOR CONCENTRATING EXTRACTS OF BARK AND OTHER LIQUIDS.—T. W. Johnson, New York city. Antedated June 26, 1869.

92,456.—SCROLL GATE FOR WATER WHEELS.—J. H. Jones, Charlton, Mass.

92,457.—DUMPING CAR.—Isaac Keith (assignor to himself, Hiram Keith, and I. N. Keith) West Sandwich, Mass.

92,458.—CHURN.—August Kindermann, Cleveland, Ohio.

92,459.—WASHING MACHINE.—C. H. Knox, Mount Pleasant, Iowa.

92,460.—VELOCIPEDE.—Henry Laurence, New Orleans La.

92,461.—APPARATUS FOR RAISING COAL.—Alfred Lawton (assignor to F. N. Lawton), Philadelphia, Pa.

92,462.—MACHINE FOR MAKING PLUG TOBACCO.—Peter Mayo, Richmond, Va.

92,463.—SAW MILL.—G. L. McCahan, Baltimore, Md.

92,464.—COOKING STOVE.—J. H. McConnell, Newcastle, Pa., assignor to himself and J. R. Richardson.

92,465.—APPARATUS FOR DEPURATING LIQUIDS.—William Needham and James Kite, Vauxhall, England.

92,466.—CIRCULAR SAW MILL.—John Orm, Paducah, Ky.

92,467.—BOWLING ALLEY.—A. T. Peirce, Fair Haven, Mass.

92,468.—BUTTER-KNIFE REST.—B. D. Reed, Westfield, Mass.

92,469.—METHOD OF MAKING BANDS FOR SHINGLE BUNDLES.—Jacob Reese, Pittsburgh, Pa.

92,470.—ROTATING BELL AND BELL WHEEL.—Joshua Regester, Baltimore, Md.

92,471.—PICKER CUSHION FOR LOOMS.—G. L. Richardson and J. C. Moody, Brunswick, Me.

92,472.—UMBRELLA FRAME.—H. T. Robbins, Boston, Mass.

92,473.—HORSE POWER.—Cyrus Roberts and John A. Throp, Three Rivers, Mich.

92,474.—HORSE POWER.—Cyrus Roberts and John A. Throp, Three Rivers, Mich.

92,475.—HORSE POWER.—Cyrus Roberts and John A. Throp, Three Rivers, Mich.

92,476.—COAL-LOADING APPARATUS.—S. S. Roberts, Elizabeth, Pa.

92,477.—STILL FOR ALCOHOLIC SPIRITS.—Wm. Robson and G. W. Robson, Cincinnati, Ohio.

92,478.—FURNACE FOR MANUFACTURING IRON AND STEEL.—Henderson Ross and D. F. Agnew, Pittsburgh, Pa. Antedated June 30, 1869.

92,479.—DOUGH KNEADER.—C. B. Sawyer, Fitchburgh, Mass., assignor to himself and F. G. Allen, Providence, R. I.

92,480.—APPARATUS FOR SHOTTING METALS.—Thos. Shaw, Philadelphia, Pa. Antedated April 30, 1869.

92,481.—COTTON-SEED PLANTER.—Joseph Shearer, and M. B. Armstrong, Timbersville, Ill.

92,482.—BOOKHOLDER.—C. W. Simpson, Bangor, Me.

92,483.—BROOM.—Albert Sinclair, West Waterville, Me.

92,484.—PROCESS OF TANNING SKINS.—Christian Smith, Bell Air, assignor to himself, August Briel, and Godfrey Rusck.

92,485.—VELOCIPEDE.—W. H. Smith, Newport, R. I.

92,486.—DOOR SPRING.—Enos Stimson, Montpelier, Vt.

92,487.—TENT.—P. E. L. W. Stockmann, Keppel street, Russel Square, England. Patented in England, September 21, 1868.

92,488.—CLOTHES-PIN.—D. M. Strain, Jr., Des Moines, Iowa.

92,489.—PRESSURE BLOWER.—B. F. Sturtevant, Boston, Mass.

92,490.—BLAST APPARATUS.—B. F. Sturtevant, West Roxbury, Mass.

92,491.—MACHINE FOR CUTTING BEAD MITERS.—R. F. Tompkins, New York city.

92,492.—EXTENSION LADDER.—W. F. Trautman, Llewellyn, Pa.

92,493.—SIGNAL LANTERN.—E. G. Turner, New Bedford, Mass.

92,494.—MACHINE FOR MAKING RAILROAD CHAIRS.—Wm. VanAnden, Poughkeesie, N. Y.

92,495.—HORSE HAY FORK.—J. M. Walker (assignor to himself and J. C. Hollinger), Rossville, Pa.

92,496.—MACHINE FOR PRESSING THE SEATS AND BACKS OF CHAIRS AND SETTEES INTO THEIR FRAMES.—G. A. Watkins, Cavendish, Vt.

92,497.—COMPOSITION FOR TOBACCO SUBSTITUTE.—J. B. Webster (assignor to himself, W. E. Greene, and Henry E. Winslow), Stockton, Cal.

92,498.—WORK TABLE IMPLEMENT AND SPOOL OF THREAD COMBINED.—Geo. Wells, Bethel, Conn.

92,499.—CAR STARTER.—G. A. Wilbur, Skowhegan, Me. Antedated Dec. 4, 1868.

92,500.—HARVESTER.—D. H. Wilgus and S. M. Denny, Harveysburg, Ohio.

92,501.—TRESTLE.—Jos. Witmer, Niagara, assignor to himself, and Tobias Witmer, Williamsville, N. Y.

92,502.—DOOR LOCK.—T. B. Worrell, Frankford, Pa.

92,503.—THREE-HORSE EQUALIZER.—E. M. Wright, Castile, N. Y., assignor for one half to Gardner Herrick, Albion, Mich.

92,504.—POST AUGER.—James Armstrong, Bucyrus, Ohio.

92,505.—BLAST FURNACE.—Geo. Atkins, Sharon, Pa.

92,506.—PLASTERING TROWEL.—Samuel Ault, Bridgtown, near Cannock, England. Patented in England, Nov. 2, 1868.

92,507.—WIRE CUTTER.—Henry Axtell, Yreka, Cal.

92,508.—EXCAVATING MACHINE.—J. A. Bailey, Detroit, Mich.

92,509.—FENCE.—Thomas Barnes, Wayne, Mich.

92,510.—TURBINE WATER-WHEEL.—Jeremiah Barney, Perry's Mills, N. Y.

92,511.—COAL STOVE.—I. J. Baxter, Peekskill, N. Y.

92,512.—WAGON BRAKE.—J. T. Bennett, Lenora, Minn.

92,513.—SPRING-FAN ATTACHMENT.—John Carey, Victoria, Mo.

92,514.—SAW BUCK.—E. H. Clark, Appleton, Wis.

92,515.—LANTERN.—P. J. Clark, West Meriden, Conn.

92,516.—PIPE CUTTER.—Edward Clarkson, Carbondale, Pa.

92,517.—GRAIN BINDER.—E. H. Clinton, Iowa City, Iowa.

92,518.—POTATO DIGGER.—W. W. Cole, and T. McGhee, Eudora, Kansas.

92,519.—ADJUSTABLE BRACKET.—J. H. Davis, Chilicothe, Mo.

92,520.—CAN OPENER.—M. E. Davis, Folsom, Cal., administratrix of the estate of M. C. Davis, deceased.

92,521.—HORSE RAKE.—Edward Dorr, Rockford, Ill.

92,522.—NECKTIE RETAINER.—S. A. Fite (assignor to himself and J. H. Mansur), Philadelphia, Pa.

92,523.—LOOM.—Wm. Gadd and John Moore, Manchester, Great Britain.

92,524.—GATE.—W. H. Goodale, Colton, N. Y.

92,525.—CARRIAGE SPRING.—G. R. Groot, Cincinnati, Ohio.

92,526.—BLAST HEATING FURNACE.—Homer Hamilton, Youngstown, Ohio.

92,527.—FIRE-ESCAPE LADDER.—H. T. Hartman, Norwood, Va.

92,528.—VELOCIPEDE.—R. C. Hemmings, New Haven, Conn.

92,529.—CULTIVATOR.—Isaiah Henton, Shelbyville, Ill.

92,530.—FIRE TONGS.—M. C. Heptinstall, Enfield, N. C.

92,531.—DOOR CLAMP.—H. O. Hooper, Diamond Springs, Cal.

92,532.—HATCHET.—Jabez Jenkins, Philadelphia, Pa.

92,533.—BLACK BOARD.—W. H. Joeckel, New York city.

92,534.—COMBINED COLLAR AND HAMES.—F. Jones, Burlington, Iowa.

92,535.—ELASTIC TACKLE BLOCK.—J. E. Jones, Wiretown, N.J.

92,536.—CARRIAGE.—J. R. McAlister, Heuvelton, N. Y.

92,537.—VAPOR BURNER.—J. H. Melick, New Germantown, N. J.

92,538.—SPICE CAN.—Edwin Norton (assignor to himself and O. W. Norton), Brooklyn, N. Y.

92,539.—OUTHAUL FOR BOOMS.—Thomas O'Neill, New York city.

92,540.—WASHING MACHINE.—M. A. Page, La Crosse, Wis.

92,541.—AUGER HANDLE.—S. T. Peat, Florence, N. J.

92,542.—ICE PLANER.—W. F. Pough, Esopus, N. Y.

92,543.—COMBINED DRUM AND OVEN.—G. F. Reinhardt, Lincoln, Ill.

92,544.—IRONING MACHINE.—Louis Ringler, New York city.

92,545.—WATCH-MAKERS' LATHE.—C. C. Rowell and John Belknap, St. Johnsburg, Vt.

92,546.—COAL SCUTTLE.—Morris Saulson, Troy, N. Y.

92,547.—CAR COUPLING.—J. E. Simpson, Malden Bridge, N.Y.

92,548.—FEED CUTTER.—Felix Sims, Ridgeville, assignor to himself and J. N. Templer, Portland, Ind.

92,549.—SASH BALANCE.—Wm. Stanfield, Flora, Ill.

92,550.—RECORDING DESK OR TABLE.—W. B. C. Stirling (assignor to himself and D. O. Cowen), Batavia, Ohio.

92,551.—LIGHTNING ROD.—L. D. Vermilya, Dayton, Ohio, and W. S. Reyburn, and E. A. W. Hunter, Philadelphia, Pa.

92,552.—CORK EXTRACTOR.—C. G. Wilson, Brooklyn, N. Y.

92,553.—PORTABLE FIELD FENCE.—Wm. Wilson, Jr., Raymond, Ill.

92,554.—VELOCIPEDE.—Henry Wolfkill, Mill Creek Post Office, Pa.

92,555.—STEERING APPARATUS.—Henry York, Smith's Landing, N. J.

92,556.—GRAIN CLEANER.—Wilson Ager, Washington, D. C.

92,557.—WAGON BRAKE.—Wm. P. Alcorn, New Wilmington, Pa.

92,558.—ENVELOPE GUMMER.—Edwin Allen, Norwich, Conn. Antedated July 3, 1869.

92,559.—COCKLE SEPARATOR.—S. W. Andrews and L. Godfrey, Greeneville, Tenn.

92,560.—HORSE POWER.—Cornelius Aultman and Joseph Allonas (assignors to C. Aultman and H. H. Taylor), Mansfield, Ohio.

92,561.—PAINT MILL.—William R. Axe, Rockton, Ill., assignor to Samuel J. Goodwin, Beloit, Wis.

92,562.—FURNACE GRATE.—Isaac R. Barbour, deceased, Hannibal, Mo.: Wm. G. Barbour, administrator.

92,563.—SIDING GAGE.—Stephen V. Barns (assignor to himself and Isaac G. Dundore), Whitney's Point, N. Y.

92,564.—LOW WATER INDICATOR.—Frederick S. Barus, New York city.

92,565.—MACHINE FOR CUTTING MILLING TOOLS.—Benjamin F. Bee, Harwich, Mass., assignor to the New York Tap and Die Company. Antedated June 10, 1869.

92,566.—CHURN.—Charles H. Beeman and Edwin G. Beeman, North Fairfax, Vt.

92,567.—DIE FOR FORMING THREADS ON BOLTS.—Alexis Belaieff, St. Petersburg, Russia.

92,568.—MACHINE FOR CLEANING SAND.—Edwin Bennett, Baltimore, Md., assignor to himself and William T. Gillender, Philadelphia, Pa.

92,569.—TUBE WELL.—S. L. Bignall, Chicago, Ill.

92,570.—LAMP CRANE.—Andrew C. Black, Kaukauna, Wis.

92,571.—AIR-TRAP FOR STEAM AND OTHER BNGINERY.—Geo. W. Blake, New York city.

92,572.—STEAM GAGE FOR HEAT AND PRESSURE.—James M. Blanchard, Washington, D. C.

92,573.—TAPE MEASURE.—L. P. Bradley, New Haven, Conn.

92,574.—METHOD OF PROPELLING SLEDS.—John Braun, Philadelphia, Pa.

92,575.—LEVEE.—Alexander G. Brawner, Frankfort, Ky.

92,576.—CHAIR.—Peter Buckley (assignor to himself and Edwin Bulgin), Vienna, N. J.

92,577.—MAST HOOP.—E. F. Burrows, Mystic River, Conn.

92,578.—METHOD OF RETARDING THE GROWTH OF STRAWBERRY VINES.—George Burson, East Palestine, Ohio.

92,579.—IRON FENCE.—Clark T. Bush, Middleburg, N. Y.

92,580.—RECIPROCATING BELLOWS.—John S. Butler and Andrew J. Stucker, Silver City, Idaho Ter.

92,581.—HAND GARDEN CULTIVATOR.—Philander Byrns, Mindoro, Wis.

92,582.—FENCE.—John Carr, Emerald Postoffice, Ohio.

92,583.—STRAW CUTTER.—Danford Chaffee, Rome, Pa.

92,584.—PORTABLE PUMP.—Jules A. Cheron, New York city.

92,585.—PULVERIZING AND MIXING CYLINDER.—William Coggeshall, Springfield, Ohio, and John W. Stanley, Chicago, Ill.

91,586.—LUBRICATING DEVICE FOR SPINDLES.—Albert A. Davis and Benjamin F. Walker, Lowell, Mass., assignors to B. F. Walker and M. R. Favoe.

92,587.—COMPOUND FOR CURING PILES.—Stephen S. Davis, Edgerton, Wis. Antedated June 30 1869.

92,588.—COPY HOLDER.—H. B. Denny, Washington, D. C.

92,589.—AUTOMATIC FAN.—Coellestin Lieringer and Morris Lindamann, Cincinnati, Ohio.

92,590.—COMBINED PLOW, CULTIVATOR, AND MARKER.—John Dooley, St. Paul, Minn.

92,591.—SHINGLE MACHINE.—John B. Dougherty, Rochester, N. Y. Antedated June 30, 1869.

92,592.—RAILWAY CAR AXLE.—Robert Dutch, Jersey City, N. J.

92,593.—PRINTING REVENUE STAMPS, ETC., IN TWO OR MORE COLORS.—John Earle and Alfred B. Steel, Philadelphia, Pa.

92,594.—GOLD WASHING MACHINE.—Wm. B. Eltonhead, Philadelphia, Pa.

92,595.—DOOR OF A BURGLAR PROOF SAFE.—John Farrel, New York city.

92,596.—PAPER-MAKING MACHINE.—Elias T. Ford, Stillwater, N. Y.

92,597.—COUNTERPOISE GUN CARRIAGE.—J. G. Foster, Nashua, N. H.

92,598.—TELEGRAPH FIRE ALARM.—J. B. Frantz, Cleveland, Ohio.

92,599.—BALANCE SLIDE VALVE FOR STEAM ENGINES.—D. R. Fraser (assignor to himself and P. W. Gates), Chicago, Ill.

92,600.—PAPER PERFORATOR.—J. G. Gaston, Cincinnati, Ohio.

92,601.—BOTTLE STOPPER.—Wm. H. Gibbs, Cincinnati, Ohio.

92,602.—SAW FOR CUTTING HEDGE FOR PLASHING.—David Gore, Carlinville, Ill.

92,603.—TURBINE WATER WHEEL.—Mahlon Gregg, Rochester, N. Y.

92,604.—MACHINE FOR BENDING PLOW HANDLES.—George V. Griffith, Fort Wayne, Ind.

92,605.—MEANS OF ATTACHING ARTIFICIAL TEETH TO THEIR BASE PLATES.—Edward Hale, Jr. (assignor to himself and Joshua H. Alexander), St. Louis, Mo.

92,606.—MODE OF ATTACHING RUBBER TIRES TO CARRIAGE WHEELS.—David Ham, Iowa City, Iowa.

92,607.—DEVICE FOR PROPELLING CARRIAGES.—Thomas U Hamilton and Hendrick H. Hamilton, Panama, N. Y.

92,608.—THILL COUPLING.—Edmund A. Harvey, Wilmington, Del.

92,609.—VARIETY MOLDING MACHINE.—James Hatch, San Francisco, Cal.

92,610.—BURGLAR ALARM.—Andrew George Hutchinson, Stoneycroft, near Liverpool, Great Britain, assignor to Thomas Rowland and Henry Rowland.

92,611.—COMPOSITION WAGON BODY.—John W. Jarboe, Green Point, N. Y.

92,612.—SHUTTLE-BOX OPERATING LEVER FOR LOOMS.—Barton H. Jenks, Bridesburg, Pa.

92,613.—WEATHER STRIP.—Chas. A. Judd, Milwaukee, Wis.

92,614.—HARROW.—Albert Kane and Nelson Kane, Newport, N. Y.

92,615.—ATMOSPHERIC TANNING APPARATUS.—John E. Kauffelt, Shrewsbury, Pa.

92,616.—AUTOMATIC CHECK ROW CORN PLANTER.—John L. Kreider, Chestnut Level, Pa.

92,617.—EXHAUST DEVICE FOR LOCOMOTIVE SMOKE STACKS.—Robert H. Lecky, Allegheny City, Pa. Antedated June 29, 1869.

92,618.—SPOOL SHOW CASE.—John N. Leonard, Rockville, Conn.

92,619.—APPARATUS FOR DISPLAYING SPOOLS OF COTTON, ETC.—John N. Leonard, Rockville, Conn.

92,620.—CHAIR.—Leon Lindquest, Pittsburgh, Pa.

92,621.—Pump for Continuous Discharge.—Samuel T. Lount, Rathbone, West Va.
92,622.—Steam Water Heater.—William B. Mack, Detroit, Mich.
92,623.—Cooking Stove.—Charles Maguire, Chicago, Ill.
92,624.—Mop.—W. Mallerd (assignor to himself and John Barr), Bridgeport, Conn.
92,625.—Brick Machine.—J. F. Mallinckrodt, St. Louis, Mo.
92,626.—Prison Bar.—Jeremiah A. Marden, Boston, assignor to Charles E. and John H. Abbott, Malden, Mass.
92,627.—Steam Lift and Force Pump.—James R. Maxwell, and Ezra Cope, Cincinnati, Ohio.
92,628.—Pitman Connection.—William K. Miller, Canton, Ohio.
92,629.—Grain Separator.—Wm. K. Miller, Canton, Ohio.
92,630.—Balanced Cylindrical Slide Valve.—J. G. Millholland, Harrisburg, Pa.
92,631.—Animal Trap.—Levi Moore, Baraboo, Wis.
92,632.—Hand Seed Planter.—Albert More, Moresville, N. Y.
92,633.—Apparatus for Ageing Spirits.—Edmund L. Morse, St. Louis, Mo.
92,634.—Boots and Shoes.—Walter Murray, Chicago, Ill.
92,635.—Carbureter for Air and Gas.—Wm. J. Nichols, Buffalo, N. Y.
92,636.—Brick Machine.—Walker Olds, Albany, Ill.
92,637.—Instrument for Cutting Pegs from Boots, etc.—Frank Osborne, South Hanson, assignor to himself and W. H. Keene, East Bridgewater, Mass.
92,638.—Lightning Rod.—Nathaniel Otis, Charles City, Iowa.
92,639.—Elastic Tip for Furniture, etc.—Wm. S. Paddock, Albany, N. Y.
92,640.—Process for Purifying Alcohol and other Spirits.—C. C. Parsons, New York city.
92,641.—Corn and Cotton Cultivator.—R. F. Patton, Quincy, Ohio.
92,642.—Clamp.—O. L. Payne, Batavia, Ill.
92,643.—Bedstead.—J. E. Pencille, Lockport, N. Y.
92,644.—Dead Beat Verge for Clocks.—Noah Pomeroy, Hartford, Conn.
92,645.—Ships' Cargo Indicator.—W. O. Reim, Springfield, Ohio.
92,646.—Shock Tier.—Woodson Rice, London, Ohio.
92,647.—Spindle Bolster.—Isaac P. Richards, Whitinsville, Mass.
92,648.—Direct-acting Engine Valve Gear.—J. B. Root, New York city. Antedated July 8, 1869.
92,649.—Shaft Coupling.—Clement Russell, Massillon, Ohio.
92,650.—Thrashing Machine.—Clement Russell, T. H. Russell, and W. K. Miller, Massillon, Ohio.
92,651.—German Erasive Soap.—Geo. Sanger, Beloit, Wis.
92,652.—Chemical Olive Soap.—Geo. Sanger, Beloit, Wis.
92,653.—Combined Scouring and Fulling Soap.—George Sanger, Beloit, Wis.
92,654.—Detersive Soap.—Geo. Sanger, Beloit, Wis.
92,655.—"Fulling Soap."—Geo. Sanger, Beloit, Wis.
92,656.—Process for Refining Tallow.—Geo. Sanger, Beloit, Wis.
92,657.—Stenciling Apparatus.—Leonhard Schmidt and F. E. Held, Chicago, Ill.
92,658.—Grain Drill.—P. J. Schmitt (assignor to Siegel, Schmitt & Co.), Carlinville, Ill.
92,659.—Corn Planter.—Jas. Selby, Peoria, Ill.
92,660.—Cooking Stove.—W. G. Semple, Cincinnati, Ohio.
92,661.—Lamp.—J. W. Shehan, San Francisco, Cal.
92,662.—Hinge.—J. D. Shepard and R. W. English, Buffalo, N. Y., assignors to J. D. Shepard.
92,663.—Toast Rack.—Daniel Sherwood, Lowell, Mass., assignor to Woods, Sherwood & Co.
92,664.—Horse-power.—C. J. Shuttleworth, Springville, N.Y.
92,665.—Cooking Stove.—Elihu Smith, Albany, N. Y.
92,666.—Artificial Honey.—G. H. Smitson, Ripley, Ohio.
92,667.—Manufacture of Iron.—David Stewart, Kittanning, Pa.
92,668.—Apparatus for Propelling Carriages.—Daniel Swank, Newton, Iowa.
92,669.—Cartridge Loader.—J. M. Taylor, Lexington, Ky., assignor to Chas. Parker, Meriden, Conn.
92,670.—Stair Rod.—H. Uhry, New York city.
92,671.—Stair Rod.—H. Uhry, New York city.
92,672.—Stair Rod.—H. Uhry, New York city.
92,673.—Breech-loader.—Zdeuko Ritter Von Wessely, New York city, assignor to Providence Tool Company, Providence, R. I.
92,674.—Stove Cover.—S. D. Vose, Milwaukee, Wis.
92,675.—Milk Safe.—Jacob Waldron, North Creek, N. Y.
92,676.—Mode of Repairing Plumbago Crucibles used in Meting Steel.—Nathan Washburn, Worcester, Mass.
92,677.—Apparatus for Making Molds for Metal Castings.—Adam Weaber, Philadelphia, Pa.
92,678.—Grain Drill.—Wm. Weusthoff, Dayton, Ohio.
92,679.—Grain Drill.—Wm. Weusthoff, Dayton, Ohio.
92,680.—Seed Wheel for Grain Drill.—Wm. Weusthoff and Chas. Schmidt, Dayton, Ohio.
92,681.—Seed Wheel for Seeding Machine.—Wm. Weusthoff and Chas. Schmidt, Dayton, Ohio.
92,682.—Drilling Machine.—Wm. C. Whipple, New Haven, Conn.
92,683.—Manufacture of Glue from the Pith of Horns.—Jesse Windward, East Cambridge, Mass.
92,684.—Tobacco Cutting Machine.—Michael Winter, New York city.
92,685.—Apparatus for Rectifying and Flavoring Spirits.—Ludwig Wolff, Chicago, Ill.
92,686.—Cultivator.—J. P. Zeller, South Bend, Ind.
92,687.—Steam Petroleum Gas Generating Apparatus.—R. M. Whipple and A. I. Ambler, Chicago, Ill.
92,688.—Hand Stamp.—M. P. Norton, Troy, N. Y. Antedated June 10, 1869.

REISSUES.

38,056.—Shovel Plow.—Dated March 31, 1863; reissue 3,545 (dated July 6, and omitted in the list of claims of that date).—Israel Mosher, Mosherville, and Walden Eddy, Union Village, N. Y.
15,838.—Apparatus for Generating Carbonic Acid.—Dated Oct. 7, 1856; reissue 3,546.—J. F. Boynton, Syracuse, N. Y.
84,091.—Machine for Folding and Cording the Edge of Paper Strips.—Dated Nov. 17, 1868; reissue 3,547.—A. T. Denison and E. P. Furlong, Mechanic's Falls, Me., assignees of J. E. Coffin.
48,536.—Matallic Cartridge Case.—Dated July 4, 1865; reissue 3,548.—W. C. Dodge, Washington city, D. C.
67,530.—Tube Cutter.—Dated August 6, 1867; reissue 3,549. Division B.—Henry Getty, Brooklyn, N. Y.
38,862.—Thrashing Machine.—Dated June 9, 1863; reissue 3,550. Division A.—Reuben Harder and Minard Harder, Cobleskill, N.Y., assignees of Minard Harder, George W. Douglass, Hiram Becker, and David Anthony.
38,862.—Thrashing Machine.—Dated June 9, 1863; reissue 3,551. Division B.—Reuben Harder and Minard Harder, Cobleskill, N.Y., assignees of Minard Harder, G. W. Douglass, Hiram Becker, and David Anthony.
89,768.—Compound Fabrics for the Production of Shirt Collars.—Dated May 4, 1869; reissue 3,552.—W. E. Lockwood, Philadelphia, Pa., assignee, by mesne assignments, of Walter Hunt.
72,335.—Manufacture of Iron.—Dated Dec. 17, 1867; reissue 3,553.—David Stewart, Kittanning, Pa.
80,261.—Wooden Pavement.—Dated July 21, 1868; reissue 3,554.—C. Williams, New York city.

DESIGNS.

3,578.—Face-plate of a Lock.—Wm. Gorman (assignor to the Russell & Erwin Manufacturing Co.), New Britain, Conn.
3,579.—Scarf Pattern.—F. W. Henson (assignor to himself and T. S. Henson), Philadelphia, Pa.
3,580.—Floor Oilcloth Pattern.—Robert Hoskin, Brooklyn, assignor to Deborah Powers, Albert E. Powers, and Nathaniel B. Powers, Lansingburg, N. Y.
3,581.—Trade Mark.—F. M. Maas, New York city.
3,582.—Wrench Head.—C. N. Morgan, Granby, Mass.
3,583.—Stove Door.—I. A. Sheppard, Philadelphia, Pa.
3,584.—Floor Oilcloth Pattern.—J. T. Webster, New York city, assignor to Deborah Powers, A. E. Powers, and N. B. Powers, Lansingburg, N. Y.

EXTENSIONS.

Machine for Mitering Printers' Rules.—W. McDonald, Morrisania, N. Y.—Letters Patent No. 13,197, dated July 3, 1855.
Self-regulating Wind Mill.—A. P. Brown, Syracuse, N. Y.—Letters Patent No. 13,156, dated July 3, 1855.

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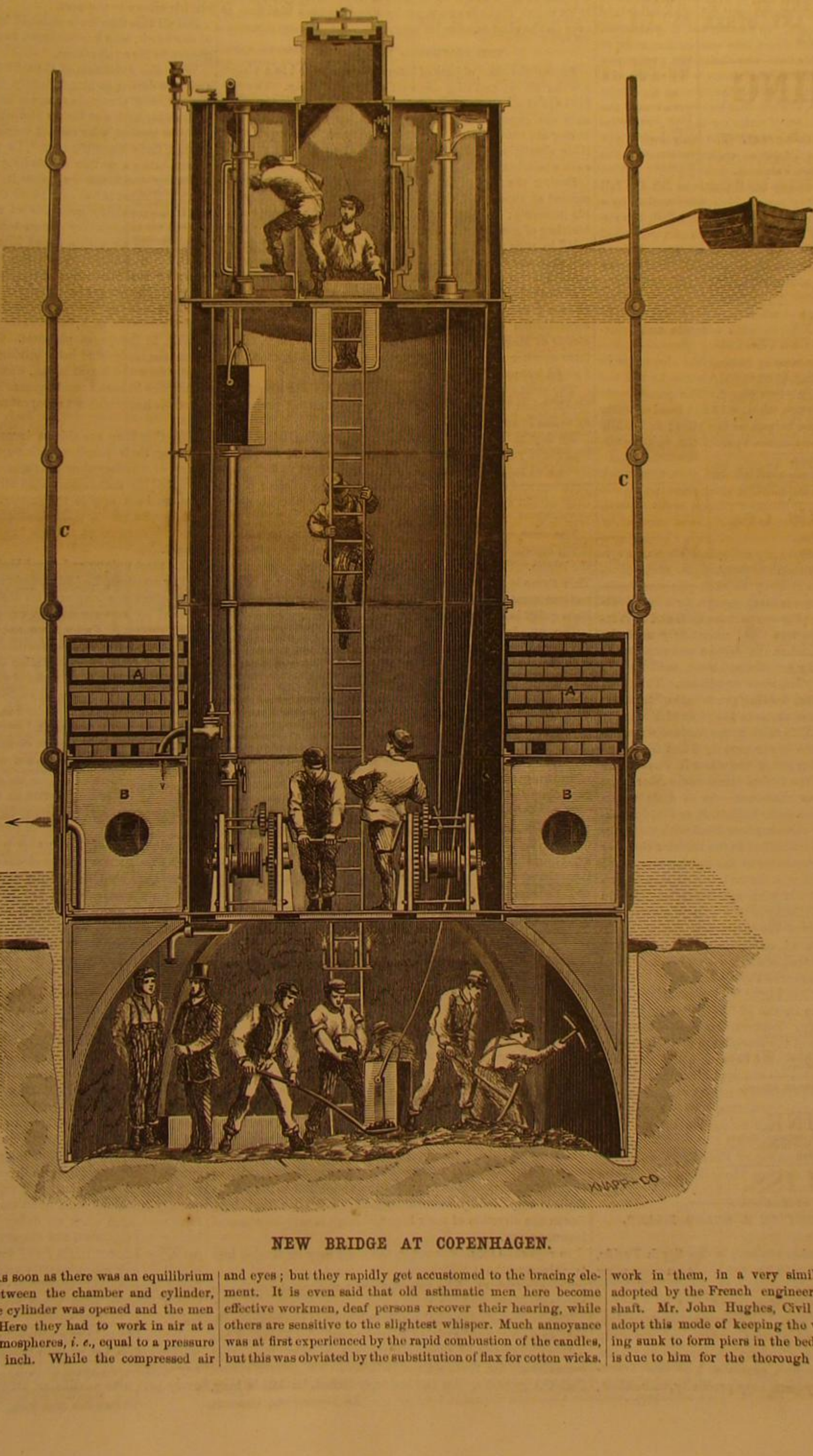
Caissons for Pier-Building.

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.



NEW BRIDGE AT COPENHAGEN.

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 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 access 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 us 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.

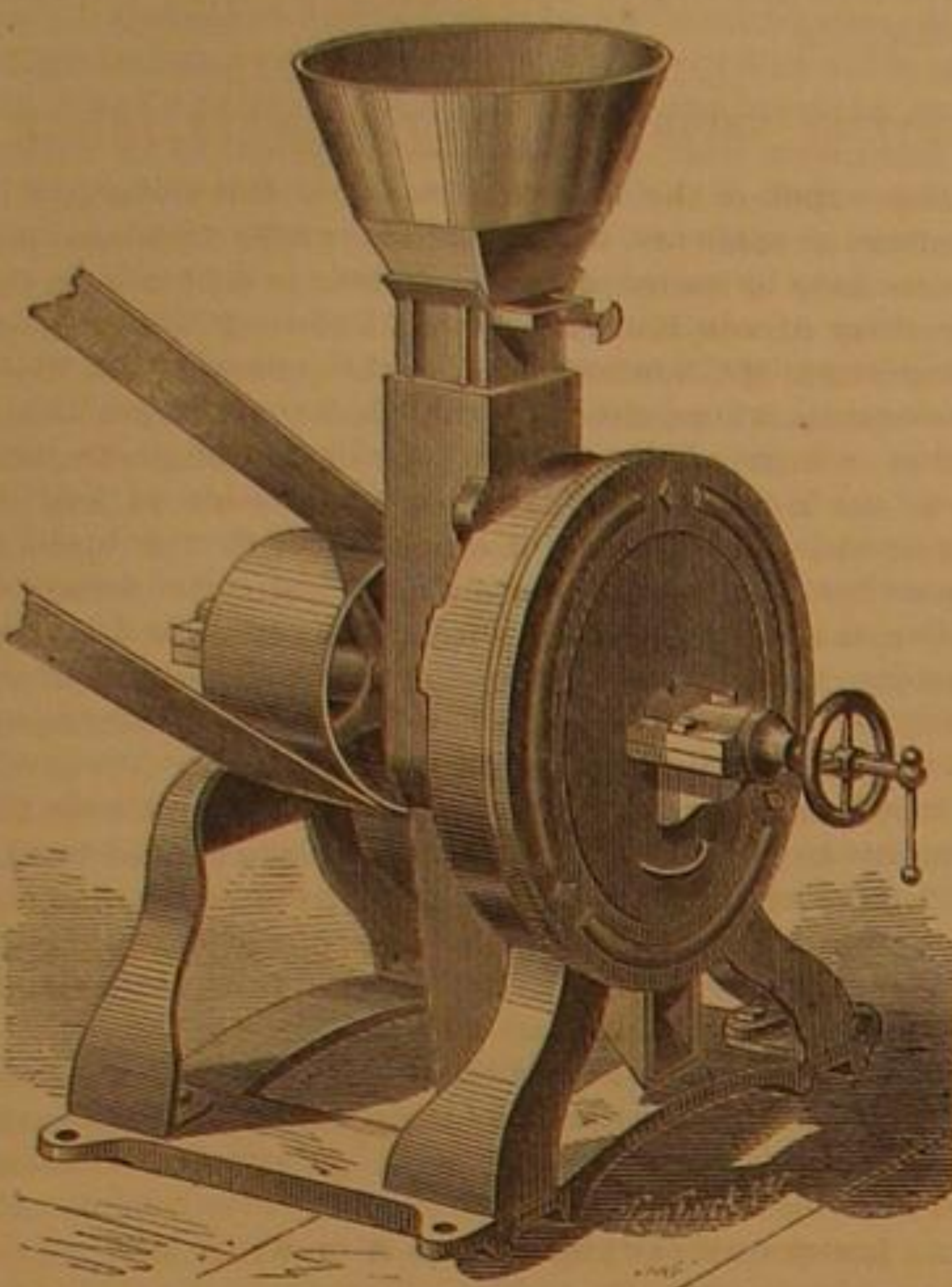
Corks protected in this manner are but slightly acted upon, though remaining over the boiling nitric acid more than four hours, and over hot acid for ten. In some instances, when not entirely covered, the vapor softens the cork beneath the silicate to the depth of about a quarter of an inch, but the 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



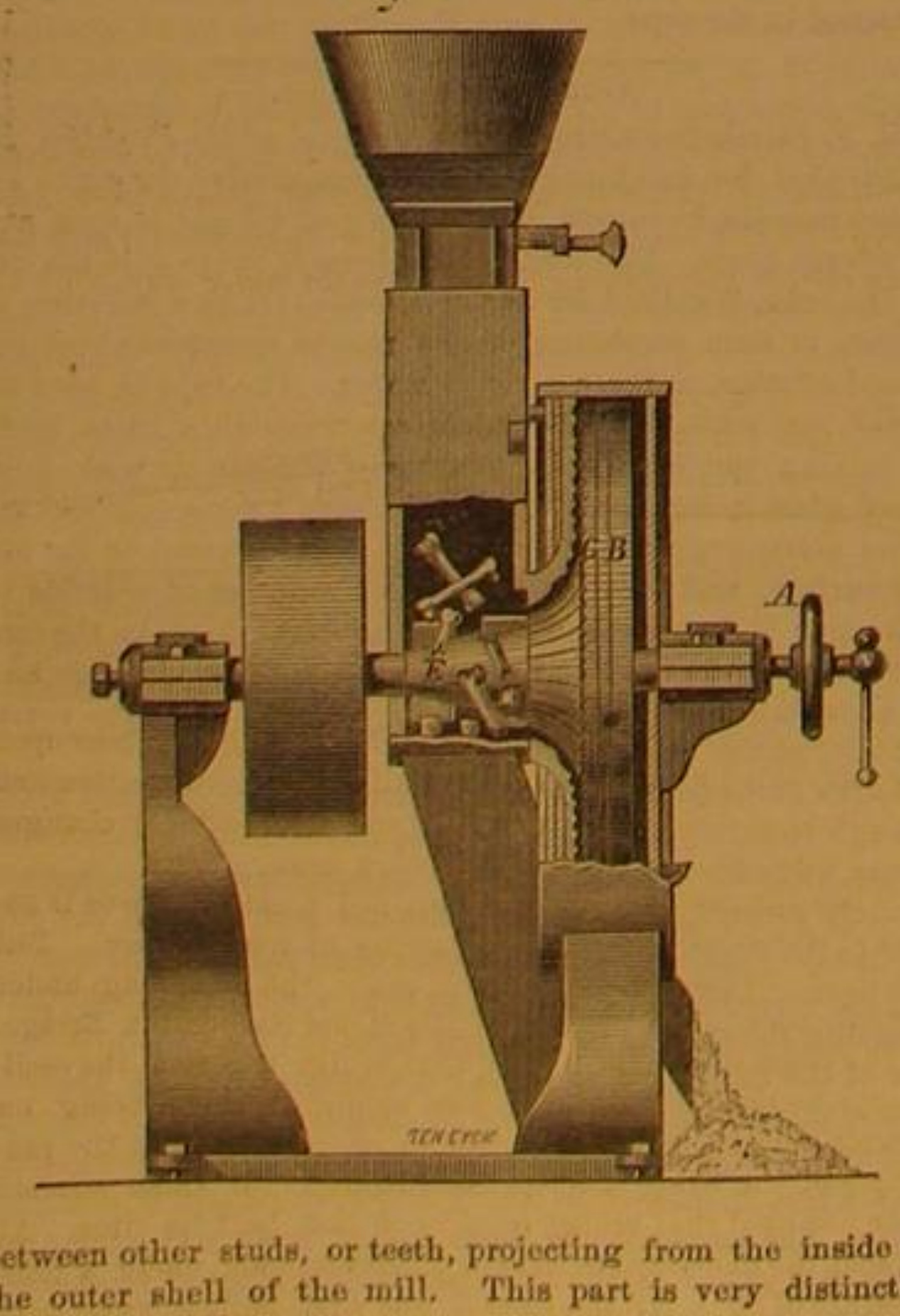
which has, although but recently introduced, attained an excellent reputation for its efficiency and other good qualities. An examination will satisfy all practical minds that the devices employed must secure good work.

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."

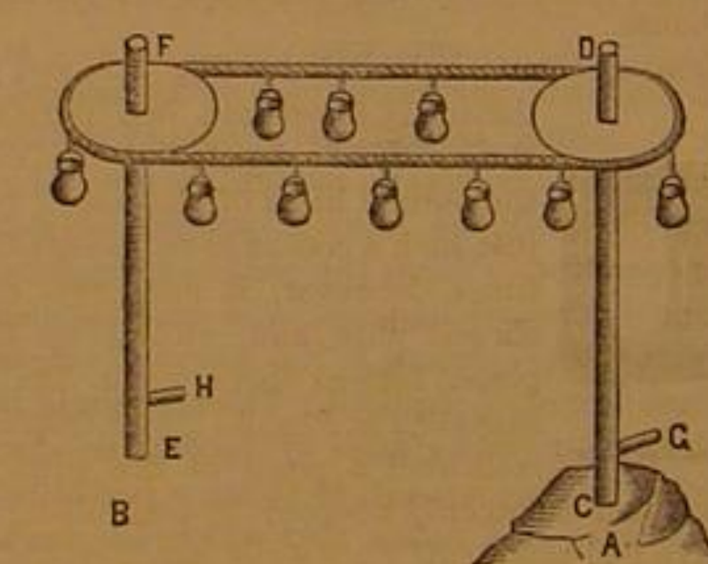
This principle has been successfully extended by the inventor to mills for nearly all grinding purposes.

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."

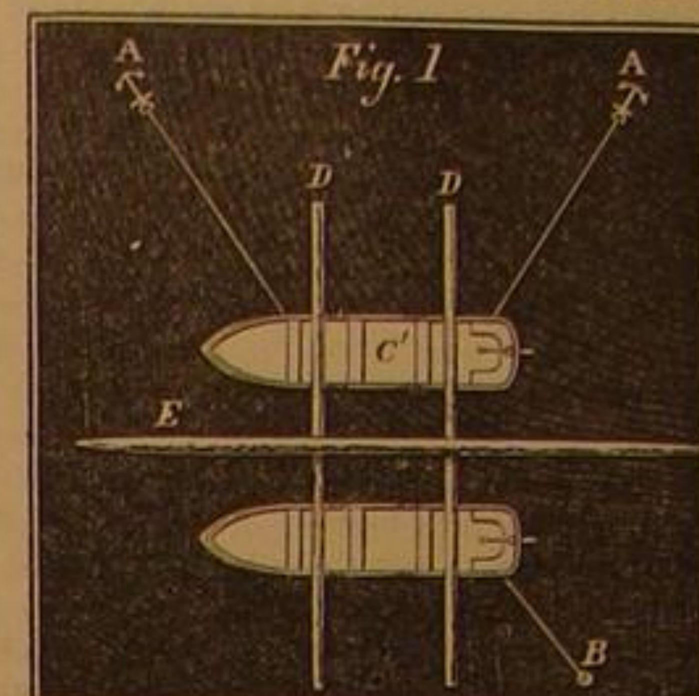
Venterus Mandey and James Moxon, Philomat, were thus nearly two hundred years in advance of the recent inventor of the wire tramway.—*Engineering.*

(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.

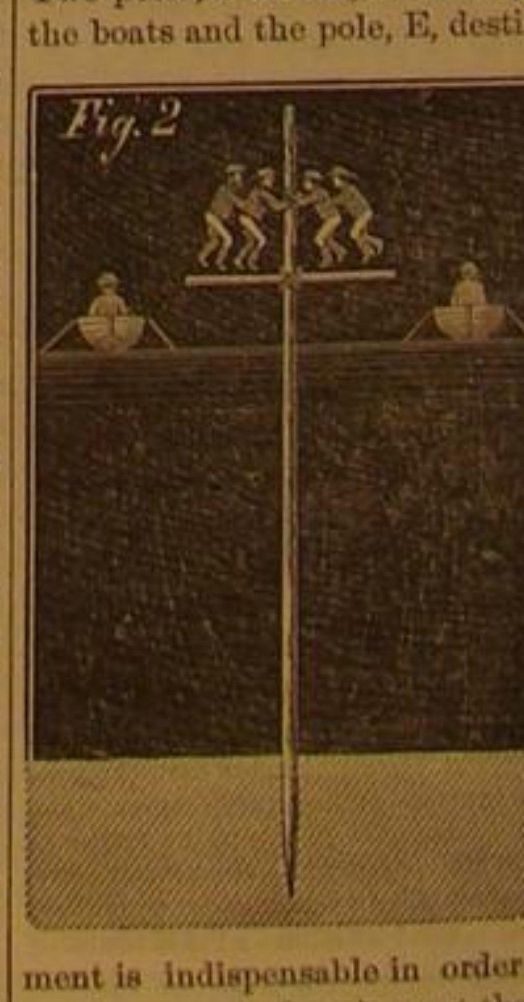
We are indebted to three brothers, James, Samuel, and John Ludlow, of Weehawken, N. J.,—who have been regularly engaged in shad fishing for more than thirty years, and whose father, James, and grandfather, Anthony Ludlow (an old soldier of the revolution), before them, followed the same profession,—for 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 of 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.

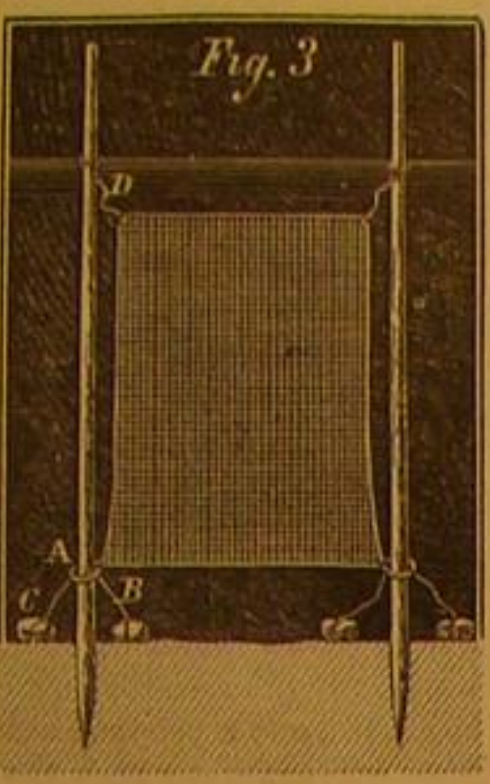
The mode of driving in the poles is illustrated in the following diagram, Fig. 1.

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.



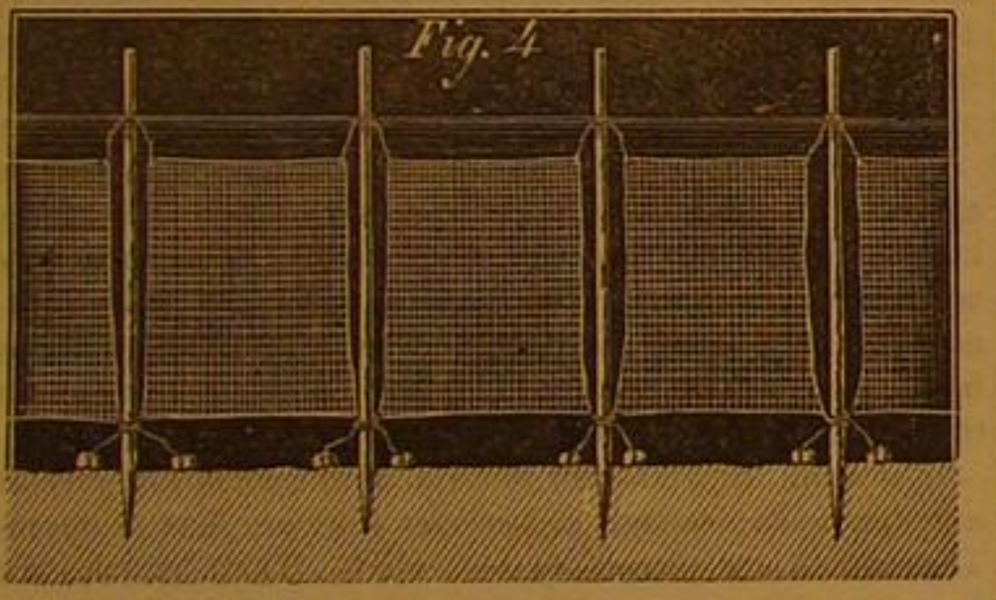
Over each pole is slipped a hoop, A, Fig. 3, to the bottom of which, by means of a fifteen fathom line called the "foot rope," B, is attached a heavy stone, C. The net is attached by one corner to the hoop and above to an "arm line," D, 15 fathoms in length. This arrangement as will be seen, allows of 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.

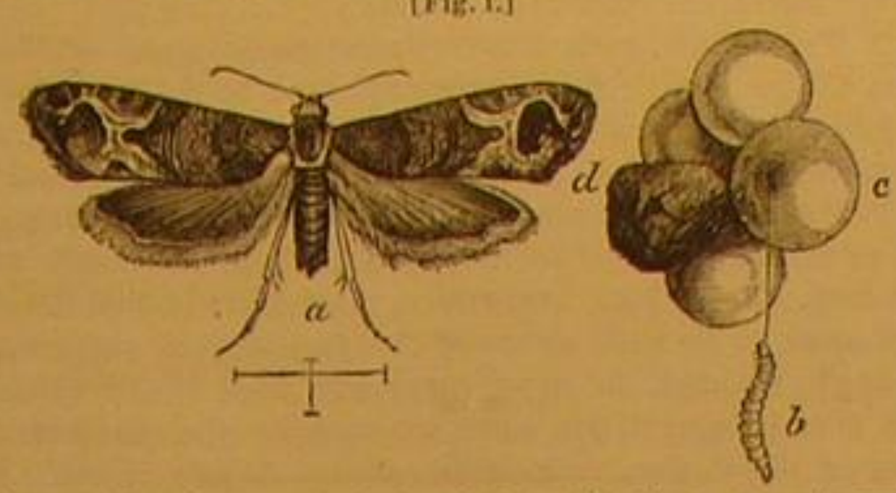
The Grape-Berry Moth.

(*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

[Fig. 1.]



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

science. 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.

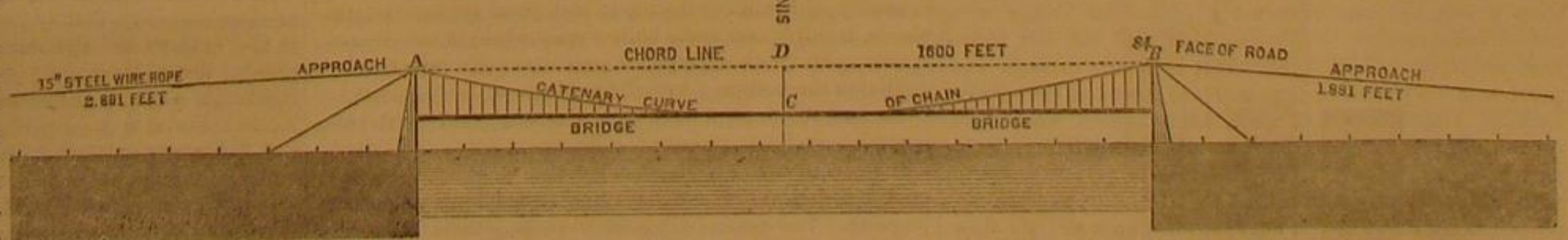
The proposed bridge, according to the plans now before the Commissioners, will be very nearly one mile (5,228 feet) in length. The abutment on the New York side will be at pier No. 29, and on the Brooklyn side at the slip at Fulton Ferry. The grade on the approach from the New York terminus at the City 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 3¼ 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 great est 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 "Moule'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 of 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 snug 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.

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 numbered 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.

Fig. 1

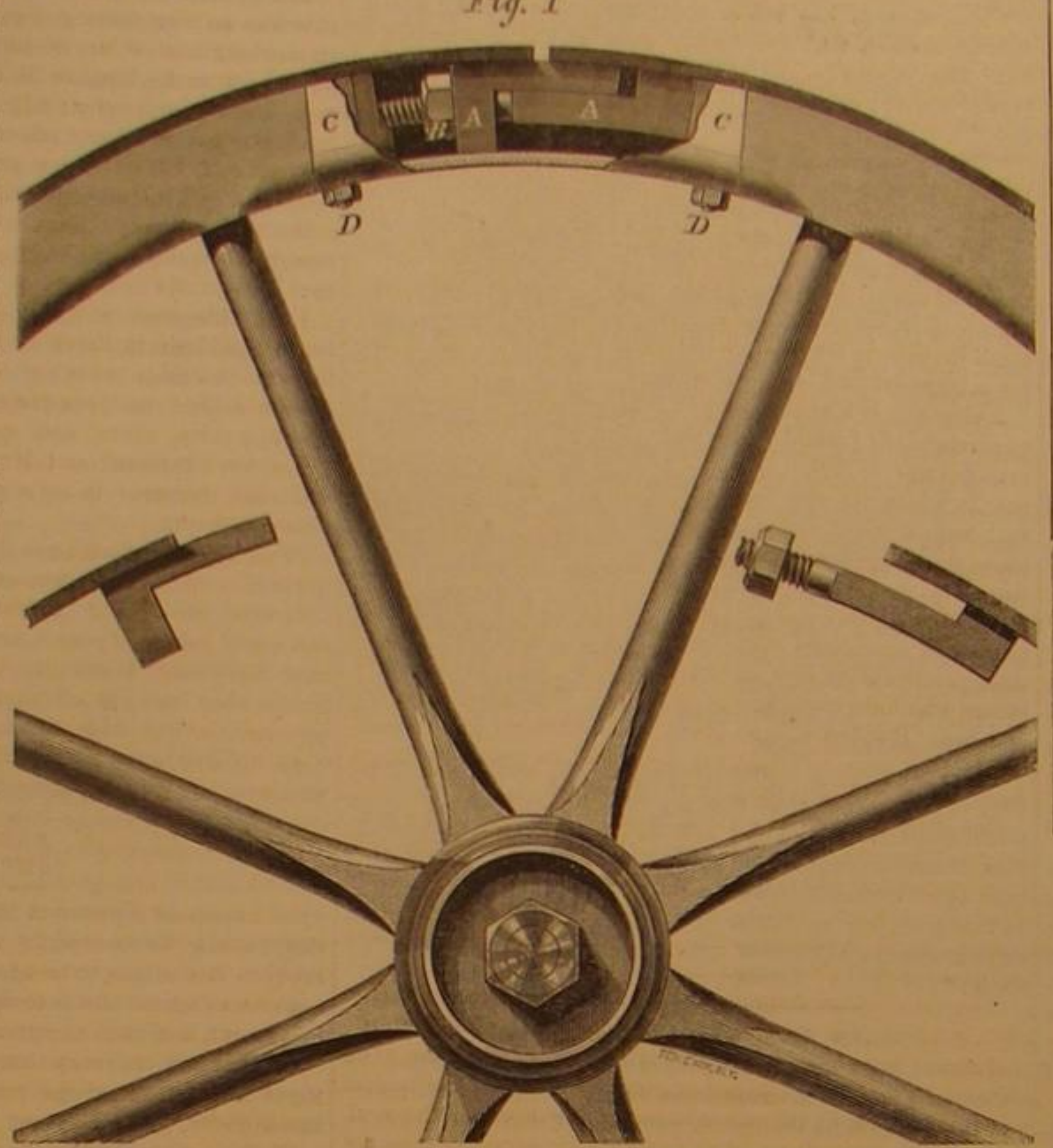
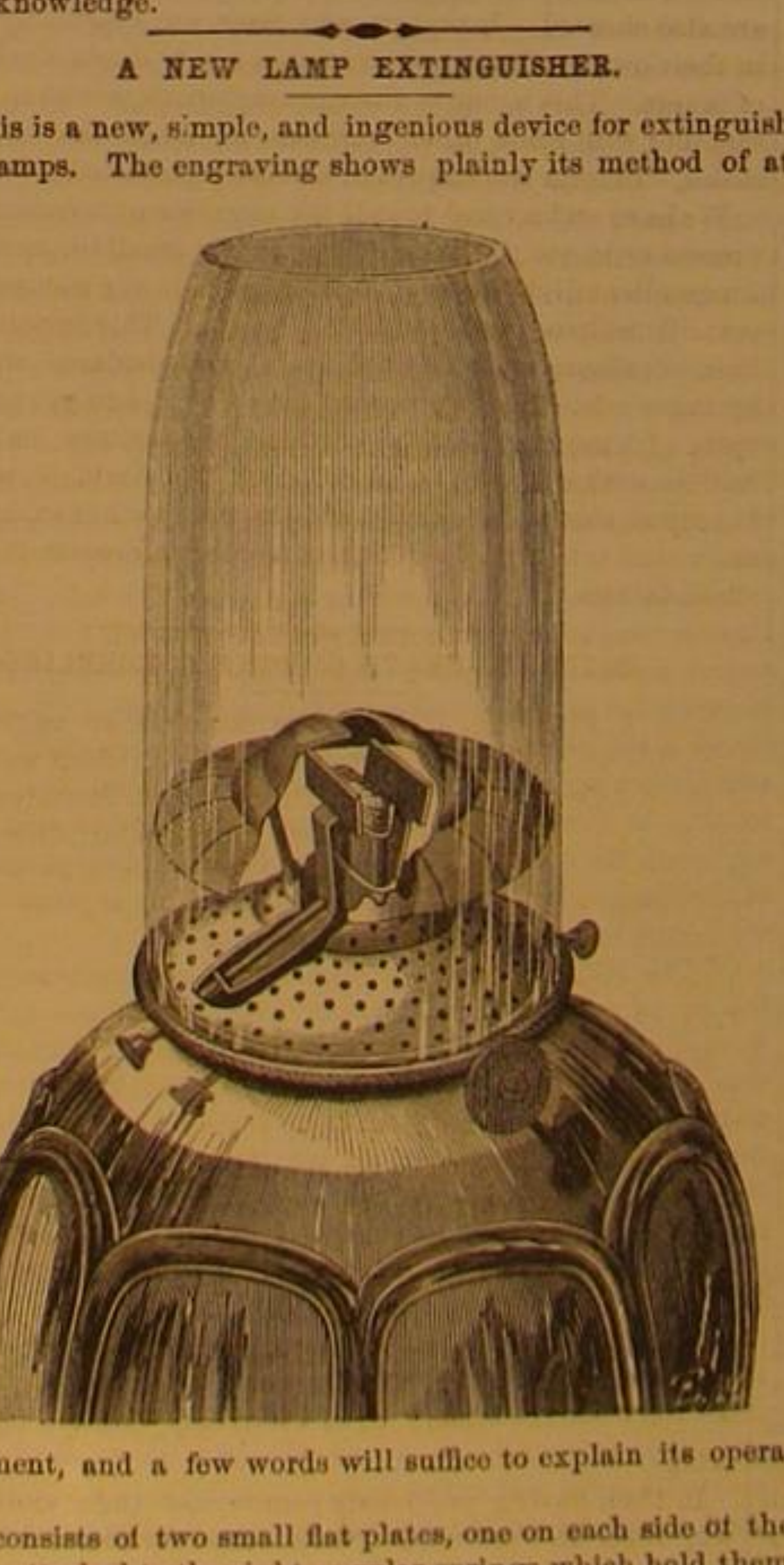


Fig. 2

PEARSON'S TIRE TIGHTENER.

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 temperature 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.

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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 lot 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 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.

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 tc 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 Colonyof 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.

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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 Gause, 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, 1868.
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 Photographic 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 18, 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 Adella 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.

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

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SCIENTIFIC AMERICAN

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

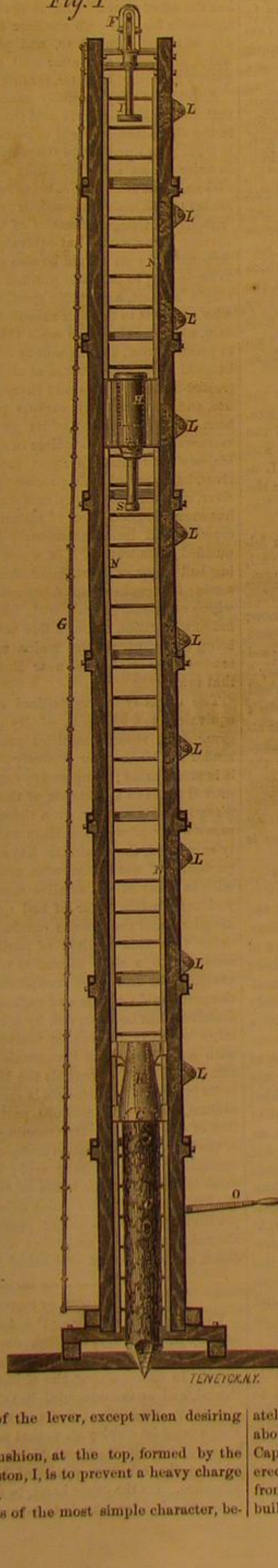
Vol. XXI.—No. 7. [NEW SERIES.] | NEW YORK, AUGUST 14, 1869. | $3 per Annum. [IN ADVANCE.]

Shaw's Gunpowder Hammer for Driving Piles.

This method of operating hammers for driving piles and for other purposes, is now attracting great attention in the engineering world.

The machine is constructed of heavy wood framing, as in the ordinary pile driving mach'ne, and is provided with a cylinder head of cast iron, K, resting on the top of the pile, C, and guided by the iron rails, N; the cylinder is bored out on its upper end for the reception of a plunger, S, of the hammer, H, and iscast concave on its lower end for the reception of the pile, C. The hammer, H, is guided by the rails, N, (the same as the cylinder)and is bored on its upper end for the reception ot a piston, I. It is cast with a V-groove for the reception of a friction rod, M, Fig. 2, to be used as hereafter described. The piston and rod, I, are connected with a cross beam, firmly fixed at the top of the frame, where a rope pulley, F, is also placed for the convenience of hoisting the piles in position. The friction rod, M, is connected with the starting lever, O, and also with short cast-iron arms pivoted to brackets, L, Figs. 1 and 2, for the purpose of pressing tightly against the V-groove in the hammer, as shown in Fig. 2, whenever the hammer moves in a downward direction. A ring is made of steel and screwed on the end of plunger, S; this ring, though of solid steel, expands under this pressure, the same as hydraulic packing, and makes a tight and durable packing.

Fig. 1

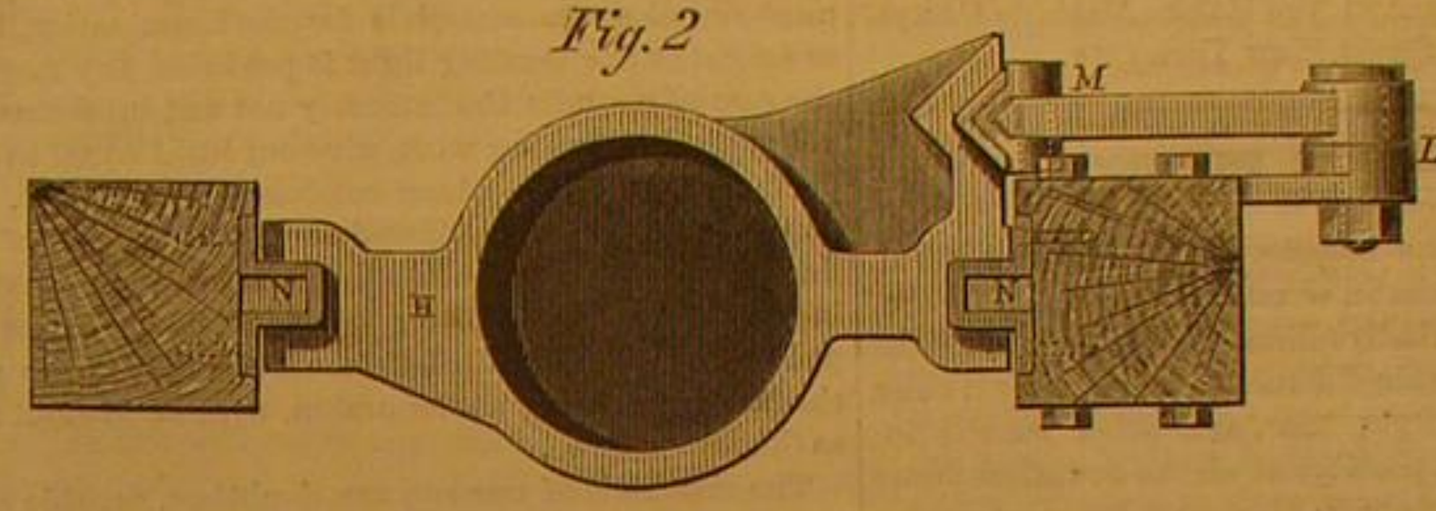


The machine is operated and controlled by a man and boy; the latter is stationed at the rope ladder, G, and throws a cartridge of powder into the cylinder, K; when the hammer is allowed to drop by the man's pressing upon the lever, Q, which elevates and releases the friction rod from the hammer and causes it to drop, forcing its plunger into the cylinder, compressing and heating the air contained therein sufficient to ignite the powder, whenever the plunger comes in contact with the cartridge and tears the paper, so that the heated air may come in contact with the powder. The explosion of the powder elevates the hammer, and the recoil of the cylinder forces the pile into the ground. When the cartridges are thrown at the rate of fifty per minute, the hammer is operated without the use of the lever, except when desiring to cease operating.

The object of the air cushion, at the top, formed by the bore in hammer, H, and piston, I, is to prevent a heavy charge from injuring the machine.

The powder employed is of the most simple character, being composed of one and a half parts chlorate of potash, and one part of bituminous coal, both pulverized and mixed through an ordinary sieve. This powder burns very slow in the open air; a barrel full might be ignited at once without causing any report. The charges of powder are exceedingly small, a charge of one third of an ounce being employed to throw a hammer of six hundred and seventy-five pounds

Fig. 2



weight, and it exerts a force on the head of the pile equal to a dead weight of three hundred thousand pounds for a temporary period. The pressure is exerted on the head of the pile during the presence of the plunger in the cylinder; this gives a blow and pressure of the character of the hydraulic press, with the rapidity of the hammer; hence the pile can be driven more rapidly, and forcibly, and firmer, without in any way injuring or splintering it, as in the common method of driving. The usual wrought iron ring, secured to the head of the pile, preparatory to driving, is, in this method, entirely dispensed with; and it is estimated, that even this trifling advantage will nearly pay for the powder employed.

Piles can now be driven so rapidly as to constantly employ a steam engine in pulling to and hoisting the piles in position.

It is believed that it will take fifty per cent less piles, when driven in this manner, as the pile is not shattered by riveting blows which destroy the strength of the wood, nor is it vibrated (like a piano string), throughout its length, by sudden raps which destroy, to a great extent, the lateral adhesion.

A Committee of Engineers, composed of W. W. Wood, Chief Engineer of U. S. Navy, H. L. Hoff, of the Eagle Iron Works, Philadelphia, and T. J. Lovegrove, Inspector of Steam Boilers, Philadelphia, appointed to investigate the operation of this invention, give the most flattering report, indorsing fully all of the above statements. It is also recommended, in the highest terms, by no less than twenty-seven gentlemen, engineers of note, presidents of railroads, etc., who have seen it in operation, and confirm its great superiority to all other methods of pile driving.

Any further information may be obtained by addressing Gunpowder Pile-driving Co., 505 Minor st., Philadelphia, Pa.

Remarkable Mirage in the English Channel.

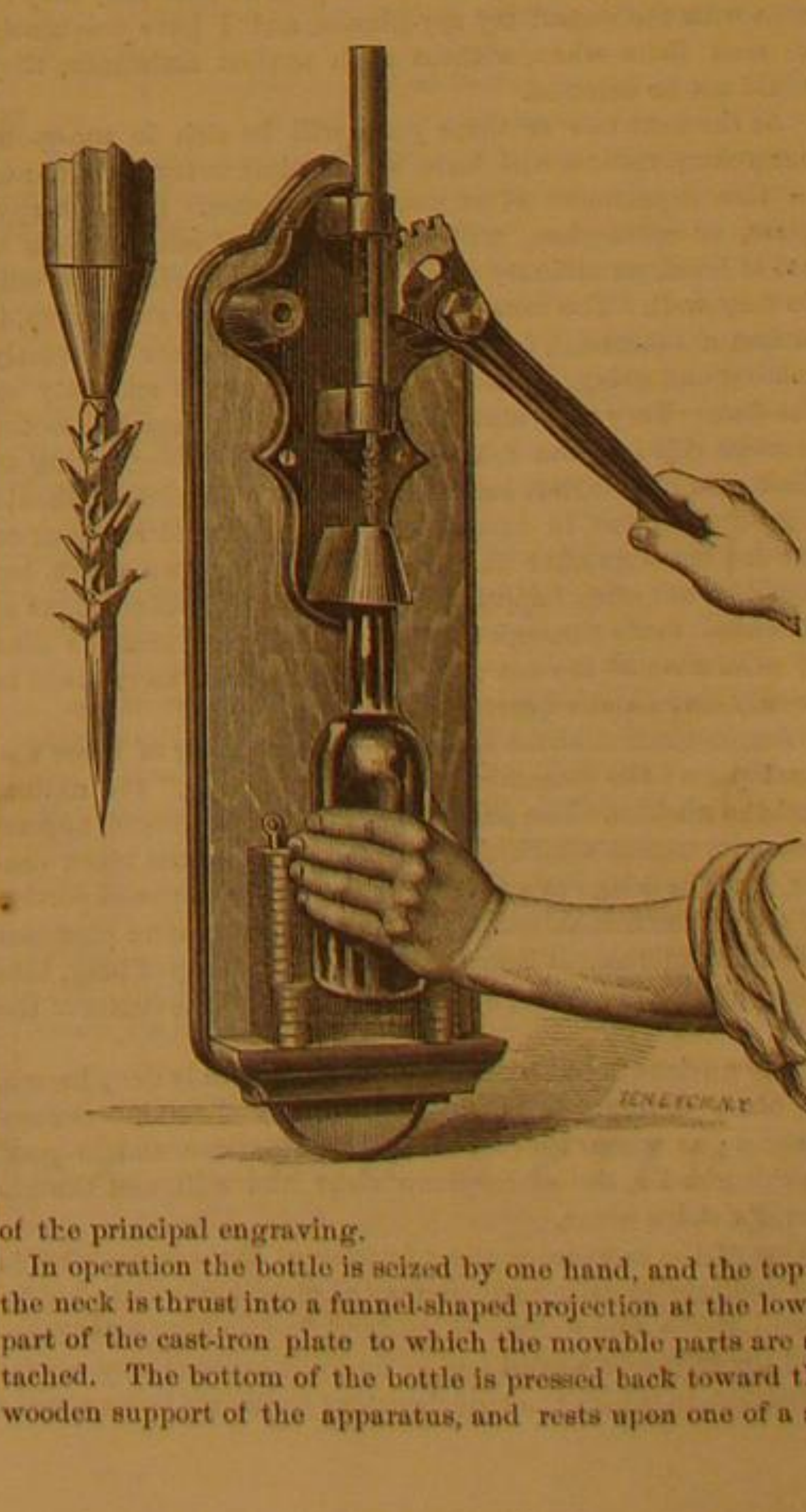
Mr. John A. Parnell, F.R.A.S., communicates to the *Philosophical Magazine*, an account of a remarkable mirage which occurred in the English Channel, April 13th, about 2 P.M.

During the morning, and up to two o'clock, P.M., a dense fog had hung over the sea; but, apparently it was not very deep, as the sun's rays penetrated it pretty freely. At the hour above mentioned, the fog opened toward the southeast, disclosing the cliffs on the French coast; and, in the course of a few minutes, the fog had disappeared, leaving the atmosphere in a state of unusual transparency. The French cliffs were apparently so lofty, and, with every indentation, so clearly visible, that one might easily have imagined that they were but ten miles distant. On examining the objects in view through a small telescope, with a 25-power, it was at once apparent that this arose from something more than common looming. The French coast could be seen from near Calais, toward the east, far away, and many miles beyond Boulogne, toward the southwest; the land in the latter direction being ordinarily invisible, as it is situated below the horizon. Immediately under the erect image of the coast was an inverted one of about double the hight of the former. The light-house at Cape Gris-nez gave five images in a vertical line, the lowest erect, but somewhat magnified; above that, and separated from it a pair of images of the center and highest portion of the building only, one erect and the other inverted; and over these another pair, the inverted image being like the former one, but the erect image showing the whole building. Over Boulogne, in the air, were two images of the double funnels and the mast of a tug boat, the lower image being erect and the upper inverted, the two lines of smoke bending, the one upward and the other downward, and both toward the west, till they joined together. The only tug-boat near Boulogne, at the time, so far as could be ascertained, was in the harbor. The cathedral was plainly visible, but only gave a single image. Toward the southwest, beyond the French coast, some fishing luggers were observed, hull down so that the position of the horizon could be ascertained; over these were pairs of images of vessels which, ordinarily, would have been invisible. In some instances three and even four pairs could be observed, placed in a vertical line, the lower image in each pair being inverted. With the exception of the uppermost pair, the images seemed to represent the maintop gallant sail only, and that considerably elongated; but the highest erect image showed the mizen and the fore masts and the jib, but in no instance could the hulls be seen. The inverted images were about twice the hight of the erect. Soon after three o'clock vessels between the observer and the horizon began to be affected. The *Varne* light ship, about 8½ miles from the English coast, had her mast, flagstaff, and stanchions elongated to some three times their proper length; this effect lasted for about ten minutes, when they shrank to less than half their usual size, and the hull began to rise till it was nearly as high as it was long, and formed a most conspicuous object, even to the naked eye. Upon looking toward Dover, the pier seemed completely disorganized; it appeared to be divided in half, longitudinally, with the sea in the midst, and the stone coping moved as if huge waves were agitating it. At four o'clock the phenomena ceased.

IMPROVED CORK EXTRACTOR.

This is a new, unique, and powerful instrument for extracting corks from champagne, porter, and other bottles where the corks are wired down; and it not only enables the cork to be quickly and certainly extracted, but obviates all previous cutting or breaking of the wire.

It consists of a stout, vertical shaft, actuated by a lever, toothed sector, and rack, and having at its lower end a spear with pivoted barbs. This spear is shown in detail at the left



of the principal engraving.

In operation the bottle is seized by one hand, and the top of the neck is thrust into a funnel-shaped projection at the lower part of the cast-iron plate to which the movable parts are attached. The bottom of the bottle is pressed back toward the wooden support of the apparatus, and rests upon one of a se ries of shelves about three eighths of an inch in thickness, and having their front edges recurved. The shelves above the bottom of the bottle are pressed backward against springs with which each shelf is supplied, so that when the bottle is removed they are again advanced uniformly. This arrangement gives a firm support to bottles of very different lengths.

The bottle being placed as described and as shown in the engraving, the hand grasping the lever is raised; this thrusts the spear into the cork and a reversed motion of the lever opens all the pivoted barbs in the position shown in detail at the left of the engraving, and draws the cork, breaking the wires etc., at the same time. Subsequent corks being drawn face the first up along the spear, until finally it is split by the conical end of the vertical shaft, and flies off out of the way.

Four motions, two with each hand, draw a cork in less time than the wire could be broken by the old method. By substituting a punch in place of the spear, and placing a small funnel to receive the cork, this machine can be used to cork bottles with great rapidity.

Patented through the Scientific American Agency, July 13, 1869, by Charles G. Wilson, of Brooklyn, N. Y., who may be addressed for the entire right at the Holske Machine Company's office, No. 528 Water Street, New York City.

FACTS CONCERNING THE SUN.

When we contemplate the benefits of the natural world, we do not often realize what a wonderful object is the sun, and how manifold are the kindly offices it constantly performs for us. From an inconceivable distance in space truly it rules the earth, imparting to it light, heat, and other subtile influences, and rendering it a possible abode for countless forms of life. The ancients were right in placing it foremost among the grand objects of creation, and we can hardly wonder that it was early chosen by idolatrous nations as an object of worship.

Of its size and distance the first astronomers had no true conception. Anaxagoras, who lived 430 years before Christ, claimed that it was as large as the whole territory of Greece, for which he was heartily laughed at. In later times, Leonard Digges, a quaint English philosopher of the sixteenth century, estimated its distance at 64,811¼ miles, which is, in reality, barely a fourth of the distance to the moon! At the present day we smile at such guesses, knowing that the Grecian peninsula would, if laid on the sun, be absolutely invisible when looked at through our largest telescopes, and that, as regards the distance of the great orb of day, our friend Digges does not give us a thousandth part of the truth.

If we attempt to obtain a conception of the vast magnitude of the sun, we find ourselves thoroughly bewildered. Were we at its center, our moon would revolve in its orbit but little more than *half way to the sun's surface*. If it were a hollow sphere, there would be sufficient room to accommodate more than 1,200,000 balls the size of our planet. The earth is a mere homeopathic pill in comparison with such a body; and if projected on its bright disk, would, from our orbit, be absolutely invisible to the naked eye. Illustrations like these do little more than show that by no effort of the imagination can we obtain a satisfactory idea of the gigantic proportions of the nearest fixed star—our sun.

When viewed with a small telescope, care being taken to shield the eye with dark-colored glass, dusky spots are often detected on the solar disk. At the present time they may be seen with the veriest toy spy-glasses, and I have frequently so seen them when, without such modest assistance, they could not be detected.

As the next two or three years will be rich in sun-spots, our young readers will have ample time to try their hands in this department of astronomical science. Either a spy-glass, or opera-glass, will answer; and if colored glass is not at hand, an ordinary piece, smoked in a candle flame, will do very well. You must not, however, give up the search, if at first unsuccessful, for the curious blotches are constantly coming and going, and sometimes appear quite suddenly on the disk. They pass slowly across from the eastern to the western side in about fourteen days, not, however, owing to their own motion, but because of the sun's rotation. Should a group continue in existence so long, it would reappear on the eastern edge after the lapse of another two weeks, but this does not often happen. It is by means of observations of this kind, made through a long series of years, that the time of revolution of the sun upon its axis has been ascertained as twenty-seven and a quarter of our days.

Astronomers describe sun-spots as consisting of three distinct parts; the penumbra, or "almost-shadow," the umbra, and the nucleus. The penumbra consists of a grayish appearance, not unlike a dark cloud, which encircles the black center, like the fringe to a mat. It is the most conspicous portion of the phenomenon, and from its varying character possesses the chief interest. It is most frequently made up of long, thin wisps of cloudy matter, extending inward to the center of the spot.

The nucleus is but a darker part of the already deep brown, or black umbra. It is only seen under favorable circumstances; as when the telescope is a large one, and in good working order, the atmosphere clear and still, and the observer's vision acute.

One of the most interesting features of the sun's surface is the delicate mottling which may at almost any time be detected, if the atmosphere is moderately free from vibrations, and the telescope a good one. To see it satisfactorily, an instrument, in which the principal lens measures two or three inches across, is necessary. We may compare this mottling to the appearance of tissue paper held up to the light; or better still, to the tufted surface of light gray chinchilla cloth, such as is used for heavy winter overcoats. But best of all, we may liken it to the snow-white ends of coral branches.

The mottling of the sun would seem to vary considerably in appearance from time to time; sometimes resembling a sky covered with mackerel clouds, and then again presenting the compact and well-defined arrangement of the coral tips.

Let us consider for a moment what happens in the case of the union of the little black points alluded to. The bright envelope called the *photosphere*—which is what we see when we look at the sun—is evidently pierced in some unaccountable manner; and the rent growing larger and larger, a deep cavity in the luminous covering ensues, and the penumbra is formed. Should the cause of the phenomenon prove sufficiently violent, the true body of the sun is then seen through rifts in the cloudy strata. But instead of being white—dazzlingly so we should expect to find it—it has a dark brown tint. This is, however, an effect of contrast, just as coal fires look dull in sunlight, and the calcium light positively black, if placed between our eyes and the sun. The central mass supplies the materials for the illumination, but is not as bright as the dazzling light it produces, any more than in the case of a candle, the intensely hot and luminous gases enveloping the glowing wick, give out light equal to the upper portion of the flame, where combustion is perfect. Thus a sun-spot is by some considered as a tearing aside of the long flames issuing from the liquid or gaseous sea beneath, revealing the less brilliant lower strata of flame (to our view the penumbra), and the still less luminous body of the sun itself, the latter appearing as the umbra, with or without a nucleus, as the case may be.

The materials of our sun are, doubtless, capable of producing greater heat, pound for pound, than the substances usually employed by us for the same purpose. Recent researches in chemistry would seem to point to a more elementary condition of matter in the stars and nebulæ, than any with which we are acquainted on the earth. Who can say but that the production of our terrestrial elements was accompanied by displays of light and heat similar in intensity to those now witnessed in the sun and stars. This theory has great support in the constantly accumulating facts which the spectroscope is bringing to our attention.

One of the most impressive sights which ever falls to the lot of man to witness, is that of a *total* eclipse of the sun. Such an event is comparatively rare for any one part of the earth's surface, so that one may live to a good old age, and die without having witnessed such a phenomenon. In London, for instance, there has been no total eclipse since the year 1715; and more than five and a half centuries had then elapsed since the previous one.

The characteristic features of such an occurrence are the following: The peculiar gloom which spreads itself, like a pall, over the landscape; the changing tints of the sky, black, orange, indigo, red, sickly yellow, and leaden hues appearing at one and the same time, in different portions of the heavens; the awful approach of the moon's shadow in the air; and lastly, the magnificent circle of light around the eclipsed sun, called the *corona*, which is compared to the "glory" around the head of a saint, in an old painting. We might add to these the rosy flames frequently seen issuing from the dark limb of the moon, but in reality connected with the solar atmosphere. These flames are often to be seen with the naked eye. During the past year they have been analyzed by the spectroscope, and found to be masses of self-luminous hydrogen. Finally, the larger planets, and some of the principal stars, are occasionally recognized by acute observers during the period of totality, as the gloomiest part of the eclipse is called.—*W. S. Gilman, Jr., in the Riverside Magazine.*

Purifying Water.

It is a well-known and generally observed fact that the water of rivers, canals, and some lakes is never quite clear. This turbidity, which often remains even after many days of quiet rest, is partly due to inorganic substances floating about in the water and suspended therein, but is far more frequently caused by matters of an organic nature too minutely divided and too small to be readily recognized, even by a powerful microscope. The researches of some of the members of this report have undeniably proved that, at least as far as the Netherland waters they submitted to research are concerned, this turbidity is due to extremely minutely divided clay, by the aid of which a great deal more of organic matter than could otherwise remain suspended is kept in such an extreme state of division as to pass through filters and not deposit, even after many days of rest. When, to such kinds of water, a solution of alum (from 1-50,000th to 1-100,000th of the bulk of the water) is added, it will be observed that after a longer or shorter lapse of time a flocculent precipitate is formed, which is either alumina or a basic sulphate thereof, which flocculent material takes up all the turbidity of the water, leaving that perfectly clear; the precipitate thus formed has been submitted to chemical tests, and it was found to contain a large quantity of organic matter, and to yield, on being heated with soda-lime, ammonia very largely.

Since the committee was instructed to ascertain and discover the means of improving the condition of the potable waters where it was required, this especially also applied to the towns and villages whose chief supply of water for domestic and drinking purposes depends upon that of the river Maas, along the banks of which, in the lower portion of its seaward course, the population is entirely dependent upon its water; which has been almost from time immemorial known to produce, in those not accustomed to its daily use, a diarrhea, which in certain individuals is accompanied by very unpleasant, if not always, therefore, dangerous symptoms.

The water of this river has been analyzed over and over again by many eminent scientific chemists, and has been submitted to microscopic research, but no trouble, nor anything science could, armed with its best weapons, bring to bear on this research, has ever revealed the precise cause of this peculiar property, which is not possessed by the water of the same river, nor also by that of the Rhine, higher up its course.

For curiosity's sake, we here quote the result of one of the most recent analyses of this water taken at flood tide at Rotterdam: Physical properties, very turbid, does not become clear on standing, is not rendered clear on addition of a few drops of hydrochloric acid; taste—not quite unpalatable; solid residue—dried at 120° C., yielded, for 1 liter, 0·195 grm., containing 0·055 of combustible matter; earthy salts 0·0975 grm., containing 0·048 sulphate of lime, chlorides of alkalies, 0·0233; ammonia, none; slight trace of nitrates; dry residue had a yellow color before ignition.

It is a highly important fact, and one of very general importance to learn, that Dr. J. W. Gunning, of Amsterdam, has found that the perchloride of iron added to this water (and the same applies to far more foul waters experimented upon) has the effect of rendering it perfectly wholesome and even agreeable for use. To one liter of water, 0·032 grm. of the dry salt just alluded to, and previously dissolved in pure water, are added, and, after well stirring the liquid, it is left quietly standing, to settle, for full thirty-six hours.

A series of very carefully made experiments has proved that no free hydrochloric acid (the quality thereof contained in the above-stated weight of perchloride of iron only amounts to 0·021 grm.) was left in the clarified and purified water, but in order to suit the application on the large scale, and to make assurance doubly sure, as regards any acid or perchloride being left undecomposed, or rather uncombined, with the organic and inorganic matter of the water, Dr. Gunning has advised that a small, but equivalent, quantity of crystallized carbonate of soda should be also added some hours previous to beginning to take the purified water for use. At Dr. Gunning's request, a scientific gentleman of high attainments, who happens to have an excellent opportunity, near Rotterdam, to try on the large scale this process, has submitted it to practical test, and a quantity of no less than about 240,000 liters of Maas water, taken at all times of the year, has been treated by this process, and thereby rendered perfectly fit for use, and consumed by various parties, has proved to have been entirely deprived of its property of causing diarrhea; moreover, the medical officer in charge of the crew of Her Majesty's corvette the *Lynx*, moored off Rotterdam, in the river, has applied this process to the water taken from the river, and found by experience that the thus purified water has even the good effect of restoring to health such of the crew as had been incautiously drinking the not previously purified Maas water. It is, when using this means of purifying bad water, of great importance to let the sediment quietly settle; it occupies about 4 per cent of the bulk of the water, which on the large scale will, for security's sake, be submitted to a filtration through fine well-cleansed sea-sand before being sent through the mains of the large waterworks intended to be established near Rotterdam for the supply of that town.

The quantity of crystallized carbonate of soda which is equivalent to 0·032 grm. of dry perchloride of iron is 0·085 grm.; both these quantities are the maximum required to render the Maas water perfectly pure, even at the time when it is most turbid; comparative experiments have conclusively proved that the application of this process is very superior to filtration of the water, even through animal charcoal. The result obtained with the Maas water having been so eminently successful, the committee has applied this method to the purifying of water otherwise non-drinkable, such as is met with in many of the smaller canals, brooks, and also pumps yielding surface water of bad quality in many parts of the kingdom, and the results obtained are such as to justify the order that this method of purifying must be applied by authority to a class of waters which, thus treated, become available for use. The precipitate formed by the addition of the perchloride of iron and carbonate of soda, both previously dissolved, has been proved, by accurate analysis, to contain a large quantity of organic matter, which, on being ignited with soda-lime, yielded ammonia very largely; analysis has also proved that, as regards the Maas water, the only addition to its inorganic constituents is that of one part of chloride of sodium, by weight, in 40,000 parts of water by the application of this process. Dr. Gunning has found that the effect of the perchloride is not so conspicuous with some well waters containing much carbolic acid; while, moreover, there may exist in some of these kinds of waters, either in quantity or quality, inorganic salts which delay or altogether impede the peculiar mode of flocculent precipitation observed with the aboved-named Maas and other waters to take place after addition of the iron salt.—*Chemical News.*

Forms of Saw-Teeth.

The rules for regulating the forms of saw-teeth must necessarily be arbitrary, as much depends upon the nature and quality of the wood, and the direction in which it has to be sawn. In cross-cutting, the object is to sever every fiber or thread, and as the material in this direction is almost non-elastic or unyielding, teeth of an acute and nearly lancet-shape must be employed, so that acting like a series of knives in rapid motion, they cut the threads asunder rapidly and sweetly, the saw-dust produced having a fine granular appearance. On the other hand, in ripping or cutting with the grain, the desideratum is to separate the texture, as it were and as in so doing the teeth do not meet with so much resistance and resilience from the filaments as in cross-cutting, they may be made much larger and coarser, thereby producing small shavings or chips, rather than saw-dust. The nature and quality of the material to be sawn has considerable bearing on the configuration of the teeth, which, following the general law of cutting tools, and agreeably to common usage, have to be more obtuse or acute according to the disposition of the substances opposed to them. Soft and pliable woods, such as pines, willow, alder, limes, etc., require the use of large teeth with acute points and considerable pitch, whereas hard woods, or those of a tougher and denser consistency, as oak, mahogany, rosewood, etc., necessitate the adoption of teeth of perpendicular pitch and diminished space. Yellow deal, pitch pine, larch, etc., are of so gummy and resinous a character, that the teeth require not only more set but the blades themselves have to be smeared with grease, to keep them cool and decrease the friction arising from the adherence of the resin during motion. Similar results are experienced in working soft woods; the teeth become choked by the damp consolidated saw-dust, and obstinately refuse to perform their duty without extra force.—*Worssam on Mechanical Saws.*

LIGHT.

The palace keeps out the light, and the sanctuary keeps out the light. If rich men build their houses on broad avenues instead of the narrow lanes, which were streets in the former ages, they are not any more ready to let in the light from these open spaces; the drawing-rooms on the boulevard are just as dark as the chambers in the alleys of Rome or Cairo. In quantity and quality of brightness, there is nothing to choose between a house on Fifth Avenue and the interior of a house in the Jew quarter of Frankfort during most hours of the day, and most days of the year. You see as little light upon the gay and flowered carpet as upon the smirched and dingy floor. If the windows are wide and numerous, they are effectually hindered from their proper service by double or triple folds of drapery hung behind them, curtains of red and brown, thick shades, or opaque shutters. But the chances are that some false model of the architect has lessened the number of the windows themselves. How many of our newest houses seem to copy those medieval castles of German and Italian cities, and show rare slits or loop holes in place of the many windows of the last age of Puritan building.

In church building this tendency to shut out light is carried to even worse excess. The narrow lines of aperture in the walls between the useless buttresses are plated with ground glass, or with that cheap imitation of the ancient painted glass which exhibits the faces of Apostles and the scenes of the Gospel story in tawdry ugliness, varying this libel upon art by signs which mean nothing to the worshipers. Instead of the cheerful light upon the faces and forms of living men, we have the painful postures of leaning and agonizing saints, which transmit the hues, but not the shades and softness of the rainbow.

Another method of shutting out the light from house and church, more respectable, but not less sure and injurious, is in excessive tree planting. Trees are good, but we may have too much of a good thing. Trees are good, but sunlight is better, and if we cannot have them both, we had best keep the light and dispense with the trees. Trees are good in their place, but their place is not in front of windows, or anywhere that they can stop the sun from entering the house. There is sanitary virtue in the resinous breath of a pine forest, yet it is suicidal folly which will environ a house with thick evergreens, whether in city or country, destroying so the landscape of the rooms and doubling the desolation of winter. Such delicate and swaying shade as the branches of an elm can throw to break the blaze of the summer sun is well enough, but the somber shade which is solid and unyielding, fixed for all seasons, and stubborn against the sun, is only evil before our windows. For eight months, at least, of the year, the sunlight should have no barrier of any kind to hinder its entrance to the house; and for the remaining months, it should have easy evasion of the light foliage. Trees are not ornamental when they hide the house, and they are not healthful when they darken it.

This exclusion of sunlight from house and church has, nevertheless, its confident pleas of defense. There are weak eyes which cannot bear the light, and they must be protected. There are precious carpets, and their colors must not be faded. There are draperies which the sun's rays will spoil, and fine furniture which will be ruined, if too much brightness be thrown upon it. In summer, heat goes with light, and only darkness will keep in the air a tolerable tone. Only a few can afford the luxury of a new upholstery for every year, and it is mortifying to see that tapestries just hung in their place are already antiquated. Light may be pleasant, but if it brings opthalmia, it nullifies its own work. The argument which would shut it out seems very practicable and unanswerable. Until some saving process for furniture and for sight shall be invented, we must be content to live in the shade.

The doctors are unanimous in urging the sanitary virtues of sunlight. On this point all the schools agree—homeopathic, Allopathic, Hydropathic—and all consent that the sun has a first rank as a "healing medium." No pills, no powders, no lotions, no fluids are so potent in their influences, so infallible in their "exhibition" as this imponderable ray, which is never spent. Galen, Hahnemann, and Priessnitz alike, assume that light is essential to the effect of their remedies. The medical theory that a sick chamber must be gloomy and dark has ceased to have favor in any method of practice. A first requisite in choosing a site for a hospital is that it shall be sunny. This is quite as important as that it shall be dry; and, indeed, if it is not sunny, it can not be dry. The perfect hospital will be that which shall have the sun on all sides all the day, if the light can be so twisted by any Irish genius—which shall let it fall on all the beds in all the wards. In our recent war, the unlucky patients who found themselves billeted on the shady side of the hospital wards, had the trial of knowing that their confinement would probably be doubled; a severe wound on the sunny side would heal more quickly than a slight wound on the shady side. Even with the best ventilation, the malaria would cling in the blood which had only a northern light to drive it out. One could note the contrast, in passing between the beds of the patients who were sitting or lying in the sun, with those who were condemned to the shade. This large experience of the hospitals in the war converted many who were skeptics about light as a healing agent, and who went into the service with the lingering prejudice that the sick should be kept dark as well as kept quiet. Actinic influence is now not a fancy lo be laughed at, but a fact to be considered and used. Hereafter, curtains on sick beds will be not only superfluous but a positive nuisance, to be put aside with all speed.

The exact reason, and the exact way of this sanitary influence of sunlight are not yet fully understood, but the fact is acknowledged. It is an influence which works in all kinds of disease. Inflammatory diseases, nervous diseases, digestive troubles, are all cured by a full supply of the sun's rays. These rays assist other remedies, and are the substitute for many remedies. They work in the Allopathic way upon jaundice and bilious maladies, bringing light out of the darkness; and they work in the Homeopathic way upon pale, lymphatic disorders, changing the unhealthy pallor to the whiteness of health. The direct action of the sun upon the skin is, indeed, dreaded by many, and it is not probable that any protest of a journal of health will lessen the sale of French kid gloves, or drive veils out of use. A white hand and a fair cheek will still be preferred to the bronze and tan of a sun-browned skin. Some protection against the burning of the sun may be allowed. The best sanitary influence of the sunlight is not that of the hot ray directly upon the skin, but rather of the light in the air that is around the body, the light that envelops, rather than the light that impinges upon the frame. The sunny atmosphere, more than the battery of rays, forces the frame into vigor. Reflected sunlight, if we can have plenty of it, is even better than the direct sunlight. The diffused stream, more than the exuberant fountain, dispenses the blessing. It is enough if we are only in the light, and it is not necessary to be always "under the sun." By an arrangement of pivoted mirrors, such as the damsels of Amsterdam use to bring images of the street into their chambers, one may get the disk of the sun itself into the room; but there is no need of that, if the reflected light is allowed to enter freely. This light does not lose its virtue, though it may have been beaten back from wall or tower, and may have taken many paths on its capricious race from its orb in the sky. We may get all the good of the sunlight without being either burned or dazzled, without feeling too sharply the hot hand of the sun upon our head.

The health-giving influence of light is undoubtedly largely upon the mind. It makes us cheerful, hopeful, and buoyant Whether that cheerfulness comes from the quicker flow of the blood or any change in its globules, or whether it makes the blood flow more swiftly and so gives more strength is of no importance. This we know, that low spirits are not nourished by the sunlight. Happiness in the light is the congenial state, and melancholy is driven back.

We may condense into a few practical rules the substance of these rambling remarks. First, in building, or buying, or hiring a house, choose always a site where there is abundance of light. Avoid dark lanes, neighborhoods where there are high walls, or thick groves, or any obstruction which shuts out the sun. A cottage with three rooms and light in them, is better than a palace with thirty halls and chambers, where the light must be made by artificial aids.

Then, secondly, live in those rooms of the house in which the light has freest entrance, sit in them, eat in them, sleep in them. If any are to be shut up and kept for state occasions, or for the reception of rare visitors, let them be the darkest rooms of the house, the north and east rooms, rather than the south and west. Let the sunny rooms be those which are the most constantly used.

In the third place, have such finish of the house in walls, ceiling, furniture, drapery, decorations, as shall assist and multiply, not absorb and destroy the light. As far as possible, let the brightness that comes into the house be met and repeated by the brightness that stays in the house. Have colors in the furniture that will be brought out and not ruined by the light falling upon them.

In the fourth place, give the light plenty of room to come in at the windows. When a bay window is built, with its treble surface of glass, do not neutralize its excellent gift by a treble fold of damask, and so destroy its beauty and its use. It is bad when two bay windows on the same side of the house, hinder each other's freedom, like the Siamese twins with their fatal ligament. But it is worse when within the house the heavy folds of cushion make the projecting window a useless excrescence, "a wart and a wen," on the side of the house, as Emerson says of the man who has no place in his soul for the sense of God with him.

And perhaps we ought to add a fifth rule, to get as much sunlight as we can in the day by early rising. That constant phenomenon which kindles the rapture of so many makers of verses, but is rarely witnessed in the cities, the rising of the sun, should not be altogether taken for granted. The morning light is good light for health as well as for song. Gaslight destroys more eyes than sunlight, and the wear and tear of evening riot ruin more furniture than any bleaching of the sun through the windows. It is safe to say that at no season of the year should the quantity of artificial light which we use be greater than the quantity of natural light. In the dead of winter the sun ought still to be the first of the torch-bearers. When we have artificial light we ought to have enough of it; and the discovery of kerosene has been a boon to the race, in giving a new lightness to the night. But no amount of artificial light, whether of candles, or oils, or oil from the rock, or magnesium, or oxygen, or the electric current, can match or reach the bounty of that great ever-flowing reservoir in the heaven. What amazing folly, for men who have such large estate in lands and houses and stocks, to shut themselves all day in dark corners, and scheme and figure by gaslight how they may add to their stores! Wiser is the farmer, who sows and reaps under the open sky, than he whose wealth is gained by a light which warms only to lameness and premature old age. The gospel of light needs especially to be preached to those whose work is among warehouses and in the haunts of traffic.—*Herald of Health.*

Moss-Agate Hunting in the West.

A correspondent of the Cincinnati *Commercial* writes from Sherman, Black Hills, Wyoming Territory:

"Pretty nearly every visiter to these hills and the plains is an anxious and excited seeker after 'moss-agates'—a name applied to a species of silicious formation that has been wonderfully and beautifully figured and flowered through the united agencies of iron solutions penetrating it, and then, becoming exposed to the action of the air, going through a sun and wind-drying process after the waters of some river bed or lake had evaporated. Some of these moss-agates are very tastefully inlaid with exact imitations of pine trees, vines, cedar forests, hedges, trains of cars, stars, figures, and almost every imaginable drawing. The agates found along the line of the Union Pacific Railroad are of four different colors, partaking of the names of the places where found, as follows: The Cheyenne brown agate, Granger Water agate, Church Buttes light blue agate, and the Sweetwater cream agate. The two latter are the most valuable, and most delicately formed.

"The most extensive agate beds are found in the vicinity of Church Buttes and Granger, distant about eight hundred and eighty miles west of Omaha. These beds are about fifty yards wide and nearly one hundred yards long, being isolated from each other at a distance of from one to two miles. As you approach them you observe a large patch of smooth, black, round cobble stones, and between these lie, almost concealed, the different sized and shaped moss-agates, and, occasionally sparkling among them, a bright topaz, and brown and yellow streaked carnelian. The intrinsic value of the agate consists in its display of moss, the vine and cedar forest being the most prized for jewelry sets. In one hour's time I have gathered a half gallon, some of which are extremely pretty, and I know of no pleasure, either in hunting buffalo or catching trout, half so exciting and so full of glory as the finding of a choice agate. I have seen staid old men search in silence for a few minutes for a 'real shiner,' and when they came upon it pick it up suddenly, take off their hats, swing them in the air, jump up and shout aloud, like schoolboys that had just been let out for a two-weeks' vacation. The very novelty of finding precious stones among black rocks, far out on the plains, many miles from home or habitation, is a delight so pleasing and intoxicating that it takes a mighty nerve to resist the pressure of one's making a most stupendous fool of himself. Good agates are worth, as jewels, from three to five dollars apiece. As novelties they are invaluable."

Mineral Caoutchouc.

Recent communications from Adelaide, South Australia, says the *Chemical News*, have made known the discovery in the southern portion of the colony of a remarkable carboniferous substance, which hitherto has only been found in small quantity in the coal strata of Derbyshire (England). It is a mineral caoutchouc, so called from its general appearance and elasticity. In Australia it is found on the surface of the sandy soil, through which it would appear to exude from beneath, as, burnt off occasionally by the bush fires, it is again found after the winter season, occurring in quantity and of varying thickness. Analysis proves it to yield 82 per cent or more of a pure hydrocarbon oil; its value for the manufacture of gas there will be great, and it is also believed to be applicable to the making of certain dyes. The discovery is also important from its indication of the existence of oils or other carboniferous deposits. This material, known in mineralogy as elaterite, is also found in a coal pit at Montrelais, near Nantes, France, at Neufchâtel, and on the Island of Zante. According to the analysis of the late Professor Johnston, of Durham University, it is a hydrocarbon, containing from 83·7 to 85·5 per cent. of carbon, and from 12·5 to 13·28 per cent. of hydrogen. The variety found in Derbyshire (near Castleton) has a specific gravity varying between 0·9053 to 1·233; the substance is highly inflammable, its color blackish-brown, its luster resinous.

Antiquity of the Wheelbarrow.

M. Le Duc corrects an error that has prevailed in France with regard to the invention of this useful little vehicle. It has been attributed to M. Dupin, who it has been claimed devised it in 1669. M. Le Duc says he has found mention of them in the thirteenth, fourteenth, and fifteenth century MSS., and gives an illustration taken from a vignette of a manuscript of the thirteenth century, of a man propelling a wheelbarrow, the form of which differs but slightly from those now in use,

A Gothic Cottage Villa.

In this illustration, extracted from *Sloan's Architectural Review*, published by Claxton, Remsen & Haffelfinger, 819 and 821 Market street, Philadelphia, we present a design for a rural residence of a size warranting the designation of cottage villa, which, it will be observed, is in the Gothic style.

The intention here is, not to present a conception exhibiting all the elaborate and costly display of the domestic Tudor style, for instance, but one, which, suited to any projector of moderate means, would be characterized by convenience, propriety, and the utmost simplicity of decoration compatible with architectural effect, combined with the most essential of all requisites, economy of construction.

Its general character, and various accommodations will, it is hoped, be easily comprehended by a comparison of the ground plan with the following detailed description of the parts, through the reference letters thereon.

Before proceeding, we may first, however, briefly notice the external decorative peculiarities of the Gothic style in its relation to domestic architecture, as contrasted with its corresponding characteristics in ecclesiastical.

In the first instance, we may name one of the most striking, namely, that domestic Gothic rarely uses pointed windows, but most generally square-headed ones; with a hood molding, conforming with the head, and terminating in elbows. This peculiarity will be observable in the example before our readers.

Another difference is in the doors, the domestic never using the common high-pointed doors with pyramidal labels.

Next to the windows and the doors, the most marked characteristic of this style is the gable, of which there are the simple gable of two lines, following the slope of the roof, and the stepped gable. The apex of the gable is also frequently crowned by the introduction of a slight octagonal shaft, with pinnacle, enriched with ornamental moldings.

The high roof is one more peculiarity which we may name; and, although this scarcely admitted much ornament, it was not, however, neglected. Relief from sameness was obtained by the employment of shingles, tiles, or, as in this case, slate of different shapes, producing a pleasing alternation of lines. We have hurriedly noticed the most striking differences, which exist in the Gothic style, according to its application. This subject, nevertheless, deserves a more extended consideration.

This villa is intended to be constructed of brick, of an ordinary quality, laid to a smooth even surface, with flat joints; will be two stories high, with an attic story within the roof; and painted French gray, or some neutral tint.

We will now proceed to explain the references on the ground plan.

In the first story: A is the vestibule, with rounded corners and tile floor, having glass doors, opening into the hall, B. These doors are made in pairs, and equal in width to the front doors. The hall, B, entered through these vestibule doors, is six feet wide by eighteen feet six inches long, with a return, toward the front, of eight feet wide. This latter portion contains the main stairway, C, is semi-circular on the front, and is continued up above the roof, forming a circular tower, a most effective and striking feature in the design.

Passing through the hall, we enter the parlor, D, an apartment nineteen feet long by fourteen wide, with two bay windows. The one on the side is octagonal, containing three divisions, and that in front is square. This latter projects two feet six inches, with a double, or, as it is usually termed, a twin window; and is carried up two stories in hight, as will be seen at a glance on the elevation.

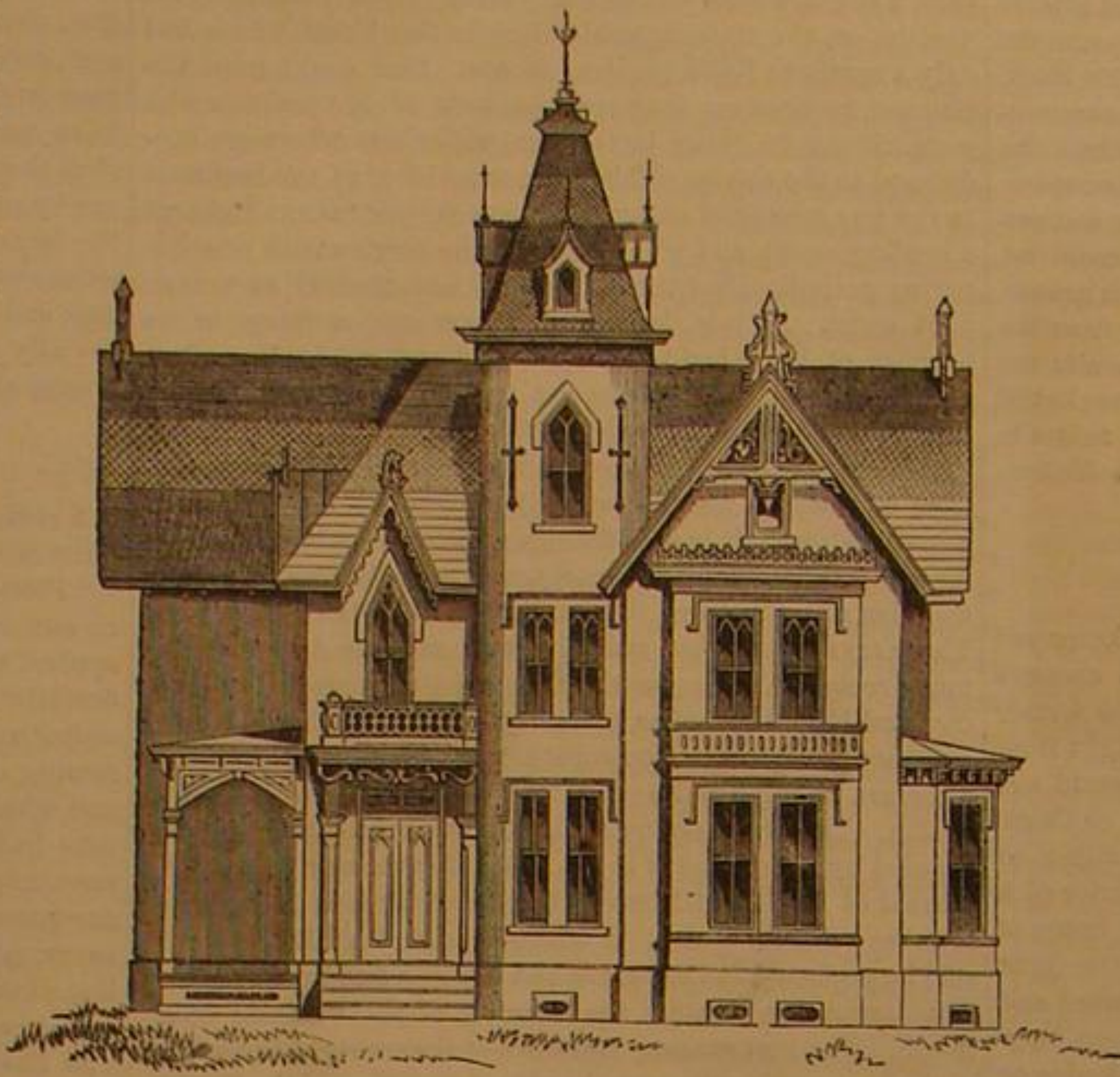
In the rear of the parlor, but not communicating with it, and also entered from the hall, is the dining-room, E, twenty feet long by fifteen feet wide, a well-lighted and convenient sized apartment, communicating at the rear, through a pantry, H, four feet six inches square, and a kitchen pantry, I, of the same dimensions, with the kitchen, F, fifteen feet by sixteen feet, which is provided with a range and sink.

There is another mode of communicating between the dining-room and kitchen, namely, through the private passage, G, which opens out into the main hall, B, and contains the private stairway.

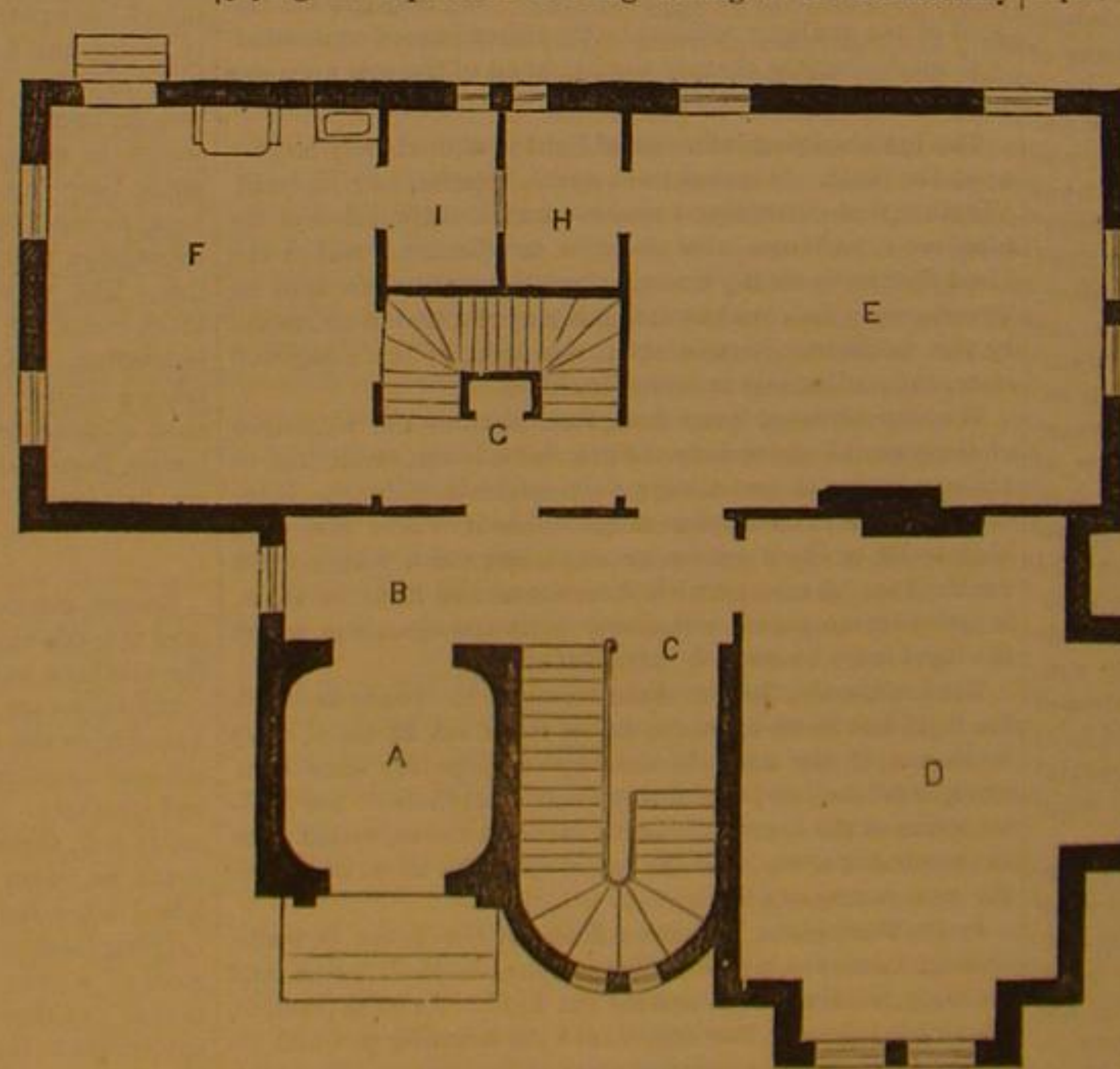
The porch, on the front, and along the side of the entrance, is accessible from the hall through the end window, which extends to the floor for that purpose. The main entrance door has a slight projecting porch, finished with an ornamental balcony above.

The second story may be arranged to suit the taste of builders, and some alteration would be admissible in the ground plan to suit individual requirements.

Those who are capable of modifying plans ought to be able to originate them, and therefore the elevation of a design is the most important thing for practical builders in rural districts, where services of expert architects are hard to obtain.



GOTHIC COTTAGE VILLA.



GROUND PLAN

History of the Argand Lamp.

No improvement had yet been devised in lamp or candle, when, in 1784, a Swiss philosopher, Argand, invented the circular wick, inclosed in a cylinder of glass. He was a man of uncommon ingenuity, who had already made various useful inventions in other branches of industry, and devoted himself to the study of this great question, how more light could be obtained. He needed lamps in great numbers for his manufactories, and as he had learnt by experience that the wick could not be made thicker without diminishing the light, it occurred to him to extend it in a circle. This increased the size, and at the same time gave him a central space within the ring, through which a current of air was brought to play upon the wick, which prevented the forming of soot and increased the illuminating power. The discovery, which was thus in part accidental, as he had not originally counted upon the advantages derived from the strong draft within created by the heat of the flame, was, nevertheless, at once fully appreciated by the intelligent inventor. He immediately determined to seek a market, and as the English were then enjoying the reputation of being willing to reward liberally every invention that could aid them in developing and perfecting their manufactures, he determined to offer it for sale in London. On the way he came near losing the whole fruit of his labors. Like King Joash of old, Argand could not resist the temptation of exhibiting his treasures to the Assyrians, who were in this case represented by the *savans* of Paris, and one of them at once caught at the principle. While Argand went to England, and there, during the rigid examination to which his invention was subjected, was led to add the chimney, the same discovery was made in France by his rival, l'Ange. Both men had been led almost necessarily to the conviction, that an outer current of air must needs be at least as useful to the flame as an inner current, and as they needed for this purpose a cylinder that should be transparent and yet capable of resisting great heat, both fell upon the same contrivance, the glass chimney of our day. Thus it came about, that while Argand is undoubtedly the sole inventor of the circular form of the wick and the inner current of air, he must share the not less important invention of the glass tube, with the Frenchman, l'Ange. The latter had, in the meantime, presented himself, lamp in hand, before the French Academy, and as the report on his invention was made a few days before his Swiss rival obtained a patent in England, the French people are apt to claim the whole proudly as their own invention. The matter was still further complicated by the strange retribution which befell the favorite of the Academy. He lost, in the annals of science and in the memory of the public, the fame of his discovery. First, it so happened that he thought it best, after the manner of the day, to engage the interest of the leading journal of Paris in his behalf; as he did not know the editor, he prevailed upon a certain Mr. Quinquet to introduce him to the former. The editor, from carelessness or ignorance, stated in the article which he wrote on the subject, and which created a great sensation, that this marvelous lamp with its brilliant light had been presented to him by Messrs. Quinquet and l'Ange. The public, always equally careless and ignorant, did not take the trouble to retain both names, and to this day the lamp is in France simply called a *quinquet*, after a man who had nothing whatever to do with the invention. *Sic ruunt fata.*

Poor M. l'Ange was equally unfortunate, as we learn from Friedrich Mohr's interesting monograph on that subject, when the Government at last decided to bestow upon him the well-earned reward.

Argand had been signally unsuccessful in England, where his patent was attacked on all sides, and rendered utterly unprofitable to him. He returned almost broken-hearted to France, and endeavored to obtain there a like patent. It was granted, in the shape of an exclusive monopoly for fifteen years; but this apparent injustice roused the indignation of his competitor and the judges of the Academy, who jointly remonstrated with the Government. To cut the Gordian knot, both inventors were joined in the patent, and it was ordered that every lamp of the kind should bear a stamp with the words: *Argand et l'Ange inveneruni.* L'Ange was speedily forgotten, and in Europe and this country Argand alone is known and honored as the inventor. After all, however, he also had, like most inventors, to be content with the fame; for, very shortly after the patent had been granted, the French revolution broke out and swept away this monopoly with so many others.—*Putnam's Magazine.*

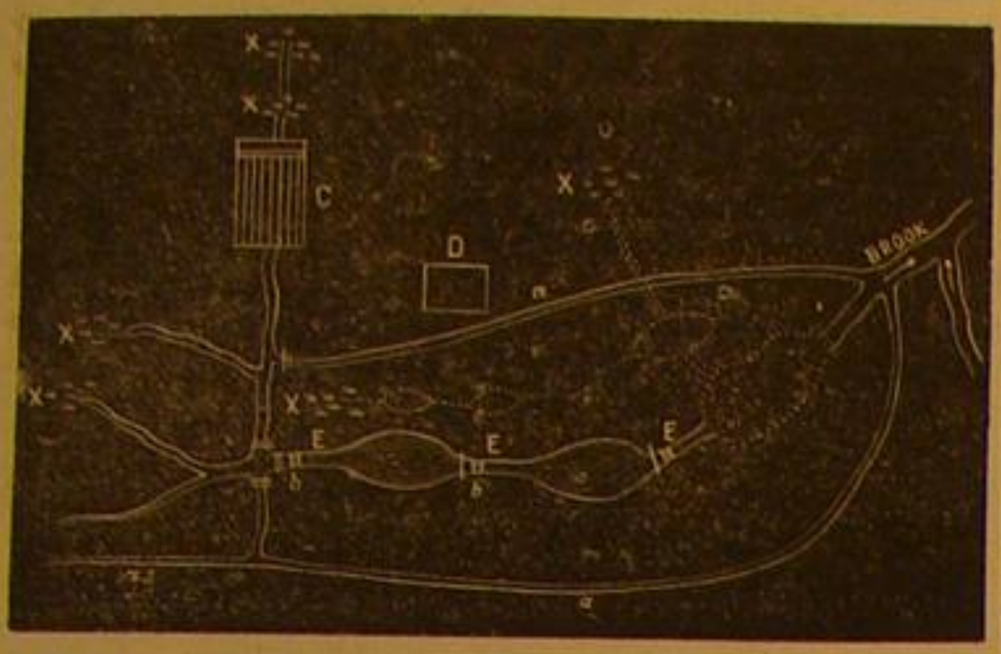
Researches on Resins.

M. Sacc observes that resins have been very little studied at all; and his researches recorded in this paper extend to copal, amber, dammar, colophony, lac (or shellac), elemi, sandarac, mastic, and carnauba wax (a resin). The author has studied the more or less degree of readiness wherewith resins are reduced to powder, the action thereupon of boiling water, of alcohol of 86 per cent strength, of ether, of ordinary acetic acid, of a hot solution of caustic soda of 1·074 specific gravity, of sulphide of carbon, of oil of turpentine, of boiled linseed oil, of benzine, of naphtha, of sulphuric acid of 1·83 specific gravity, of nitric acid of 1·329 specific gravity, and of caustic ammonia. All resins were applied in powdered state; and the solvents three times as large a bulk as that of the resins have acted for at least twenty-four hours, at temperatures varying between 15° and 22°. The results arrived at are briefly as follows: All resins submitted to experiments fuse quietly when heated, excepting amber, shellac, elemi, sandarac, and mastic, which swell up, and increase in bulk. Only the carnauba wax melts in boiling water; colophony becomes pasty therein, while dammar, shellac, elemi, and mastic agglutinate. Copal, amber, and sandarac do not change. Alcohol does not dissolve amber nor dammar; agglutinates copal, partly dissolves elemi and carnauba wax; while colophony, shellac, sandarac, and mastic are readily soluble therein. Ether does not dissolve amber and shellac; makes copals swell, and partly but slowly dissolves carnauba wax; dammar, colophony, elemi, sandarac, and mastic are readily dissolved therein. Acetic acid does not dissolve amber and shellac; causes copal to swell; somewhat acts upon carnauba wax, and does not at all act upon any other of the resins above-named. Caustic soda solution readily dissolves shellac, with difficulty colophony, and has no action upon the rest. In sulphide of carbon, amber and shellac are insoluble; copal swells therein; elemi, sandarac, mastic, and carnauba wax are with difficulty dissolved therein, while dammar and colophony are readily so. Oil of turpentine has no action upon amber or shellac; causes copal to swell; dissolves readily dammar, colophony, elemi, sandarac, carnauba, and very readily mastic. Sulphuric acid does not dissolve carnauba wax; all other resins are dissolved and colored brown, excepting dammar, which becomes bright red. Nitric acid does not act upon the resins, but colors carnauba wax straw-yellow, elemi a dirty-yellow, and mastic and sandarac bright brown. Ammonia does not dissolve some of these resins, but causes copal, sandarac, and mastic first to swell, afterward dissolving them; colophony is easily soluble therein.

A FISH FARM.

BY E. DEXTER.

The fish-hatching establishment at West Barnstable, Mass., was begun in the spring of 1868. The experiments have as yet been confined mostly to trout, of which we have hatched this year some 60,000, as well as 2,000 salmon ova which were procured in New Brunswick by the State Commissioners of Fisheries, by whom they were presented to us. As the process of hatching goes on during the transport of the eggs in wet moss, we lost several by their hatching on the way in the cars.



X, X, X, X, X, X, springs. *a, a, a*, drains. C, hatching house. D represents a series of ponds for young fish. E, E, E, spawning ways. *b, b*, plank troughs. The two ponds between E, E, E, are for spawning fish. The large pond represented by dotted lines, on the right of this, is used as a reservoir for fish. The dotted lines on the cut above the ponds represent a proposed series of ponds. A tank is also placed at this point, indicated by the x on the left of this series of proposed ponds.

The place selected for building the ponds to contain the parent trout, was a swampy piece of land at the head of a brook of considerable size, running into the salt water after a course of a mile and a half or two miles, and containing a half dozen or more pure springs, the waters of which formed the fountain head of the stream. Two ponds have thus far been made by excavation, each about forty feet long by twenty feet wide, and from three to four and a half feet deep. They are connected together, the same water being used for both ponds. The supply of water is about eighteen square inches, and is taken from tanks made of plank, varying in size from ten to fifteen feet in length, and from four to ten feet in breadth, sunk in the soft mud at the points where the springs come to the surface, and as deep as was necessary to reach the substratum of sand, which was generally about five feet. These tanks have no bottom planks, and the water wells up through the sand at the bottom, forming reservoirs of living water of even temperature, summer and winter, and not subject to freshet or variation in quantity. The temperature of the springs varies but little from 48° throughout the year.

There are now about seven hundred parent trout in the two ponds, ranging from three-quarters of a pound to three pounds in weight. It is calculated that the first pond will sustain over 2,000 fish of the larger size, while in the second three times that number of smaller fish will thrive. This is allowing one large fish or three of the smaller size to the cubic foot.

They are fed daily with live minnows and shrimp caught on the adjacent salt marshes, or, when they cannot be conveniently obtained, with chopped liver, the roe of codfish, etc. The ponds are stoned, and one of them which was built in low, wet land, is cemented on each side of the stones. Having learned by former experience that trout will spawn in the pond, and the ova thus be lost if its bottom is sandy or gravelly, we covered the bottom, where its nature seemed to invite the fish to this operation, with flat stones, thus obviating the difficulty so far as we have observed. Aquatic plants, mosses, etc., were introduced and now cover the bottom, not only providing a large amount of food in the form of crustacea, snails, etc., but also supplying to the water the necessary chemical elements which are being constantly exhausted by the respiration of the fish.

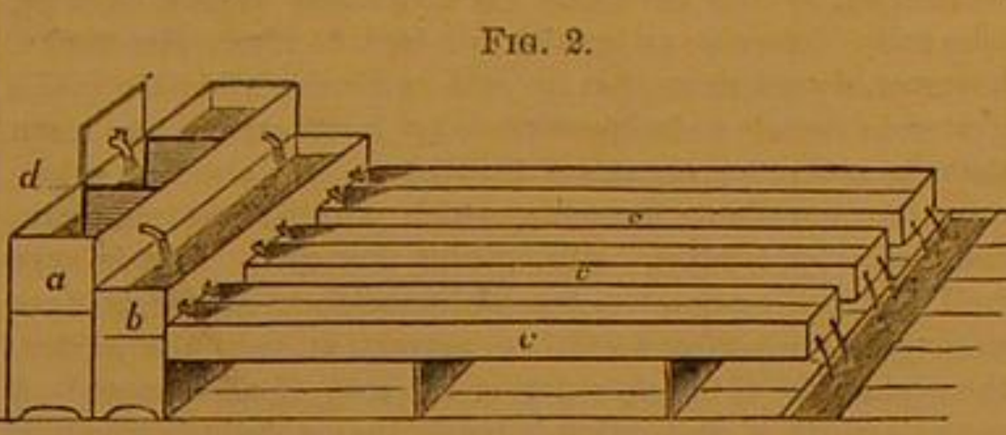
The water enters each pond through a plank trough, the sides of which are sunk nearly to the level of the ground. These troughs are fifty feet long and three and a half feet wide, and are filled to the depth of six inches with coarse gravel, over which there are six inches of water flowing with a slight current to the ponds. As it is the habit of the trout to seek shallow running streams to spawn, they eagerly resort to these *spawning ways* when ready, and are taken by closing the bottom of the way, and driving the fish into a bag net at its entrance into the pond. They are then removed in tubs to the *hatching house*, for the purpose of taking the ova from the female and impregnating them with the milt of the male fish. The modus operandi is as follows: The female fish is grasped with one hand by the back and shoulders, the vent being held under the surface of the water in a tin pan or other vessel partly filled, while with the other hand the abdomen is gently rubbed or pressed toward the vent. If the ova are mature and ready to be shed, a slight pressure is sufficient to extrude them. The same operation is then gone through with the male; if his milt is mature, it will flow in a small quantity into the vessel. A few drops are sufficient to impregnate thousands of eggs. The milt and the ova are then gently stirred together, and allowed to remain undisturbed for five or ten minutes. The water is then poured off, new water is gently admitted to wash the eggs, and they are ready to be placed in the hatching troughs.

It may be as well to state here that the spawning time for trout is from October till March, the principal spawning months being November and December. It is generally calculated that a trout weighing one pound will produce 1,000 eggs; the larger and smaller ones in the same general proportion. I have known, however, during the past season, a trout of less than half a pound in weight, to deliver 1,000 eggs by actual count.

The first requisite now is a supply of pure *spring* water for hatching the eggs,—neither too warm nor too cold. From 45° to 50° is the best. Every degree warmer or colder will make from six to eight day's difference in the time of hatching. From 37° to 54° is considered the limit within which to hatch trout. By a calculation in Mr. Norris' book(" American Fish Culture "), it will take one hundred and sixty-five days with water at 37°, and thirty-two days with water at 54°.

The hatching house in the establishment we have spoken of is a wooden building twenty feet long by twelve feet wide, into which water is admitted about three feet above the level of the floor, from springs immediately in the rear, inclosed in sunken tanks, as before described, and covered so as to be out of reach of cold or heat. To enable the water to be brought in at this hight from the floor, the house is sunk three feet in the ground, and the boards are covered with a heavy coat of pitch inside and out, to a point above the level of the surrounding ground to prevent their rotting. The amount of water now used in the house is what will flow through two faucets, one inch in diameter, with a moderate pressure. This is led, in the first instance, into a straining trough (Fig. 2), running across the width of the building, where it passes through flannel strainers, *d*, to insure its purity. It then flows into a *distributing trough* (*b*), which is parallel to the straining trough and a few inches lower, from which, by means of faucets, it is let on to the hatching troughs in such quantity as may be best.

Fig. 2.



The hatching troughs (Fig. 2, *c*) are placed at right angles to the others, and are sixteen feet long, fifteen inches wide, and eight inches deep, and are six in number with covers upon hinges, the top of them being about fifteen inches from the floor. They are lined with slate, one-half of an inch thick, upon the sides and bottom, with transverse subdivisions; every two feet made of the same material and two inches in hight. A fungus growth, very detrimental to the ova, is unavoidable when wood only is used. The bottom of the troughs is covered with about one inch of moderately fine gravel, and over it flows a constant stream of screened spring water about an inch deep, the lower end of the trough being depressed two inches. On this gravel the impregnated ova are placed in a single layer. In about three weeks the eyes can be seen in the impregnated eggs, appearing simply as two black specks; the blood-vessels of the future fish may also be seen, and from this time its development may be traced daily in the shell. With the temperature of the water at 48°, we may look for the hatching of the ova from the forty-fifth to the fiftieth day. A trout just hatched is about three-eighths of an inch in length, and has attached to it an umbilical sac of several times its own bulk, which sustains the young fish for about forty days, when it is absorbed. The young fish may now be let out into the waters it is desired to stock. They will thrive if placed in a brook even at this early age, such waters supplying an abundance of minute particles of food. If reared in confinement, however, they must be fed with raw liver chopped to the consistency of blood and mixed with water, with the yolk of eggs grated very fine and treated in the same way, or thin sour curds. The latter food is perhaps the best as it sinks more slowly, and trout seize their food *in transitu*, paying little attention to it after it reaches the bottom.

We have sought only to give such a general description of a fish breeding establishment, and of the habits and treatment of the fish, as would give some idea of the practical parts of the art of pisciculture. There are many details connected with the subject which we have not touched upon. They can be found very thoroughly treated of in any of the modern works on pisciculture, of which Norris' " American Fish Culture " is the latest and most practical.

In the above all general considerations have been avoided. It would, perhaps, have been as well to have stated that the arguments in favor of artificial hatching of eggs are based on the small proportion of them that are hatched when deposited in a stream, by the fish following the course of nature, and the very large proportion when hatched by artificial arrangement. The many enemies of fish spawn (other fish, water insects, birds, rats, not to speak of sediment, freshets, ice, etc., etc.) reduce the number of the eggs sadly. It has been calculated by English pisciculturists that not one salmon reaches the proper size for the table out of every thousaud eggs deposited in the stream. As the salmon migrates to the sea when weighing only a few ounces, it would, however, be more subject to casualty than the trout.—*American Naturalist.*

Improved Awnings Wanted---A Suggestion.

In the midst of the great advance of mechanic art, and the cultivation of all those means of comfort which go to make what we may well consider refined civilization, there is often a strange and unaccountable neglect of certain very palpable matters, the inconvenience of which, strangely enough, is constantly recurring to us, and yet brings no reform.

Every city in our Union is, and has been subject for many years to the positive nuisance of what are called " awnings ;" a stupid device to protect goods in store windows from the action of the sun—and this at the expense of the public comfort. To effect which purpose the plan, almost without an exception, is to use sail-cloth, either stretched or on roller. In very heavy rain the awnings that through a negligence, far too common, are left spread out over the sidewalks get filled with rain-water, and ever and anon, deluge the passengers who are necessitated to walk under them. They all are claimed to be water-proof; and such is the actual fact, for they do discharge the water as in the manner stated; and in proof of which so many witnesses can seriously testify. The wind frequently assists in this ejection of water; and does more, for it makes such serious rents in these sail-cloth ceilings that the rain, like the express trains, " goes right through, without stoppage!"

And, even where the things are fairly rolled up (more through economy on the part of the proprietor than for any regard for the comfort of the dear people), the framing yet remains to catch the falling rain and transmit it in heavy drips to the recipient dresses and silk hats whose wearers have the luck to be on hand.

A cry of " stand from under!" would be altogether vain, for there is a forest of such bare poles or bars still awaiting the unfortunate in his fancied escape. It is literally running the rain-let.

Now, in sober sadness let us ask—why is this shameful nuisance permitted? Have we no better means of shedding the sidewalks from the sun than by this antiquated makeshift?

Our areas have been made pleasant with the light of day transmitted through ground-glass. There surely is no reason why ground glass, of a much less thickness, could not be used in sliding-frames for the purpose now so barbarously monopolized by sail-cloth. Whether it rained or not, the glass would prove a protector to the foot passenger. And moreover, the merchant might have his sign on the glass, and with the aid of artistic taste this sidewalk covering might be made a most desirable decoration as well as a necessity to our street architecture.

We merely make the suggestion in the hope that some ingenious inventor may turn his mind to a subject that all have more or less a feeling appreciation of.

Let some fitting substitute be given to the public, and municipal authorities peremptorily abolish the existing trespassings on our streets in the form of those awnings; a sound so closely akin to the other expression—awful, as to be truly suggestive.—*Sloan's Architectural Review.*

The Nichols Steel Patents.

For the past few months we have heard much talk about the Nichols patent processes for the conversion of malleable iron and white cast-iron articles into steel; but, more from the want of time than curiosity or interest, we did not visit the works of the Canton Malleable Iron Company, where the experimenting has been done until recently.

Five patents have been granted to Mr. Nichols and the members of the Malleable Iron Company jointly, and although they are for different processes, each does its work so thoroughly that we could not decide upon a favorite. Two are for converting malleable iron castings into steel. One of these is an instantaneous process, and the other requires from one to twenty-four hours, depending upon the size of the articles. The one we esteem for its quickness of action and the other for its superior production.

Another patent is for converting white cast iron into steel. The article was taken right from the foundery floor and packed in annealing pots, and then placed in the ovens precisely after the manner of making malleable iron, differing only in the chemicals used in the pots. This patent we look upon as especially valuable. We were shown plow points thus made that were heated under our observation, hammered to a fine edge and thus tempered so hard that after breaking off a point to see the quality of the steel we readily scratched our name upon the window glass. We were also shown many other articles, among them knife guards used by reaper and mower manufacturers, and by them made of wrought iron at great expense.

By far however the most interesting experiment we witnessed was under a patent for refining steel or restoring burnt steel. We saw a piece of steel broken, one half of which was thrown into the fire and burnt until the particles looked lifeless and granulated easily. This same piece was again heated and plunged into the chemical bath and in a moment came forth, not only restored to life, but in comparison to the piece held in our hand it was much finer, and upon test much superior in strength.

Another patent secures a process by which cast iron is hardened more thoroughly and permanently than by any other known means. The saving that will accrue from the use of this process in the manufacture of car-wheels alone must be enormous.

We look upon these processes as wonderful and, in our opinion, will in a year's time develop themselves into immense value, and we feel proud that the patents are held by Canton citizens.—*Canton (O.) Repository and Republican.*

The English parliamentary committee upon the proposed channel tunnel between England and France, have had an interview with the Emperor of the French, and have obtained a copy of the report of the French special commission appointed to examine into the practicability of the proposed work. The report is favorable, and indorses the plans of the English engineers as feasible.

Correspondence.

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

Grindstones.---Where they come from, and How they are Made.

Messrs. Editors:—The sandstone formation overlying the coal beds of England furnishes the grindstones of that country, the principal quarries being located at Newcastle-upon-Tyne, and at Wickersley, near Sheffield.

These quarries are worked by hand, and all the grindstones are made with mallet and chisel, and have been imported into this country for over one hundred years.

The grindstones from the provinces of Nova Scotia and New Brunswick, are also the over-lying sandstone formations of the coal districts bordering on the Bay of Fundy, and extending across the Province to the Gulf of St. Lawrence. These immense deposits contain a great variety of grits, known as the Nova Scotia grindstones. These quarries are generally worked by the French people known as "Acadians," from the name they gave this country, "Acadia," and are the descendants of the "Huguenots," who were driven out of France by religious persecution.

They are a very industrious and simple-minded people, and the females retain to this day the style of dress brought over from France by their ancestors.

The tides of the Bay of Fundy rise and fall from 60 to 70 feet every twelve hours, and these people avail themselves of this power to work the quarries, which extend from a high bluff on the mainland, down to low water mark in the bay.

At low water a huge mass of stone is loosened from its bed and a heavy chain is passed under it and over a large boat, which is placed alongside. As the tide rises, the stone, attached to the bottom of the boat is floated into a sand cove at high water, and made into grindstones after the tide recedes. This work is done with mallet and chisel, the rough parts being first chopped off with a heavy ax. Machinery has been recently introduced, and the small grindstones are now turned in a lathe by steam power. The sandstone deposits of this country which are made into grindstones, are found along the shores of Lake Erie, and extending for a considerable distance east and west of Cleveland, and inland as far as Marietta, on the Ohio. They are also found on the shores of Lake Huron, above Detroit.

These deposits are of a different character from the foreign stone, and do not seem to be the overlying strata of coal formations, but appear to be a later formation, as the quarries look as though this part of Ohio had once been the bottom of the Lake, the sand of which had become solid, and been up-heaved by some convulsion of nature. Nearly all the Ohio grindstones are made by machinery driven by steam power.

The blocks of stone being loosened from the quarry bed, are roughly hewed out, with a square hole in the center. This is placed on a heavy square iron shaft furnished with a 9-inch collar, against which the stone is securely fastened by means of another collar keyed against the side of the stone. The shaft and stone being driven by steam power, two men on opposite sides of the stone turn it off perfectly true, by means of soft iron bars about 6 feet long, and 2 by ½-inch thick, which are drawn out to a thin point, which is curved upward. This was formerly a very unhealthy occupation owing to the shaft dust being inhaled by the workmen, but this difficulty is now obviated by means of blowers which drive it away.

J. E. Mitchell.

Philadelphia, Pa.

Defense of Patent Right Dealers.

Messrs. Editors:—I notice in several late newspapers that a professor in an agricultural institution of this State, who evidently sets no common value on his own sagacity, warns farmers of the dangerous character of "patent-right men," advising them in no case to have anything to do with the men, or their goods, affirming that in ninety-nine cases out of a hundred these men are robbers, and that their machines are altogether worthless, etc., etc. Now admitting that some of these inventions are of no value, and that persons engaged in selling them have, in some instances, taken undue advantage of the inexperience, credulity, or ignorance of the parties with whom they have dealt, it appears to us to be making rather wholesale work of it to condemn all new inventions indiscriminately at "one fell swoop"—together with the persons engaged in introducing them.

We think that not many farmers will see proper to follow the professor's advice, so gratuitously offered. It should be regarded as only an insult offered to their understanding.

Farmers, as a class, are sensible men, why not let them examine new machines, and decide for themselves?

The professor's method seems to us to do great injustice to inventors, as well as dealers in patents. It may be asserted that no class of men are more indebted to inventors than farmers. They can now, with their improved machinery and implements, accomplish more in a day than they formerly could in a week. Much of the work then performed by human muscle exclusively, is done in one tenth part the time, and less than half the expense, by steam or horse-power.

Now, for farmers to "go back" on the men by whom they have received most benefit, would be as unwise as it would be unjust.

Intelligent farmers who study the best books on farming, and who are regular readers of such excellent journals as the *American Agriculturist* and Scientific American, are in very little danger of being "robbed" by "patent-right men."

Joseph R. Parks.

Muscatine, Iowa.

Ripening of Wine---America Ahead of France.

Messrs. Editors:—Your number of July 31, page 68, states the effects on the wine by the method of heating called Pasteur's process. Permit me to explain the cause of the effects aforesaid, so that your readers may intelligently judge of the merits of the heating process. All fermentation results from the presence of certain microscopic fungi, short-lived, but multiplying with astonishing rapidity under favorable conditions of temperature and atmospheric oxygen in liquids, that contain nitrogenous parts; on these glutinous albuminous parts they feed, and on them their existence depends, the want of gluten precludes their existence. While their action in maturity is to convert the sugar of the fluid into alcohol, a certain high proportion of alcohol terminates their existence, as well as a very large excess of sugar extinguishes their function; fermentation ceases. But this species flourishes only when supplied with atmospheric oxygen. This wanting, they barely exist but in the state of spores or seeds, ready to take maturity and propagate by obtaining the proper conditions to their support. Still, while the species of mycoderms, that causes beneficial or purely alcoholic fermentation, finds insufficient atmospheric oxygen in the fluid for their support, other kinds, able to do with less or differently composed air, can obtain a foothold—provided always there is gluten—and by their presence cause putrefaction, decay, diseases, or under certain conditions of continued surface contact with atmospheric oxygen acetic acidification. Now, all this organism, and the spores or seeds from which they originate, are killed in a brief time at a temperature exceeding about 135° F., or slowly die if 121° to 135° F., is proportionally longer continued.

The principal part of the foregoing has been satisfactorily established by the laborious investigations of Mr. Pasteur, who fully deserves all praise allotted to him. His works, however, do not show that he paid particular attention to the gluten in liquids to be preserved by heating, but we learn that the spores or organism floating in the air, may subsequently contaminate the wine, which will be restored again and again by heating—still, gluten remains. This is very well, but as the organism cannot live without gluten, is it not so much more perfect a cure to extract at once the gluten, the sustenance of the mycoderms, the root of all disease? A penny's worth of prevention is better than a dollar's worth of cure.

Air-treatment, while it promotes, accelerates, and controls all fermentation, eliminates from all fermenting (and other) fluids the gluten by oxidation, which renders it insoluble, and therein lies a total and economical prevention from all further injury by destructive mycoderms; and without the expensive, and to the common producer of fermented beverages, impracticable and impossible arrangements for carefully heating wine, cider, beer, etc. Thus America is ahead of France.

P. O. Box 6,844, New York city. R. D'Heureuse.

Novel Mode of Obtaining Capital.

Messrs. Editors.—I have been unfortunate in business and am anxious to make another start. I propose insuring my life in favor of any one in a mutual life insurance company for $20,000 the party paying the premium receiving the dividends and who will give me $12,000. I will insure in any company the party may wish, and take out any kind of policy. I will pay the premium the first year. If you will exert yourself and make this arrangement for me, I will come on as soon as I receive a notification from you, and as soon as I receive the money will pay you $1,000. It appears to me that almost any of the large capitalists in New York who desire to invest their money in something safe, would make this arrangement, as it would be perfectly safe, at the same time paying a dividend annually. Let me know from you what you think of the proposition and whether you think it practicable or not. I am only 24 years of age, therefore the premium would be very trifling.

A. C. McRae.

Macon Depot, Ala.

[We unfortunately do not know of any capitalist likely to take a venture in the manner our correspondent suggests. If this should meet the eye of any person having $12,000 to thus invest, he may correspond and remit as above. The thousand dollars promised us, may be sent direct to this office.—Eds.

Explanation of Singular Phenomena.

Messrs. Editors:—In answer to your inquiry in the present volume, page 70, for an explanation of the curious phenomena noticed in an oil jar, I think I can give one. When the jar is placed upon a painted board or a hard pine board, the oil exuding from the jar forms with the paint or the pitch in the hard pine board, a gum which prevents further leaking. On the contrary, black walnut being a dry wood the oil cannot form a gum, and consequently it escapes.

Sunbury, Pa. E. H. Schneider.

Another.

Messrs. Editors:—In answer to your inquiry in number of July 31st, under article headed "Curious Phenomena," may not the reason for the oil exuding from the jar when placed upon a black walnut bench, be on account of the openness of the fibers producing capillary attraction, which would not be the case with a painted board, the paint filling the pores on the surface and destroying this attraction; and the same result would be produced by substituting the hard pine board, as the pitch closes the pores the same as the paint on the painted boards?

If your correspondent would place the jar upon a piece of ash or chestnut board with the same result as upon the painted board; I should think the theory of capillary attraction might be erroneous.

A. T. A.

Lowell, Mass.

A Remedy for Lockjaw.

Messrs. Editors:—I am extremely sorry to learn of the death of my old friend, Mr. John A. Roebling. If I had known in time that he had lockjaw I could have saved his life, and would willingly have traveled many miles to do it. Let any one who has an attack of lockjaw take a small quantity of spirits of turpentine, warm it, and pour it on the wound—no matter where the wound is, or what its nature is—and relief will follow in less than one minute. Nothing better can be applied to a severe cut or bruise than cold turpentine, it will give certain relief almost instantly. Turpentine is also a sovereign remedy for croup. Saturate a piece of flannel with it, and place the flannel on the throat and chest—and in very severe cases three to five drops on a lump of sugar may be taken inwardly. Every family should have a bottle of turpentine on hand.

D. A. Morris.

New York city.

[We would not be understood as indorsing the above remedy, because we have not tried it. It is a simple matter, and can be easily tested. In all serious cases the application should be made under medical advice.—Eds.

(For the Scientific American.)

INDELIBLE INK FOR MARKING LINEN.

By Dr. Reimann.

The following are a number of formulæ for preparing indelible ink to be made use of in marking linen. As they have all been thoroughly well-tried, and found effectual, it is to be hoped they may prove of some use to the public.

The linen is first moistened with a fluid, consisting of a mixture of, 2 parts carbonate of soda in crystals, 2 parts gum-arabic, 8 parts of water, and then dried. When quite dry, it is rubbed with a glass cloth to render it as smooth as possible, so that it may be easier to write upon. The composition of the ink itself is as follows: 1½ pts. nitrate of silver, 16 pts. distilled water, 2 pts. gum-arabic, and ½ pt. of sap green. The nitrate of silver is first disolved in the distilled water, and the gum-arabic and sap green are subsequently added.

It is necessary to write with a quill pen, all metallic pens except gold ones, decomposing the ink. It is a good plan to trace the letters on the linen with a pencil before writing them.

Marking linen is most conveniently effected by using a pencil and a small copper plate with perforations corresponding to the letters required. This plate is laid upon the linen, and the ink is applied with the pencil to the cut-out spaces, so that these spaces, and these alone are smeared with the ink.

The following ink is of service for marking linen with a pencil, when a metallic pattern-tracer is employed: 2 pts. Nitrate of silver, 4 pts. distilled water, 2½ pts. gum-arabic, 3 pts. carbonate of soda crystals, 5 pts. liquid ammonia.

The best way to prepare the ink is to first dissolve the nitrate of silver in the liquid ammonia, and the gum-arabic and soda in the distilled water. The two solutions are then mixed together and slightly warmed, when the whole mixture becomes brown. A few drops of a solution of magenta, makes the ink somewhat more distinct. It is of course unnecessary in this method to previously moisten the spot with gum-arabic solution.

For very fine linen the following ink is best employed: 4 pts. Nitrate of silver, 24 pts. distilled water. To this solution liquid ammonia is added, until the precipitate which is first formed, is re-dissolved. Then a little sap green, indigo, etc., are ground together, and dissolved in a solution of 4 pts. gum-arabic, and this soution and that of the nitrate of silver are mixed together. The whole is then diluted until it occupies 32 parts. This ink is very limpid, and easy to write with.

When dry a hot iron need only be passed over the surface of the linen, when the letters will at once make their appearance, their tint being a deep black. The ink does not injuriously affect even the finest linen.

The discovery of an aniline black has led to the employment of this coloring matter in marking linen.

This ink has the advantage of being cheaper than the ink prepared from nitrate of silver. It has also another advantage over the latter salt, viz. that is it chemically indelible. The ink made with nitrate of silver can be removed by washing the linen with a solution of hyposulphite of soda, or by moistening it with a solution of bichloride of copper and then washing with liquid ammonia. This is not the case with the aniline ink, the color of which cannot be removed by any chemical agent whatever. Linen therefore marked with this ink can never be appropriated by other persons than the rightful owner.

Such aniline ink may be prepared in the following way: 8½ grs. of Bichloride of copper are dissolved in 30 grains of distilled water, then are added 10 grains of common salt, and 9½ grains of liquid ammonia. A solution of 30 grains of hydrochlorate of aniline in 20 grains of distilled wtaer is then added to 20 grains of a solution of gum-arabic, containing 2 pts. water, 1 pt. gum-arabic, and lastly 10 grs. of glycerin. Four parts of the aniline solution thus prepared are mixed with one part of the copper solution.

The liquid which results has a green appearance, and may be at once employed for marking linen, since it invariably becomes black after a few days. A steel pen may be employed as well as a quill. If it is desirable not to wait so long for the appearance of the black color, a hot iron may be passed over the writing when the ink is dry, or the linen may be held over the flame of a spirit lamp, or over a hot plate, or hot water, when the black tint will readily appear.

It is a good plan to put the linen when marked into a tepid solution of soap, which has the effect of bringing out a fine bluish tint. The ink must be so limpid that it is able to permeate the tissue of the linen, so that the marks appear on both sides.

It is advisable to mix the solutions together, only when the ink has to be made use of.

The ink is perfectly indelible, and so easy to write with that the finest devices may be drawn with it.

A very cheap brown marking ink may be prepared from binoxide of manganese, as follows: 4 pts. Acetate of manganese dissolved in 12 pts. of water.

The place on the linen where the marks have to be made, must be previously moistened with the following solution: 1 pt. Yellow prussiate of potash, ½ pt. gum-arabic, 3 pts. water. The linen having been saturated with the above solution, is then dried, and afterwards marked with the manganese solution. On the letters becoming dry, the following solution is spread over the spot with a pencil: 4 pts. Carbonate of potash, 10 pts. water. The letters then become brown, and their color cannot be removed by alkalies, nor by acids, with the exception of dilute hydrochloric acid.

A purple marking ink can be prepared by employing bichloride of platinum: 1 pt. Bichloride of platinum, 16 pts. distilled water.

The place where the letters have to be written, must be moistened with a solution of 3 pts. Carbonate of soda, 3 pts. gum-arabic, 12 pts. water. The spot is then dried and made smooth. After the letters have been written with the platinum ink and become dry, the linen is moistened with a solution of 1 pt. Chloride of tin, 4 pts. distilled water, when an intense and beautiful purple-red color makes its appearance.

Importance of Extensibility in Materials employed for Construction of Machinery and Buildings.

A certain degree of extensibility is indispensable, in most parts of machinery or of buildings which may be supposed to allow, without fracture, any slight alteration of form that may arise from irregularity in the construction or from any extraordinary strain. The importance of this should by no means be overlooked in those structures which consist of several separately-wrought pieces, such as an iron bridge or a boiler; for these can never be so constructed that the strain is from the beginning evenly distributed throughout. If then the component parts are not sufficiently extensible, they may be broken successively long before reaching the strain for which the bridge or the boiler was calculated. In such a case the elastic elongation which the separate parts could assume is commonly an insufficient guide.

When the parts, in order to be joined together, have become weakened at any point, either by some of the material having been removed as by riveting, or by the material having at any point been overheated, it must by no means be expected to show in all parts as great an extensibility as it exhibited in experiments on tensible strength. If, however, we know to what extent a bar or a plate has been weakened at a certain part by diminution of area, or by heating, and also know the limit of elasticity in the other parts of the material, together with the absolute strength and elongation on rupture, it will then be easy to estimate approximately, in every case, the elongation which the bar or plate may assume before being broken. If, for instance, a stay be taken, manufactured of soft steel with a limit of elasticity at 41,172 lbs., and the breaking load at 68,620 lbs., per square inch, and which, on fracture, has shown an elongation of 10 per cent; and if the area, at any part, has been diminished 20 per cent, or the absolute strength of the material has been lowered to the same extent by overheating, then the stay must break with 0·8 of the strain required to break the unweakened part of the bar (that is, when the load at this part amounts to nearly 54,896 lbs. per square inch); but since the permanent elongation, as previously shown, will increase almost in the same proportion as the excess of the loads above those at the limit of elasticity, and this increase is generally greatest when approaching fracture, the stay, therefore, when loaded with 54,896 lbs. per square inch can elongate, at most, only half as much as with the load of 68,620 lbs. on the same area, or 5 per cent of the original length.

If the absolute strength were diminished at any place, to the amount of 60 per cent of the original strength, the stay would (under the same conditions and if made of the same material) break with a strain of 41,172 lbs. per square inch on the unweakened part: thus rupture would take place at the limit of elasticity and, consequently, before the part last mentioned could assume any considerable elongation.

In like manner, if in riveting an iron plate, whose absolute strength is 48,034 lbs., and the limit of elasticity 30,879 lbs. per square inch, the riveted part becomes 40 per cent weaker than the rest, it is of little avail that the plate possesses great extensibility, for it will break at the rivets when the strain on the other parts reaches 28,820 lbs. per square inch, and it can then only give way a little in the actual line of rivets. If, however, the plate were constructed of puddled steel, Bessemer steel, or cast-steel, having a breaking strain of 68,620 and a limit of elasticity of 34,310 lbs. per square inch, and could elongate on fracture 10 per cent, but was only 0·7 as thick as the former plate; then, on the same supposition with regard to the strength of the riveted portion in relation to the rest, the part riveted would break with the same absolute weight as in the previous case, corresponding to 41,172 lbs. per square inch on the rest of the steel plate; but the plate last mentioned has elongated nearly 2 per cent, that is, almost ¼ inch per foot. The latter structure would, therefore, be more worthy of reliance than the former, although it required 30 per cent less material.

As the ratio of the breaking load to the limit of elasticity is generally greater in rolled puddled steel and other kinds of soft steel than in puddled iron, the employment of such steel would consequently allow the structure to assume a greater change of form than would be permitted if soft iron were employed. When, however, these materials are compared with each other in the form of homogeneous bars, the steel usually shows less extensibility.

From what has now been advanced with reference to the disadvantage of weakened points in machinery and building structures, it will readily be understood how desirable it is, both for economy and security, that the girders and stays employed in the construction of lattice-work and suspension bridges should have bosses or swellings at the points where they are penetrated by bolts or rivets.

In employing steel for purposes in which the material must be heated for further working, especial attention should be paid to the diminution of strength consequent upon such heating. For this diminution, as proved by the experiments on fracture, is greater in steel than in iron; and in different kinds of steel is greater according as the metal is harder, or richer in carbon.—*Sandberg's Translation of Styffe's Treatise on Iron and Steel.*

Faults in Cheap Building.

These are set forth as follows in the *American Builder*:

"1st. Cramping a house down to the smallest possible space, so as to make more 'yard room,' which will never be used.

"2d. Making no calculation as to the size of rooms or the location of furniture.

"3d. Building chimneys by guess, so that one has to have a dozen lengths of useless stove pipe, or else place his stoves in the most inconvenient locations.

"4th. Arranging windows and doors so that one opens against the other, or in the very spot to be occupied by a piece of furniture, or so placing them that no fresh air can get through the house, even though the whole should be open.

"5th. Providing no means of ventilating rooms, save by open doors or windows; hence all the impure air which is generated by breathing, cooking, and fermentation, as it is rarified, rises to the top of the room, and there remains to breed discomfort, disease, and death.

"6th. Nailing sheathing to the outside of the studding, and clapboards (or siding) close to the outside of that, leaving small or no air chambers between them, and, as in nine cases out of ten, green materials for each covering have been used, they shrink and rot, soon making a honey-comb of the shell, though plastered with paint and cement.

"7th. Laying the lower floor directly upon joists, or at best lining it with culls, full of knots and shapes which are but little better than nothing, and as a consequence the floor is always cold and uncomfortable.

"8th. In finishing, first laying the bases, pilasters, and casings (perhaps of green lumber), and then lathing and plastering up to them, so that when they dry large orifices are left to let in cold and moisture.

"9th. Letting his work out, as a whole, trusting to the honesty of the contractor to do it, without having plans or specifications properly drawn, and without any one to oversee, criticise, or direct it."

General Observations on Fatty Substances.

The industrial fatty bodies are the products of the two living kingdoms, vegetable and animal.

DIVISION OF FATTY BODIES.—According to the state in which the fatty bodies occur under ordinary circumstances, they receive particular names; thus they are called oils, butters or concrete oils, greases, tallows, waxes.

The oils are liquid at the ordinary temperature; they are vegetable or animal.

The butters or concrete oils are vegetable oils, soft or solid at the ordinary temperature, soft at 64·4° F., and fusible at 96·8°.

The greases and tallows are extracted from the animal organism; the first are soft and very fusible, the tallows are solid and melt only at 100°

Lastly, the waxes may be of vegetable or animal origin; they are hard and brittle, begin to soften at 95°, and generally melt at 147°.

IN THE VEGETABLES.—In vegetables, the fatty oils are generally met in the seeds; they are contained in the part which gives birth to the cotyledons, but the substance of the plumule and the radicle does not contain any. The seeds of the *cruciferæ, drupaceæ, amentaceæ, solana,* and *papaveraceæ*, deserve to be named on account of their richness in oils.

It is very rare that fatty substances are met with in the pulpy parts of the fruits. We know only the olive, the cornel tree, and the laurels, the fruits of which contain oil in their pulpy part. The *cyperus esculentus* presents the very rare case of an oil in its root.

In the seeds of plants, the oils are generally accompanied by vegetable albumen; thus, when they are triturated with water, the albumen keeps the oil in suspension in this liquid, which then becomes white and opalescent like milk, and takes the name of *emulsion*.

Among the vegetable oils there are some which are as hard as mutton tallow; they receive then the name of concrete oils or butters. Such are those of palm, coco, nutmeg, cacao, laurel, etc.

IN THE ANIMALS.—The fatty matter, grease or tallow, is found in the cavities of the cellular tissue, but it principally affects certain parts of the body; ordinarily it is abundant under the skin, at the surface of muscles, around the kidneys, and near the intestines. It presents modifications in the different classes of animals.

In the herbivorous, it is firmer, more solid, less odoriferous than in the carnivorous. The grease of birds is soft, unctuous, and very fusible. That of fishes and cetacea is nearly fluid and very odoriferous. White and abundant in young animals, it becomes yellow and diminishes in quantity with age.

ANIMAL WAX.—Waxes are animal or vegetable concretions. Animal wax is produced by a few insects of the family of the *hymenoptera*, by bees in particular; it is secreted under the rings of the stomach of these precious insects.

Vegetable wax is abundantly met with in vegetables. It constitutes the greater part of the chlorophyl, or green substance of the different organs of plants; it exists in the pollen of flowers, in the fruit of the beech tree, poplar, etc.; it covers the envelopes of many stone fruits; it forms the varnish of leaves, is met at the surface of the leaves of the palm tree (carnauba wax), on the bark of the violet sugar cane; it surrounds the berries of the *myristica* of Para and French Guiana, of the *Chinese fustic*, of all the *myrica* of the Indias, America, and Louisiana.—*Dussauce's Treatise on the Manufacture of Soaps.*

Products of Coal.

Mr. C. A. Moon, in a recent lecture delivered to working men in Whitehaven, after enumerating the more common and well known products of the distillation of coal, including carbolic acid, says:

"But another of the discoveries of chemistry is the manufacture of the most fragrant scents, the greatest variety of odorous essences from coal-tar. The young lady arrayed in her ball-room dress, with her finest cambric pocket handkerchief in her hand, perfumed with the celebrated "millefleurs," would be astonished, perhaps shocked, if she were told that she positively carried the product of coal-tar about with her. But startling as the information might be, it would nevertheless, be an undeniable fact. It may seem strange that from this black compound, which is so offensive to our nasal organs, chemistry can really manufacture the sweetest scents. But strange as it may appear, it is a positive chemical fact.

"Lastly, alcohol is mentioned as one of the products of the Boghead coal, and is said to be more stupefying in its effects than that extracted from malt. Now, as we have an ample supply of this fiery element for all needful purposes, we shall vote that the coal keeps its alcohol undisturbed, and, instead of inflaming our tongues and stomachs with it, we turn it to illuminating and heating purposes.

"Still this enumeration does not exhaust the stock of the useful products of coal which the wondrous power of chemistry has discovered and applied, but it is neither necessary nor desirable that we should add to the list. Sufficient has been said to show that from coal alone we derive warmth, light, easy motion, beautiful dyes, and rich perfumes. And what more do we require? In fact, there seems to be no end to the solid, liquid, and gaseous things which the chemist can call forth from this black, compact substance, disinterred from the bosom of our venerable Mother Earth."

Patent Block Fuel.

Various methods have been employed in this country to consolidate coal slack into portable and convenient blocks for fuel. As yet, from various causes, none of these have proved successful. We are now informed a new patent block fuel has been introduced in England, being a mixture of small coal, coal dust, lime coal slack, culm, or other bituminous substance, which is ground fine, and to which is added, during the process of grinding, coal shale clay, and, in preference, the shale usually found associated with coal underground. This is mixed in a pan with pulverized resin, asphalte, or natural bitumen, and a vegetable glue made in the following manner: To fifty gallons of water are added five pounds of rice and five pounds of glue or gluten extracted from Indian corn, maize, or meal, which when boiled for half an hour is fit for use. The paste thus formed is then removed from the pan and molded into cakes or bricks, and afterwards dried. This fuel is said to be free from odor, and is not liable to spontaneous combustion; properties which would if combined with great heating power, as asserted, render it an admirable fuel for ships' use.

Steam vs. Mortar.

In the New York SCIENTIFIC AMERICAN, of May 15th, is a communication from Fairfield, Iowa, reporting the fall of a chimney of a flouring mill in that place which caused the entire destruction of the mill in question. The origin of the catastrophy was the turning of the escape steam into the brick flue. Now, it is strange that such errors can be committed by thinking men as to let such a subtile agent as steam in upon such an absorbent material as brick. With the exception of oil, there is no more searching power than that possessed by steam. And when we consider how liberally brick admits water into its pores we cannot be surprised to see what the effect of the injection of steam must be on it. It is not impossible that common lime mortar was used in the brickwork, and that there was a total absence of pargeting. We should under these circumstances, be very much surprised indeed if such a chimney, under such a destructive influence, could stand for any length of time.

The writer alluded to, says, that the escape pipe was let into the chimney near its base, and that at this point the bricks could be crushed between the fingers, while the balance of the chimney was perfectly solid.—*Architectural Review.*

THE landing of the French-American Cable was celebrated at Duxbury, on the 27th of July, with appropriate ceremonies. A battery came from Boston to fire the salute, and about four hundred sat down to dinner in a tent on Abram's Hill.

Improvement in Stump-pulling Machines.

We present herewith an improved stump puller; it combines great power and simplicity with efficiency and facility of operation.

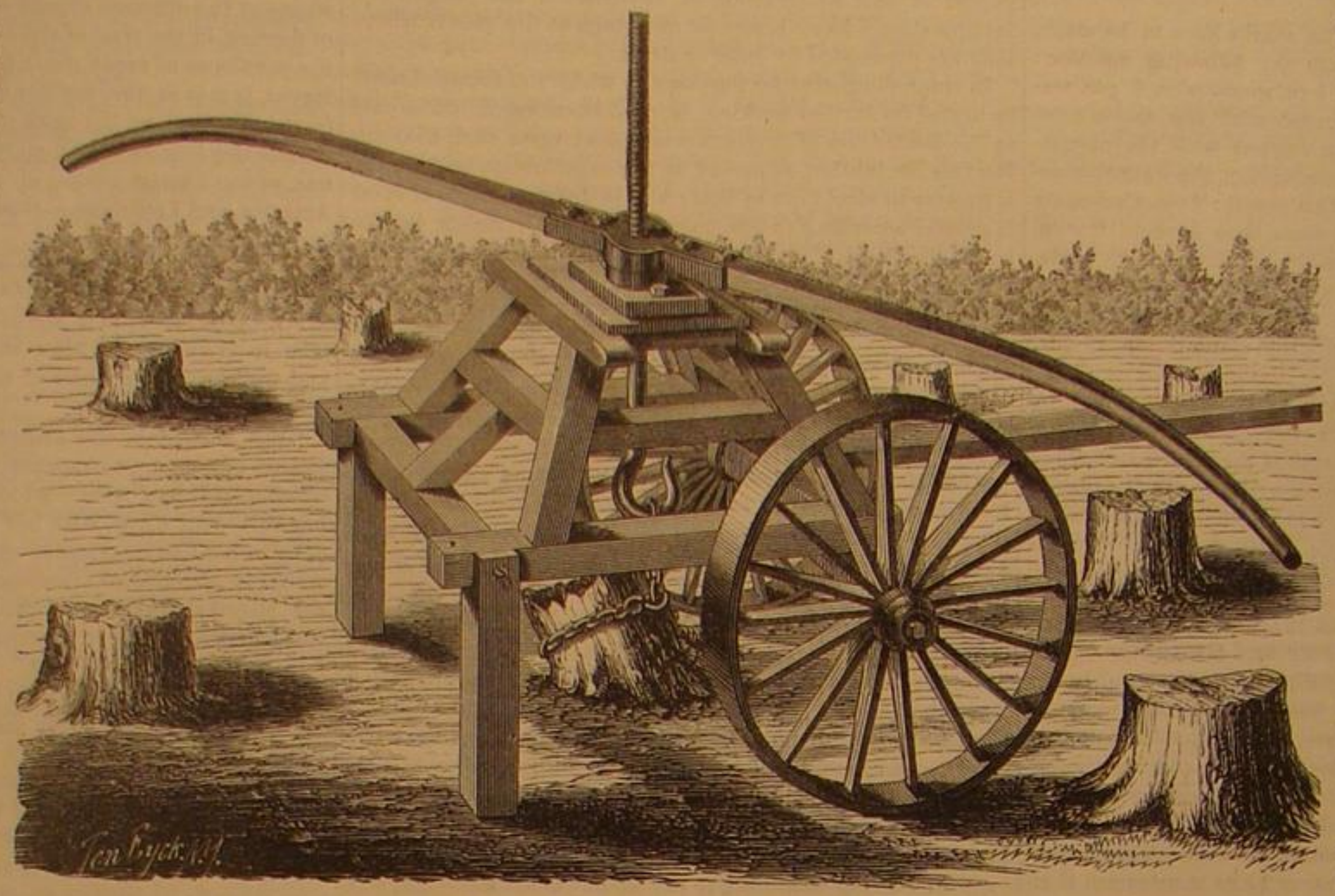
The engraving will convey so clear an idea of the machine as to render a detailed description unnecessary. It depends for its power upon a large screw and a long lever. These are mounted in a peculiar manner upon a pair of broad-tired timber wheels.

To the rear of the wheels is a strong framework of wood in the form of a truncated pyramid, with one of its lower edges resting on the axle of the wheels. On the top of this pyramidal framework, rising above the top of the wheels, rests an iron plate, through which passes a powerful screw, with a hook or other equivalent attachment at its lower end. The nut of the screw has two lateral sockets into which are fastened the two long drooping levers which pass entirely over the wheels.

When a stump is to be pulled the outer or rear edge of the pyramid is supported on two stout hinged legs or props.

These legs, when the machine is to be moved, are hooked up underneath the framework by their lower ends

When the machine is to be operated it is wheeled into position, by the team, directly over the stump, the outer props or legs are let down, and the pyramid is thus supported at every corner—by the two wheels at one edge and the two props at the other. In case the ground is soft, pieces of broad thick plank may be placed under the wheels and props. The levers are then put into their sockets at the nut, and the screw is run down. A chain or gripper is then fastened around the stump, or under some of its roots and attached to the hook of the screw. The levers are then revolved to raise the screw, either by hand or animal power, and the stump must come. The top of the stump is drawn up into the hollow of the pyramid, and when it is clear of the ground the levers are detached and placed along the tongue, the props are knocked loose and hooked up, and the stump may then be hauled off out of the way. The long and heavy tongue or pole, in conjunction with the lever, will fully balance the stump and the framework.



ROBERTSON'S STUMP PULLER.

This machine may be made of any size and power to suit the region where it is to be used, and was specially designed for use in river bottoms, where the stumps are six and seven feet in diameter.

This stump puller was patented, January 7, 1868, by Judge J. B. Robertson, of New Orleans, La., one of our oldest patrons, and one who claims to have acquired his mechanical education and taste from the SCIENTIFIC AMERICAN. He has other valuable inventions he will soon bring forward. The entire right of this stump puller is for sale. Address John B. Robertson, New Orleans, La.

Improved Seeder.

This is a simple, light, and seemingly effective implement for sowing seeds with rapidity and uniformity, or it may be advantageously applied to the distribution of artificial manures.

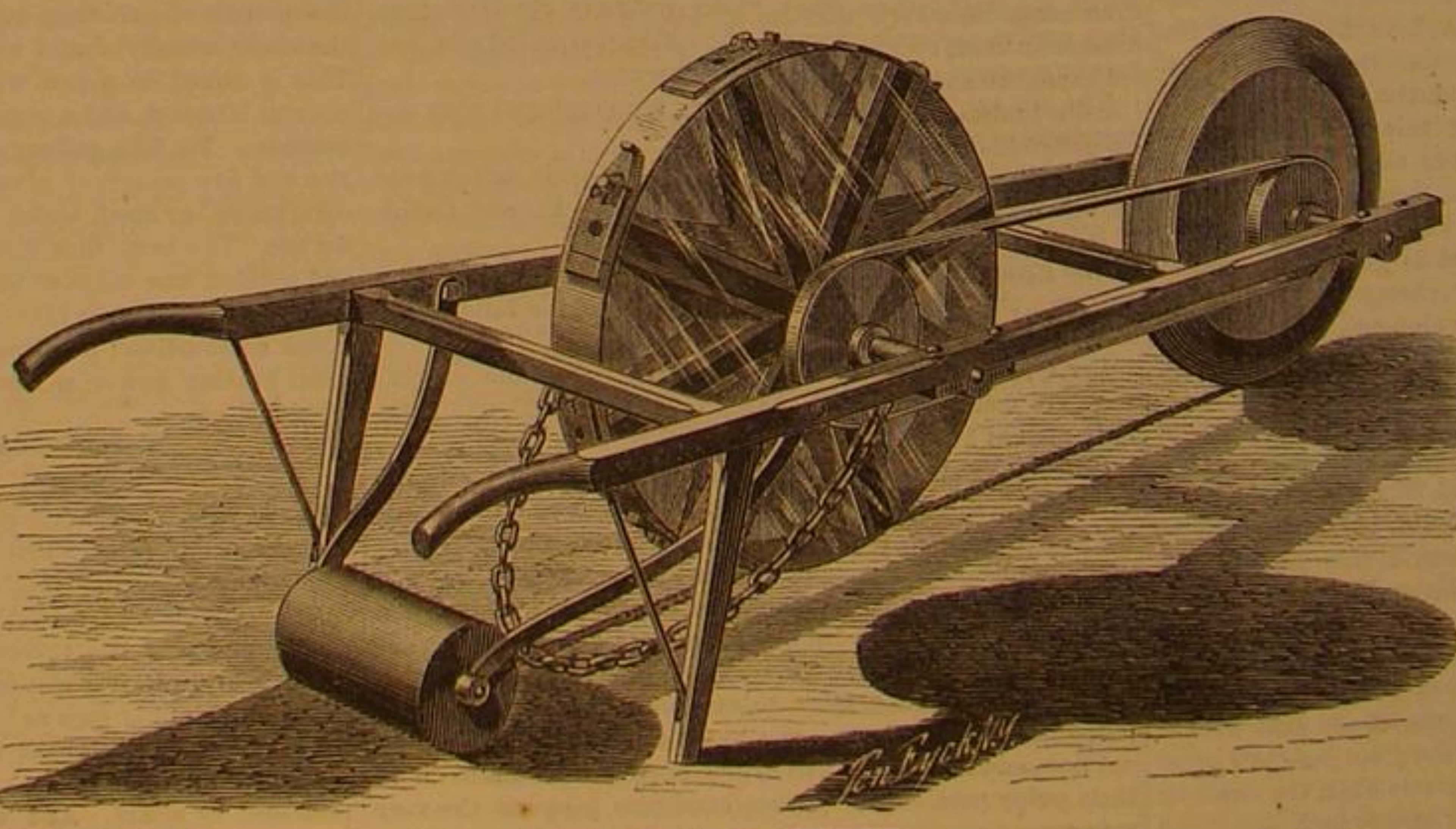
It is of the barrow form, and the seeding wheel is driven by a belt running from a pulley on the shaft of the wheel on which the machine rolls when the handles are grasped, and the seeder is propelled by the operator. Cone pulleys may be used to adjust the speed of the seeding wheel, which needs to run fast when used for distributing manures. The seeding wheel has numerous chambers radiating from the center of the wheel, each provided at the perimeter with detachable, perforated plates, with openings of various sizes for different kinds of seeds.

The seed is thus deposited in a furrow, made by the wheel upon which the machine rolls, its perimeter being so shaped as to make a furrow of the width and depth required. The seed is covered by a chain attached to the machine, which drags over the furrow behind the seeding wheel, and which is followed by a roller, also attached to the frame-work of the seeder, as shown in the engraving.

Seed can be thus sown and covered in a single operation, as fast as a man can walk The whole is so simple that it must be durable, and it will, doubtless, prove a valuable addition to the improved agricultural implements already in the market.

The inventor informs us that this machine has been thoroughly tested, and found to work admirably; sowing, covering, and rolling the seed with singular accuracy and regularity, and with light labor on the part of the workman.

Patented through the Scientific American Patent Agency, June 15, 1869, by Robert B. Tunstall, of Norfolk, Virginia, who may be addressed for the entire right for the United States.



TUNSTALL'S SEEDER.

Wooden Railways in Canada.

Some time ago we gave a description of the wooden railroad from Carthage to Harrisville, N. Y., a distance of 47½ miles, and alluded to the importance of cheap wooden railways as a substitute for the more perfect iron road, to be used with light locomotives. Experiments made in Canada seem to justify the belief that heavier locomotives can be employed than we were then inclined to suppose. The Montreal *Gazette* gives the following summary of a report made by a committee appointed to report on the Clifton Wooden Railway, which contains points of general interest:

The locomotives weigh ten tuns without wood or water, have taken from 30 to 40 tuns freight a trip, and cost $6,500 each, American currency. They have since been supplemented by engines weighing twenty tuns and costing $8,500, which will draw double the weight on the general down grade from the mines to Ogdensburg, over, in some places, an up grade of from 80 to 90 feet to the mile as soon as some portions of the road bed have been strengthened, some of the rails now springing under the immense weight.

The cost of keeping up the track, continues the committee, has been, and will not hereafter, Mr. Hurlbert (engineer of the road) says, exceed the wages of two men for every three miles of road, and these men will keep it in good running order and replace the worn out rails as fast as required. This does not include renewal of trestle or crib work. We notice that from one to two new rails per mile were put in this spring, and this was rendered necessary from the difficulty of obtaining good sound maple when the road was built, and some of the rails had got "warped" before being used, so that they were laid on the ties "heart side" up; they will not last so long that way as if the heart of the rail was laid downward. We counted 21 track men on the 20 miles we passed over, the track was required to be made ready for the large locomotives as quick as possible. It is estimated that these 20-tun locomotives will take easily 80 tuns per trip, and they intend to make two trips daily. It takes 22,000 feet maple to lay a mile of track, and from $80 to $100 States currency will pay for the labor required to replace it in position.

We may mention that we came down from the mines at the rate of 8 miles an hour, including all stoppages, having about 25 tuns of freight aboard. Mr. Hurlbert is strongly in favor of the gage in use generally in the United States for railways, and thinks that a narrower gage than 4 feet 8½ inches will not be found an improvement, though at the same time he acknowledges that rolling stock can be built much cheaper for a gage say 3½ or 4 feet than for the other gage. We noticed that where in building an iron railway there would have been "deep fills" that trestle work was used for cheapness; and in some cases for a long distance where, say a mile or more of low wet land had to be crossed, the track was made by placing logs crosswise of the road, with stringers upon these logs, the ties being placed in the usual way upon the longitudinal stringers. This gives a cheap roadway perfectly safe for a number of years. When we traveled over the railway the rails were quite wet, and in going up the steepest grades sand had to be used; the cars were loaded with from 15 to 18 tuns of castings for the works at the mines. The sharpest curves on the road were of 250 feet radius, which would seem hardly practicable, but it is beyond question that such curves are used in several places to avoid rock cuttings. A 14-tun engine can draw, on these wooden roads, on an occasional up grade of 250 feet to the mile, 20 tuns of freight easily; and from 100 to 140 feet grade is not considered very objectionable; of course the easier the grades the better for any sort of road, and the more level the route can be made, without too great expense, the better. The rails are made of maple, 14 feet long, 6 by 4 inches, laid edge wise. Mr. Hurlbert suggets that rails would be best 7 by 3½ inches. The rims of the wheels are like those used on iron railways, only wider and the flanges a little beveled, so that the flange in pressing against the rail does not cut it. We did not see a single rail "broomed up" or cut on the inside, and only a few on the outside, where the heart of the rail had been laid uppermost. The "switches" are made in the usual way, the rails being kept together with iron rods when required to be moved. The "keys" are made of maple plank. The rails are sunk into the ties (which are cut into six inches wide and four inches deep) and are kept in place by wedges or keys, twelve inches long by four inches wide and one and a half inches thick at one end, by ⅜ of an inch at the other, and driven in on the outside of the rail, keeping it against the shoulder of the tie. The ties are put down without being sided. There has not been a single car off the tracks since the road went into operation. The country through which the Clifton Railway is built is not only broken but even mountainous, and there is no difficulty, in our opinion, in constructing such a railway in almost any part of these townships. From the information obtained as to the cost of labor, materials, etc., in the vicinity of the Clifton road, we are of opinion that the cost of grading, furnishing ties and rails, and laying the same, with a moderate allowance of rolling stock, sufficient for some years, will not exceed, for our railways, $5,000 a mile, exclusive of large bridges—and this to build in a more permanent manner than the Clifton road is built. We are fully convinced of the practicability of wooden railways, where the principal object is a freight traffic, at rates of speed from 8 to 12 miles an hour, and that next to an iron railway, or where the cost of an iron road is too great to be undertaken, that wooden railways can be cheaply built, economically carried on, and a large paying business done by their means.

NATURE unrelentingly punishes those who obey not her laws.

Scientific American.

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Contents:

(Illustrated articles are marked with an asterisk.)

CHINESE LABOR IN AMERICA.

The United States may as well look the subject of Chinese labor squarely in the face, and make timely provision to absorb and utilize this new accession to our population.

Some are bitterly opposed to their coming. This opposition is based upon groundless prejudice. The policy of the Government has hitherto opened the doors of immigration to people of every race and clime. Shall we now close it upon the Mongolian, and if so, why?

We have hitherto spoken of the intelligence, industry, frugality, and order-loving disposition of the Chinese. That our views in this regard are correct, is proved by the testimony of the bitterest opponents to their immigration. Thus the Hon. Eugene Casserly, in his recent speech at San Francisco, says:

It is the duty of every class of men to unite to prevent the introduction of the Chinese. If they come in contact only with the common laborers to-day, to-morrow they will be in competition with the mason, the bricklayer, the carpenter, and the machinist, for they are the most frugal, industrious, and ingenious people on the face of the earth. Look at the splendid granite building occupied by Wells, Fargo & Co., the stone of which was cut in China, and was built by Chinamen. Men who can do such work for less than half the price paid white mechanics were an injury to the State, and he would unite with any party that would use energetic means to keep them out of the country.

Now it may be the duty of American citizens to drive out and to keep out the Chinese, but, as yet, we have only Mr. Casserly's assertions, and those of others like him to prove it.

It would seem that John Chinaman has the principal qualities that have made the bee and the ant famous among insects; and which induced the wise Solomon to select the ant as a fit instructor for the indolent. If industry, frugality, ingenuity, and thrift are bad qualifications for citizenship, let us clear the workers out of the hive, and cultivate drones. The Indian is the reverse of the Chinaman in these qualities, and it is well known what kind of a citizen he makes.

But while we assert that the Chinese character possesses, in an eminent degree the qualities we have ever been taught to regard as the elements of citizenship, we do not see how it is possible, with any show of consistency, to attempt, either by persecution or legislation, to shut our doors against them. One thing is certain, if they do not come here, they must go elsewhere. The tide of population has been so long dammed up within the limits of the Celestial Empire that it must soon burst its bounds. But let us not condemn the Chinese without good reason. Let us not imitate the conduct of the wolf in the fable, and accuse him of soiling the stream when it flows from us toward him. Let us not make his virtues a plea against him. A land that is constantly importing vice by wholesale must stand in need of a little virtue. Our Atlantic cities are deluged with the very offscourings of humanity. We see in the Mongolian tide setting in upon our Western shores, an addition to our population, which will tend to neutralize the evils which must, unchecked, arise from the dirty stream now pouring in through our Eastern seaports. The New York *Sun*, in an able article on this subject, in its issue of July 15th, says:

The fact is, there is not such a widespread prejudice against the Chinese as Eastern people have been led to believe existed in California. The large majority of the respectable people of both parties consider their presence a blessing. The lower class of foreign laborers oppose their coming, and persecute them whenever opportunity occurs. The Irish are their worst enemies, but Irish capitalists who employ labor are glad to obtain their services.

Politicians, or rather the unscrupulous demagogues among politicians, have caused most of the trouble. To secure the support of the most reckless and vicious portions of the population, they have framed unjust laws, and winked at outrages and abuses which are a disgrace to the State. Against all this, John, by his skill, patience, exemplary conduct, industry, and moderate charges for labor, is slowly but steadily working his way.

Do we need labor? If yes, then let us select the kind we want, and permit it to enter the country in just such proportion as our necessities demand. It is admitted that labor is needed in many parts of the country. Then, are the Chinese best qualified to furnish this labor in proper kind and quality? The answer to this question must decide the main question, whatever false side issues may be raised in regard to it. Now, all who have had dealings with the Chinese, or who have had them in employ, unanimously concur in the praise of their good qualities as laborers, and, for the most part, unite in the opinion that they will furnish just the kind of labor of which we now stand most in need. There can be, it seems to us, only one conclusion in regard to this matter. The Chinaman wants to work for us, and we want him. Then let an end be speedily put to the disgraceful treatment he has hitherto received, a blot upon the history of the "Golden State," which makes humanity blush. Let us welcome him, with all the rest of the oppressed and suffering who now find refuge here, confident that, by the process of assimilation, we can absorb, and render homogeneous the mixed races which are destined to people this continent.

WORKING OUT AND PATENTING NEW INVENTIONS.

Inventors, especially those of little experience in working out new ideas, and obtaining patents, are likely to be led into some errors which they might easily avoid.

A common one is the supposition, that ill-built machinery will do to demonstrate a principle. Experimental machines are often so poorly constructed, that instead of satisfying the mind of the experimenter, they make him skeptical of success by their imperfect working. The principle may be perfectly sound, and would prove so, if properly tested, yet the idea is either abandoned, or a new and more perfect machine has to be constructed, and the money already expended thrown away. It is an old maxim that what is worth doing at all is worth doing well; and nowhere is the truth of the saying more strikingly demonstrated than in the performance of an experiment. An experiment is utterly valueless unless performed with care, and under all the conditions ultimately to be fulfilled.

Tinkering should be, by all means, avoided; and nice and good workmanship secured, whenever possible to attain it. It costs more at first, but it is more economical in the end.

A second mistake is the supposition, that almost any one possessed of some legal knowledge can properly prepare specifications, and claims for a patent. This is one of the most fatal mistakes inventors make. The proper preparation of the papers for an application requires not only knowledge of the patent laws, but matured judgment, based upon large experience. To claim more than can properly be claimed, is to insure the rejection of the application. To claim less is to force the client to obtain by reissue what he might have obtained at first. Even the most skillful and experienced men may err in judgment on this point; how much more likely to blunder is one who has had little or no experience.

Some inventors attempt the prosecution of their own claims. Most of these come to grief. Not that the Patent Office willingly refuses to recognize their claims, but that all legal procedure is, and from its nature must be, attended with the observance of technicalities, to neglect which is to jeopardize their rights and cause the applicants much annoyance.

A third mistake on the part of those inexperienced in obtaining patents, is the supposition that, because a patent is rejected on the first application, it is a gone case. Now, the fact is, that perhaps one third of all the patents issued are rejected on first application, and yet, upon amendment of claims, or, in some cases, argument to show that amendment is not needed, are subsequently allowed.

This ought not to discourage the inventor from proceeding with his application, but it frequently does discourage him. Many a good thing has been dropped in this way for want of pluck to prosecute claims on which an excellent patent might have been obtained.

THE INDISCRIMINATE USE OF FIREWORKS.

The catastrophe which occurred in Chatham street on the evening of July 28th, is another serious lesson teaching the insane folly of permitting the indiscriminate use of fireworks. Seven persons were all badly, and some mortally burned, while the running away of the team, scattering fire in all directions, endangered the lives of the multitude that at that hour always crowd the thoroughfare in which the accident occurred.

The present restrictions upon the dangerous pastime of exploding and burning all sorts of fireworks, are almost worthless. Though the general practice is limited to the National holiday, and to illuminations, processions, etc., it is never safe to permit their use in the immediate proximity of buildings or in crowded thoroughfares.

In the case alluded to, a party of intoxicated roughs bent on making a splurge on their return from an excursion, smoked their cigars and ignited lucifer matches in a wagon containing dangerous explosives. The punishment for their recklessness, which probably would never have been meted out to them by the city authorities, was swift and terrible. Few will shed tears, and some will even be inclined to recommend the distribution of fireworks among this class of men, provided they would blow themselves up, away from respectable people, and where property could not be endangered.

The sale of poisons is made the subject of restrictive legislation, and the law is pretty generally enforced. But poisons subserve a useful purpose, and it would be unwise to prohibit their sale. Fireworks, on the contrary, are of no general utility, and their sale should be totally prohibited, or their indiscriminate sale ought to incur severe penalties.

AN ARRANT HUMBUG.

Our attention has been called to the following recipe which our correspondent informs us has been sold largely in the section where he resides, but not used to a very large extent through fear of explosions:

Recipe and Directions for Manufacturing the Sun-Light Oil—To make one gallon, take 3 quarts of Benzine, 1 ounce pulverized Alum, 1 1-2 ounces Alcohol, 2 ounces Cream Tartar, 2 ounces Sal Soda, 1 pint of Potatoes (cut fine), 2 table spoonfuls of fine Salt, 2 drachms Oil of Sassafras, 4 drachms of Gum Camphor. Dissolve the Alum in the Alcohol as much as possible, then add the Gum Camphor, stir for a few minutes, then add to one pint of the Benzine, stir it well for ten minutes, then add all the other ingredients except the Benzine, stir well until it foams, then add the remainder of the Benzine; leave it open and exposed to the air; shake it occasionally, and in two hours' time it will be fit to use, although it should stand if convenient, for 48 hours before using.

This is the proportion for one gallon, and the person who purchases the ingredients of a retail druggist for a single gallon will be charged much more in proprotion than if he bought in larger quantities, and must expect that by some druggist he will be charged two or three times the wholesale price for a single gallon of Benzine, as many retail druggists often buy but a few gallons at a time and have to pay about twice the wholesale price.

You are to use Benzine of 65 or 72 gravity, which costs but 12 1-2 cents per gallon in New York, Chicago, or Cleveland, and but 8 cents in Pittsburgh.

The ingredients used in one gallon will answer for ten gallons by adding 8 1-2 gallons of Benzine, one quart Potatoes and one pint fine Salt. The Sun-Light Oil should always be used with a patent or Sun-Light Burner.

Any individual detected making or selling the Sun-Light oil without a right from us will be prosecuted as an infringer.

This recipe contains a large proportion of hydrocarbon oil of a highly inflammable character, in which certain substances are dissolved, ostensibly, to make it a safe material for consumption in lamps, for illuminating purposes. The public may rest assured that they cannot either use this or any similar mixture with safety, and we warn them against imposition from men, whose only excuse for making such compounds, if they have any excuse at all, is their ignorance.

Let any one who wishes to try the following experiment put a little of this oil into a watch-glass, in a room heated to about 90°, or into any other shallow vessel, and hold a lighted match over it. If the vapor takes fire, it is dangerous. On the contrary if the match can be smothered out in the oil without igniting it, it is safe. All good kerosene should stand this test.

No oil is explosive in and of itself, it is only when the vapor arising therefrom becomes mixed in the proper proportions with air, that it will explode. There should be no inflammable vapor from any oil used for burning in lamps at ordinary temperatures. A volatile oil is unfit for the purpose, and men who would, knowing the nature of their wares willfully peddle through the country such vile and dangerous compounds, deserve the fate of other incendiaries.

We have understood that this or similar oils are sold in different parts of the country by the gallon at a price ranging from seventy-five cents to a dollar. Any one can figure for themselves from the data given in the above recipe, the large profits made upon the sale of the villainous stuff. When these people wish to sell you such compounds in future, show them the door at once.

WHEN DOCTORS DISAGREE WHO SHALL DECIDE?

This knotty question, the puzzle of wise-heads for generations, has lately been decided by Judge Blatchford, in the case of the Rumford Chemical Works *vs.* Lauer, a report of which we publish in another column.

It appears that Prof. Eben N. Horsford, the distinguished chemist and *savant*, formerly of Harvard University, Cambridge, Mass., after long research and experiment, discovered a method of manufacturing the acid phosphates in such a form as to render them useful in the making of bread.

There is no cereal so well suited to the wants of man as wheat. Among its mineral constituents, highly necessary to the nutrition and building-up of the human system, are phosphates of potash, lime, magnesia, and iron. But in the bolting processes employed to produce the fine white flours which the public demands, these important minerals are more or less sifted out and lost.

The object of Prof. Horsford's improvements were to restore these missing ingredients to the flour, and also to furnish a more convenient and better leaven than yeast for bread making.

One of Prof. Horsford's preparations consists of a fine, white, dry, acid powder, containing the necessary phosphates, which is mixed with common flour and baked in the ordinary manner. For leavening purposes, bicarbonate of soda is combined with the phosphate and the flour, and when the mass is wetted carbonic acid is liberated, which leavens the dough perfectly, thus dispensing altogether with yeast.

The improvements of Prof. Horsford were duly patented, and the patents were purchased by the Rumford Chemical Works of Rhode Island. The manufacture of the phosphate preparation has become an extensive business, and other parties are now seeking to take it up. It was to restrain one of these infringers that the present suit was brought.

On the part of the defense, the learned Benjamin Silliman, Jr., Professor of General and Applied Chemistry, of Yale College, George F. Barker, Professor of Physiological Chemistry and Toxicology, of Yale Medical College, Prof. Austin Flint, Jr., Prof. Charles A. Seeley, and Mr. Place, all testified in the most positive manner, that by following an old formula of the celebrated chemist, Berzelius, given in Gmelin, they had produced an acid phosphate in the form of a fine, white, dry, non-hygroscopic, homogeneous powder, capable of evolving carbonic acid and producing phosphate of soda in its reaction with bicarbonate of soda, and otherwise presenting all the properties of the article described in the plaintiff's patent. These witnesses had repeatedly tried the formula and they exhibited specimens of the powders thus produced. One of the witnesses, Prof. Seeley, testified that when the formula of Berzelius was intelligently followed it was impossible to produce any other substance.

On the other hand, the distinguished Prof. R. Ogden Doremus, of the Medical Societies in this city, testified for the plaintiff, that the formula of Berzelius does not contain such a description as will enable him, as a practical chemist, to produce such a substance as the previous witnesses had described. He had, he said, made but one trial, which resulted in a white powder having an acid taste which soon became inert, and would not, when mixed with bicarbonate of soda, set free carbonic acid.

Professor Horsford testified that he had devoted much time to the subject, but had been unable from the formula of Berzelius to produce the article described by the witnesses for the defense. The substance which he had produced was sometimes sticky, and from day to day lost its strength, until it had no capacity to decompose bicarbonate of soda.

Here was a marked disagreement in the testimony of the learned doctors; but it does not seem to have troubled Judge Blatchford very much. He decided the matter readily, and at the same time gave the learned professors a very useful lesson in practical chemistry, by advising them to make their acid solutions a little stronger, when they would probably be able to produce the substance described by the *savans* of Yale.

Although this trial has resulted adversely, in part, to the very broad claims set up by the Rumford Chemical Works, it will not in any manner interfere with the continued manufacture of their excellent phosphoric acid preparations, which are made under the personal supervision of Prof. Horsford. If in point of law he is not the original discoverer of the acid phosphate powders, he is undoubtedly the first to develop a method of making them commercially available, and thus to put the public in possession of a valuable article, the use of which is of great importance as a constituent of food. The celebrated Liebig has stated that the nutritive value of ordinary flour is increased ten per cent by the use of Professor Horsford's phosphatic bread preparations.

THE THEORY OF BOILING---TOMLINSON'S EXPERIMENTS AND CONCLUSIONS.

There have been few who have contributed more to the general stock of knowledge during the past year than Charles Tomlinson, F. R. S., F. C. S. Especially valuable is his theory of boiling as applied to the useful arts, of which we can give only a brief and cursory review. We will, however, endeavor to give our readers some of the most prominent points and practical conclusions.

According to this theory, a boiling liquid is a supersaturated solution of its own vapor. This is proved by holding a nucleus *in any part* of the liquid. It will instantly become covered with steam bubbles.

But what is a nucleus? It is a promoter of vaporization, which acts by virtue of its stronger adhesion for the vapor of the solution than the liquid from which it is produced. Among the most common and well-known nuclei are the soap used by distillers, butter used by the sugar refiners, bits of cedar used in Dr. Bostock's experiments, the brass wire used by Oersted, the pointed or rough bits of platinum used in chemical experiments and operations, etc.

Mr. Tomlinson has shown that all these nuclei are imperfect, that if they act well at first, they are likely to become inert during a single operation, and, therefore, unreliable, and, as the result of his researches, he has discovered nuclei which will not only greatly facilitate the escape of vapor from boiling solutions, but which, acting upon an entirely different principle from the ones enumerated, and others similar to them, may be relied upon as permanent and uniform in their action: these will be named further on.

Mr. Tomlinson says "all the substances which have hitherto been used empirically, because the principle which led to their adoption was not known, must be renewed at each operation, and as they are liable to cease their action before any operation is completed, they are liable to objection." They will cease to act as nuclei whenever they become chemically clean.

In Mr. Tomlinson's paper upon this subject, read before the Society of Arts, he remarks: "It has been recommended to use sharp-pointed or roughened bodies, under the impression that steam is given off with greater facility from the points or the teeth. This is a mistake. Make these rough or sharp-pointed bodies clean, and they cease to act. Sharp, angular fragments of glass, washed in sulphuric acid and rinsed, no longer act as nuclei. A rat's-tail file passed through the flame of a spirit-lamp also becomes denucleized. A body such as a file is apt to collect between its teeth the greasy kind of matter that acts so well as a nucleus; and this has led to an idea in favor of rough bodies. The air is not a nucleus. When Dr. Bostock found his thermometer cease to act, and by taking it out of the liquid and waving it in the air it liberated vapor when restored to the liquid, the thermometer had caught from the air some unclean particles of dust, which acted for a moment as nuclei, until, by the action of the ether, they became denucleized."

Mr. Tomlinson states that he has performed a very large number of experiments on the action of nuclei on various liquids at or near the boiling point, and they all point to the same conclusion; namely, that the action of a nucleus is differential, there being a greater amount of adhesion between the nucleus and the thing dissolved than between the nucleus and the liquid. In the great variety of cases the nucleus is contaminated with some kind of oily, fatty, or greasy matter, and this, having a less adhesion for the liquid part of a solution than for the gas, or the salt, or the vapor of such solution, there is, consequently, a separation of gas, or salt, or vapor. The nucleus may be a solid thrown into the vessel, or the sides of the vessel may act as a nucleus, or fatty matter may be thrown in, in order to make the vessel unclean, as in the case of the distillers and the sugar boilers. But in all cases of solid or liquid nuclei, we may always observe this differential kind of action, on which, he contends, the action of nuclei depends. The following experiment illustrates this:

Five ounces of distilled water in a clean flask boiled at $213\frac{17}{20}$° Fah. Some perfectly clean mercury was poured in, enough to form a ring at the bottom of the flask. The water rose to 214°, with much bumping, steam forming under the mercury, and distending it into hemispheres, each of which burst with a kick. It would have been dangerous to have entirely covered the bottom of the vessel with the metal, for, as it was, the bursts were of an explosive character. While this uneasy boiling was going on, a very little dirty mercury was added to the flask, and, although the mercury was not more than one sixth of that previously added, the effect was remarkable. Instead of the uneasy kicking, jerking bursts, the boiling became brisk, easy, and soft, rapid volleys of steam-balls being given off by the metal, breaking up the mass of water, while the temperature remained steady at $212\frac{2}{20}$°.

Further experiments will be alluded to in a future article, showing the reasons for selecting charcoal, coke, pumice-stone, and especially cocoa-nut shell charcoal as the best known nuclei. Our readers engaged in dyeing, distilling, etc., will not fail to see the importance of this subject, as well as its possible application to saving of fuel in steam boilers, since whatever tends to lessen the adhesion of steam to the water contained in boilers, helps to economize fuel. The experiments we shall give in our next bear strikingly upon this point.

THE ODORIFEROUS PRINCIPLES OF PLANTS---AND THEIR IMITATIONS---FUSEL OIL.

No doubt many of our readers have, while enjoying the delicate odor of a rose or a cape jasmine, wondered what it is that these and other plants possess which imparts such delicious perfumes. Chemistry has answered this question definitely, and has shown that these odors arise from volatile oils existing in the tissues of plants. Sometimes it is the flowers, sometimes it is the bark or wood that contains these essential oils. Some may be obtained by distillation of the flowers, leaves, bark, or wood, with water; others are so evanescent and destructible that more refined processes have proved necessary, and some elude all attempts to secure them.

The elements which compose these oils are only three, oxygen, hydrogen, and carbon. Charcoal and water, therefore, contain all that is necessary to their composition. Many of them are hydrocarbons mixed with an oxidized oil, and in others the oxygen enters as a chemical component. Of these last attar of roses is an example.

These oils have taste as well as smell, and give peculiar flavors to fruits, wines, and liquors distilled from fermented fruit juices. These flavors are called the bouquets of liquors. The composition of brandies, wines, and other liquors, being little else than alcohol, water, sugar, with coloring matter and a peculiar bouquet, the idea of making factitious imitations was a very natural one. In applying it to practice it was found that the chief difficulty lay in the imitation of the bouquet. Many of these have been since successfully imitated, and the substances produced form a class scarcely second in interest to any in organic chemistry.

The readers of the daily papers and the scientific press have seen so much said of fusel oil during the past year, that the name has become very familiar. They have, therefore, learned that this is a substance generated during the distillation of whiskey from potatoes, and also by other methods to which we need not refer. It is analogous to the alcohols in its reactions, and having for its base a peculiar radical called amyle, it has received the name of amylic alcohol. It has a very nasty smell, and most of its compounds and derivatives are characterized by their peculiar odors, which imitate to a nicety the odors of various plants, fruits, etc., as well as those of insects. From perfumes the most agreeable it is but a step to the utterly nasty and disgusting. A few examples will illustrate.

Drop amylic alcohol on platinum black. It immediately oxidizes to an acid which gives the smell of *valerian*.

Distil amylic alcohol with acetic acid obtained by the decomposition of acetate of potash with sulphuric acid in the retort, and an oily product smelling exactly like the *Jargonelle pear* is generated.

Distilling with chromic acid obtained in an analogous manner to the above, and an oil smelling like *apples* is produced.

Cognac and *grape oils* are imitated by the action of concentrated sulphuric acid upon the same radical.

Products having the odors of *bananas, oranges*, and many other kinds of fruits, are successfully imitated by analogous methods. In fact some chemists have affirmed that these oils are identical with those naturally compounded in the growth of plants.

But the odors thus produced, as we have already said, are not by any means all of them pleasant. The odors of disgusting plants, bed bugs, squash bugs, etc., etc., are equally attainable though not in general request.

Another class of substances possessing odors similar to those found in certain species of plants are the sulphur alcohols, as they used to be called, or the sulphides of ethyl, one of which corresponds to alcohol with its oxygen replaced with sulphur. This last is also called mercaptans on account of its affinity for mercury, (*mercurium captans*). The method by which it is produced from alcohol is indirect, and would scarcely be intelligible to the general reader. The composition of this alcohol is $C_4H_6S_2$, that of wine alcohol being $C_4H_6O_2$.

The odors of these sulphides of ethyl are like those of garlic, onions, leeks, etc. A similar compound prepared from methylic alcohol is a clear liquid, without color, but having an intolerably offensive odor of onions, which is very tenacious.

The sulphur in these compounds may be replaced by arsenic, giving rise to new compounds indescribably disgusting, and as noxious as they are offensive. Kakodyl is the name of one of these compounds, a name of ill portent, from the Greek *kakos* evil, *hyle* principle. It unites with cyanogen to make a frightfully poisonous volatile compound, a few drops of which evaporated in a room will produce almost instantaneous unconsciousness upon any unfortunate who chances to be present.

We may not extend this article further. Suffice it to say that we have mentioned only a few of the odors that may be successfully imitated by chemical compounds.

PREDICTION OF WEATHER.

The prediction of the weather from natural indications has been attempted from time immemorial; but hitherto the weather prophets have been compelled to confess that "all signs fail in dry weather." Professor Houzeau, formerly of the Royal Observatory at Brussels, has been making observations for years, and has finally published a general table whereby he claims the weather may be predicted for a short time in advance with considerable certainty.

The things to be observed are, the direction of the wind, the state of the barometer, and the state of the sky. These three states may be expressed thus: Barometer rising, falling, fixed, or very slow, falling fast, rising fast, rising slowly after sinking very low, sinking very low and for a long time.

The sky is described as being blue, cloudy, rainy, or snowy, fine, cloudy with rain or snow at commencement of wind, fine with light clouds, veiled, hot after rain, covered, fine rain falling, hot after westerly rain, etc., etc.

The directions of the wind are expressed in the points of the compass as usual.

In the absence of all definitions we must say we think these terms exceedingly indefinite. To us, the differences between a fine sky and a blue sky, or a veiled sky and a covered sky are not quite apparent. The looseness of this terminology is scarcely indicative of scientific accuracy, although the antecedents of Professor Houzeau would lead us to expect it.

We cannot give the table of indications prepared by Prof. Houzeau, but will give only some examples.

A rising barometer, with blue sky and wind N., indicates cold and dry weather. Same, with cloudy sky, weather will clear up. Same, with rain or snow, wind will change to N.E., with alternate showers and sunshine.

Barometer fixed, or very slow, with fine sky, wind N.E., the wind will continue, and weather become dry. Same, with cloudy sky, rain, or snow at commencement of wind, the same result may be expected as before.

These examples will serve to show the method employed. It must be remembered, however, that if the predictions thus made should prove very accurate for the locality of Brussels, they would not be likely to be so in other places remote from that point, though it is fair to infer that if the states of the barometer, sky, and the wind are sufficient data in one place, they would, also, be enough in another. The interpretations would, therefore, be subject to amendment.

For ourselves, we confess our faith is small, but as there is nothing apparently impossible nowadays, there may be something in Professor Houzeau's table.

Compressed Fuel from Coal Dust.

In Great Britain the quantity of coal dust remaining unemployed is calculated at 28,000,000 of tuns. Various methods have been attempted to convert it into useful fuel by compressing it into cakes, but the operation is not sufficiently remunerative. In Belgium they follow another plan, which seems to answer better. They mix coal dust with 8 per cent of tar, and then press it into cakes, which are found to make excellent fuel for steam engines. The dross accumulated in iron works, to the amount of millions of tuns, is known to contain from 25 to 50 per cent of iron, but the difficulty of extracting is very great, the metal being intimately combined with various silicates, and other substances, which are not easily separated by fusion. Lime, indeed, will decompose these silicates, but the iron thus obtained is brittle. Nevertheless, M. Fleury has recently made a successful attempt to obviate this drawback by slacking the lime used for the purpose in water containing a certain proportion of some alkaline chloride.

The Architectural Review contains a description of a patented frost-proof tin pipe for gutters. Instead of being cylindrical like ordinary pipe, it is corrugated longitudinally, so that when water in it expands by freezing, the pipe also expands approximating the cylindrical form. The idea of making corrugated pipes for the above purpose is quite old, and has been the subject of applications for patents.

BRIDGE ACROSS THE BRITISH CHANNEL.

We have received the description and drawings of a projected bridge across the British Channel designed by a French engineer, Mr. Charles Boutet.

The bridge is to extend from the Dover Hills, near Shakspeare Cliff to Cape Blanc-nez, near Calais. The distance between these two points is 32,822 yards. Nine colossal iron piers and two abutments are designed to form the supports of the entire structure; so the bridge will have ten spans each of 3,282 yards, or almost two miles. The piers are to extend 120 yards above the sea level, to allow the largest vessels to pass under the bridge. Each pier measures at the lower end 130 by 87 yards, and the foundations reach from 28 to 52 yards into the ground. The piers are to be built on shore, and floated by immense buoys to their final resting places. They are at their lower parts, provided with screw supports, which, when turned, are worked into the foundation to secure and retain the piers in position.

Each cable consists of 120 two-inch wire ropes. Buffers made of wire rope, are arranged around the piers, to prevent vessels from striking against the same, and within each pier is a staircase, extending down to the water's edge, to serve as a means of escape for shipwrecked persons. Furthermore, each pier is constructed to be used as a light-house.

The entire expense of the structure is estimated not to exceed £8,000,000. One half of this sum we are informed has already been subscribed in France.

Interesting Researches upon the Effects of Lightning Stroke upon Animals.

Benjamin W. Richardson M. D., F. R. S., has been making extensive researches with the great induction coil at the Polytechnic Institution in London to ascertain the effects of lightning stroke upon animals with a view to throwing light upon some hitherto doubtful points connected therewith. The importance of being able to ascertain whether a person is dead or otherwise after being struck by lightning will not be disputed. Dr. Richardson asserts that it would be the easiest mistake in the world to look on a man struck by lightning as dead when in truth he is only stunned.

He says: I am free to confess, and it is right to confess, I have seen an animal so seemingly dead after electrical discharge that at first I adjudged it dead, and yet it has spontaneously recovered. If then I, who am somewhat conversant with the effects of these shocks on living organisms, might, by too hasty an examination, be deceived, how much more so those who by mere accident first approach the victims to the lightning discharge; and how shall all men be guided toward a more correct knowledge as to the positive signs of death? I answer on this point with much less of knowledge than I could wish, but I may perhaps so answer as to prevent one of the most serious of errors. The positive signs of death after lightning stroke, as far as I know them up to this time, are—

(1.) Absence of all Indication of Motion of the Heart—This sign must be accepted with the understanding that there may be action of the heart which does not declare itself by audible sound or sensible motion detectable through the walls of the chest.

(2.) Absence of Reflex Action.—As a rule, an animal which has been stunned simply by the electrical shock shows signs of reflex motion, so-called, when an irritant is applied to the eye or when the skin is pricked over a muscle. Whenever there is an exhibition of reflex action, the evidence is almost certain that living action is not absolutely suspended. But it must also be accepted with this understanding, that in batrachians, at all events, its absence does not of necessity denote death. We give a shock to a frog, for instance, and we see, on applying an irritant, that the animal shows no reflex action. Yet the probabilities are that the animal will be restored to life.

(3.) Decrease of Animal Temperature, in the Cavities, to the Temperature of Water left exposed to the surrounding Air.—This, in our present state of knowledge, is a fair proof of actual death in warm-blooded animals. It does not prove the impossibility of recovery.

(4.) Absence of Color in Semi-transparent Structures.—The passing of a strong light through the hand, or other semi-transparent structure, and observing if the red color which is seen in the living parts is absent, is a good sign of death; but is not, I think, absolutely reliable, inasmuch as there may be so much resistance to conveyance of blood through the vessels that coloration due to the presence of blood in them may be absent in the hands, or even in the cheeks, while yet there may be motion of the heart.

(5.) Rigidity of Muscles.—If muscular rigidity be general, and the muscles of the chest be rigid, the evidence of absolute death is sufficient. But a partial or local rigidity of muscle is not of sufficient evidence. Rigidity may occur in one limb, so we saw at the last demonstration, in the line in which the electrical current has coursed through the body, and may not designate total extinction of living action.

(6.) Coagulation of the Blood in the Veins.—This is at once a ready and good sign of death. In the human subject the largest vein that can be found immediately under the skin should be laid freely open, a fillet being first applied above the place for the opening. If, then, in the vein there be found a coagulum, the inference is fair that the process of coagulation is complete, and that restoration of life is impossible.

(7.) Decomposition.—Lastly, the occurrence of decomposition of the body is the final proof of actual death; and although when the blood in the venous system is distinctly coagulated, and there is general *rigor mortis*, it may not be necessary to wait for decomposition of the body before committing it to the earth, in the absence of the two changes just named—coagulation and rigidity—evidence of decomposition ought always to precede the act of burial.

A Remarkable Surgical Operation.

One of our old subscribers, who is a medical practitioner at Chicago, took part in the following case, which is described by the *Chicago Tribune*. The subject was a lady from Lee Center, Ill. A careful examination by Dr. Beebe, revealed the fact that the intestine involved in an old rupture had mortified, and to allow this to remain would inevitably destroy the woman's life. He, therefore, decided to remove so much of the intestine as had undergone decomposition, and by securing the extremities of the sound intestine, to restore at length the natural passages, and thus preserve the unfortunate lady's life. Assisted by Drs. L. Dodge, J. S. Mitchell, and A. G. Beebe, this dangerous and difficult operation was accordingly performed, and four feet six inches of the intestine were removed from the patient's body, and may now be seen preserved in alcohol, in Dr. Beebe's office. The operation completed, the abdomen was carefully stitched up, the patient enjoined to preserve perfect quiet, and to abstain from solid food. Thirteen days have now elapsed, and, astounding as it may seem, the good lady has well-nigh recovered, being now allowed the freedom of her room and a generous diet, which is heartily relished. What will not the surgeons do next?

Utilizing Garbage.

The New York *Sun* says that a company has been formed in Chicago, and will soon be in operation, for distilling alcohol and extracting soap grease from ordinary city garbage. The process is a patented one, and consists in taking the garbage just as it is hauled off in the city carts, dumping it into tight tanks, and boiling six hours at a temperature of 212°. This dissolves the whole mass, which is run into fermenting tubs and worked with yeast. The soap grease and impurities rise to the top of the tubs, and are skimmed off, and the residuum is distilled in the regular way. It is estimated that each barrel of garbage will yield three pounds of soap grease and four gallons of proof spirits. The soap grease is, of course, as good as any other, but the alcohol betrays its origin by an odor which requires further processes for its removal. For many uses, however, it is as good as that derived from grain or molasses, and, if its distillation is not too costly, will yield a considerable profit.

Composition of the Milk of Different Animals.

1,000 parts contain:

	Water.	Butter.	Cheesy Matter.	Sugar.	Mineral Matter.
Woman	889·08	26·66	39·30	43·68	1·30
Cow	864·20	31·30	48·80	47·70	6·00
Goat	844·90	56·87	35·14	36·91	6·18
Ewe	832·32	51·31	69·78	39·43	7·16
Mare	904·30	24·36	33·35	32·76	5·23
Ass	890·12	18·53	35·65	50·46	5·24
Sow	818·00	60·00	53·00	60·70	8·30

Proportions of solids and water in different kinds of milk:

	Woman.	Cow.	Goat.	Ewe.	Mare.	Ass.	Sow.
Water	889·08	864·20	844·90	832·32	904·70	890·12	818·00
Solids	110·92	135·80	155·10	167·68	95·70	109·88	182·00
	1,000·00	1,000·00	1,000·00	1,000·00	1,000·00	1,000·00	1,000·00

Pig's milk is extremely rich, containing, as it does, nearly 50 per cent more nuitritive matter than is found in that of the cow. It is not unlikely that in certain forms of disease where a milk diet is prescribed the use of so concentrated a liquid food might prove serviceable.—*Chemical News.*

Dry Docks at Brooklyn.

Two very large dry docks are now in operation at South Brooklyn. No. 1 is 500 feet long, 60 feet wide at bottom, and capable of receiving vessels of 12 feet draft at low water, or 18 feet at high water. No. 2 is 447 feet long, and receives vessels drawing 17 feet at low water, and 22 feet at high water. By means of a central gate this dock may be divided into two separate parts each forming an independent dock.

The pumping is done by means of a superior horizontal engine of 100-horse power and two oscillators of fifty and thirty horse-power, respectively. The former of these engines connects with a double centrifugal pump, of mammoth proportions, and with a capacity for pumping and discharging forty thousand gallons of water per minute. At this rate, the average time required for completely relieving the docks from water is about 3½ hours; the docks ordinarily contain eight millions of gallons of water. The oscillators are attached to centrifugal pumps used for drainage, or keeping the docks free from water when occupied by vessels. Their average capacity is about one thousand gallons each per minute.

Diarrhea

Is a very common disease in summer-time. Cholera is nothing more than exaggerated diarrhea. When a man has died of diarrhea, he has died of cholera, in reality. It may be well for travelers to know, that the first, the most important, and the most indispensable item in the arrest and cure of looseness of the bowels, is absolute quietude on a bed; nature herself always prompts this by disinclining us to locomotion. The next thing is, to eat nothing but common rice, parched like coffee, and then boiled, and taken with a little salt and butter. Drink little or no liquid of any kind. Bits of ice may be eaten and swallowed at will. Every step taken in diarrhea, every spoonful of liquid, only aggravates the disease. If locomotion is compulsory, the misfortune of the necessity may be lessened by having a stout piece of woolen flannel bound tightly round the abdomen, so as to be doubled in front, and kept well in its place. In the practice of many years, we have never failed to notice a gratifying result to follow these observances.—*Hall's Journal of Health.*

How to Set a Slide Valve having Equalized Exhaust.

1. Place the crank at the 180° location, mark on the cross-head and one of its guides opposing "center punch" points.

2. Bring the crank to the zero and mark a second point on the guide. The two points thus found, measure the length of the stroke. Move the eccentric until the valve has the required lead for the forward stroke.

3. Advance the crank in the direction of the motion until the exhaust of the opposite stroke closes; scribe a line across the guide which shall pass through the point on the cross-head.

4. Move the crank until the other exhaust closes and scribe a second line on the guide.

5. If now the exhaust should close at equal distances from the commencement of each stroke the motion would be in adjustment; if not, alter the length of the eccentric rod until the closure becomes equalized, then return the crank to the zero position, and alter the angular advance of the eccentric until the required lead of the forward stroke is secured.

The position of the valve at the moment of closure may readily be fixed by means of a "valve gage" fitting center punch points on the valve stem and its stuffing box.

The above process will serve also to equalize the cut-off if the valve be proportioned for this object.—*Auchincloss' Link and Valve Motions.*

How to Observe the Eclipse and Save Your Eyes.

A correspondent writes to the *Evening Post* as follows:

"Take a large card with a small round hole in the center, and hold it against the sun's rays, so that the shadow will fall on the floor, pavement, wall, or other dark and smooth surface. In the middle of the shadow there will be a true image of the sun, and the eclipse can be studied in its progress without straining the eyes, and without smutting face or hands with smoked glass.

"This simple process was suggested by the familiar circumstance, that the light spots in the shadows, during a solar eclipse, take the shape of the luminous portions of the sun's disk, and the perforated card has been used with perfect success."

A Durable Chair.—In response to an article published in these columns some time ago for a good chair we have received a number of specimens from different manufactures. One of the best and strongest is of the Shaker pattern, with arms, and splint bottom of generous width, made by Tarbel, Royse & Co., of Bellows Falls, Vt., under a patent granted to one of the firm, March 19, 1867. It is the embodiment of comfort, and looks as if it would endure for ages.

It is said that a cheap outer cell for a Daniells battery can be made from a common tin canister by placing it in a solution of sulphate of copper, and putting in the porous cell, zinc and acid as usual, and connecting the zinc with the canister below water mark by a copper wire. After a little the inside of the canister will be coated with copper. It is said to be quite as good as a cell made entirely of copper.

Treatment of Corns.—Persons troubled with corns, and who is not, will find great relief, and sometimes absolute cure, by the application of a slice of lemon to affected parts, secured by a strip of cloth, on going to bed. We have tried it on a painful hard old fellow and found immediate relief.

A Monster Cannon.—A new twenty-inch cannon, smooth bore, weighing fifty-seven tuns, has lately arrived at Fortress Monroe from Pittsburgh, Pa. It is the largest piece of ordnance ever produced in this country. It will throw a ball weighing eleven hundred pounds.

IMPORTANT PATENT DECISION.

UNITED STATES CIRCUIT COURT, SOUTHERN DISTRICT OF NEW YORK. IN EQUITY. DECISION BY JUDGE BLATCHFORD.

The Rumford Chemical Works vs. John E. Lauer. Opinion of the Court. July 13, 1869.

In this case the original patent was granted to Prof. Eben N. Horsford, April 22, 1856, and was reissued to the plaintiffs, who are assignees, May 1, 1865, and reissued to them a second time, June 9, 1868. The infringement alleged in the bill is the making and selling by the defendant, of pulverulent acid, in infringement of said reissued patent of 1868. * * *

The specification of the plaintiffs' patent states the invention to be "a new pulverulent acid for use in the preparation of soda powders, farinaceous food, and for other purposes." It then describes the acid and the mode of its preparation. It says: "Carefully washed and properly burned bones, after being ground, are put into freshly diluted oil of vitriol, with continual stirring and in the following proportions: Five hundred pounds of the above described bones, (sometimes called bone ash), four hundred pounds of oil of vitriol, and one thousand pounds water. These ingredients are stirred, from time to time, for about three days, when, ordinarily, the action will be completed, and the resultant products will be phosphoric acid, superphosphates and sulphate of lime, or gypsum, with a small proportion of salts of magnesia and soda in a pasty-like mass." Various methods are then described for making this mass pulverulent: (1st.) Mixing it, while moist, with any farinaceous substance, drying it slowly in the sun or with artificial heat not above 130° F., and pulverizing it; (2d.) Mixing it with freshly burned gypsum, drying it in the sun, or by artificial heat, and pulverizing it; (3d.) Mixing it with stearine or other fatty bodies, drying it and pulverizing it; (4th.) Leaching the mass, mixing the concentrated extracts with burned gypsum or stearine, drying it and pulverizing it; (5th.) Drying and pulverizing it without admixture. All of these modes are stated to have given desirable results, but a preferable mode is then described, which consists in leaching the mass, concentrating the mass to 25° Baume, thereby obtaining a solution consisting of phosphoric acid and acid phosphate of lime, with slight traces of other salts, substantially freed from gypsum or sulphate of lime, heating ten gallons of this mixture to boiling, adding four pounds of perfectly white bone ash, continuing the boiling until the concentrated liquid mass, containing in solution the added bone ash, becomes pasty, cooling the mass, adding seventy-six pounds of wheaten flour, mixed to a uniform paste, adding sixteen pounds of potato starch, carefully mixed, sifting it through a sieve with quarter inch meshes, drying it thoroughly at a temperature of not over 150° F., and pulverizing it. * * * The specification says: "* * The body which I have in view and above described is a form of acid phosphate of lime, or of mixed acid phosphate of lime and phosphoric acid, in which the phosphoric acid is the active and valuable constituent, free from the objectionable qualities of the above-mentioned bodies. It is a dry, fine, white, or nearly white, homogeneous powder, unobjectionable on account of odor, taste or composition, is an essential and important element in healthful nutrition, and is suited to be employed as the acid ingredient in the preparation of self-raising farinaceous food." * * *

The claims of the patent are as follows: [illegible]

THE DEFENSE.

[illegible]

EVIDENCE FOR THE DEFENDANT.

[illegible] by Berzelius, and that he cannot see that an acid phosphate prepared according to the directions given by Berzelius would not be useful in raising bread, if used in the same manner as the Horsford acid phosphate.

Professor George F. Barker, Professor of Physiological Chemistry and Toxicology in the Medical Institution of Yale College, testifies, that the description in Gmelin is sufficiently accurate to enable a chemist to produce the salt described in the first paragraph, that is, the white acid powder, without invention or discovery; that he produced at the first trial, a substance having all the properties described in the first clause of the paragraph of Gmelin; and that, from the results of his own experiments, he could see no difficulty, after producing that acid once successfully, in repeating its production any number of times successfully. * * *

Professor Seeley testifies, that the description contained in the first clause of the paragraph of Gmelin is sufficiently clear to enable a chemist, without invention or discovery, to produce such a three-fourths phosphate as the sample which he produced as an exhibit, and having the acid properties stated in said paragraph; that he has made experiments, with a view to ascertain whether, from the description by Berzelius and the paragraph in Gmelin he could produce a powder which would not be acid or which would be sticky, and was unable to produce such a substance; that the process described in the first part of the paragraph of Gmelin is very explicit; that it is impossible, when it is intelligently followed, to produce any other substance than the three-fourths phosphate, such as the specimen so produced by him as an exhibit; that he has made several specimens of such three-fourths phosphate; and that, when the process was intelligently followed, it invariably produced the same result. * * *

Professor Silliman, Professor of general and applied Chemistry in Yale College, testifies, that the description in Gmelin is sufficiently clear to enable a chemist, without invention or discovery, to produce such a three-fourths phosphate as the specimen produced by him as an exhibit; that such phosphate is an acid phosphate, which, in its reaction with the bicarbonate of soda, evolves carbonic acid and produces phosphate of soda; and that the specimen which he produced as an exhibit was prepared by dissolving in water glacial phosphoric acid, boiling the solution until all the metaphosphoric acid was converted into tribasic phosphate, diluting to about 138° or 139° of concentration, saturating with common commercial bone phosphate to a state of solution, adding alcohol, which threw down a voluminous precipitate of the three-fourths phosphate, throwing it upon a filter, washing it with alcohol, and drying in the air.

It is shown, by the evidence, that a chemist would properly understand, by the expression "the salt (c)," in Gmelin, what is known as bone earth or bone phosphate or ordinary phosphate of lime. The paragraph in Gmelin plainly describes two substances, and a separate process for making each of the two substances. The first substance is a white powder, to be produced by saturating with phosphate of lime an aqueous solution of phosphoric acid, mixing alcohol with the solution, and thus forming a white precipitate, which is to be washed with alcohol and dried. The second substance is acid, but tenacious and sticky, and is to be produced by immersing the salt c recently precipitated, in a solution of hydrated phosphoric acid, ignited just before it is dissolved in water. The chemical testimony shows that there is a sufficient difference in the two processes, caused by using in the latter one, hydrated phosphoric acid and igniting it before dissolving it in water, to produce the difference in result. * * *

THE PLAINTIFFS' EVIDENCE.

In reply to the testimony introduced on the part of defendant as to the identity of the powder described by Gmelin, with the powder claimed in the first claim of the plaintiffs' patent, as above defined, Professor Horsford, himself, and Professor R. Ogden Doremus, testify, that they were unable to make, with certainty, from the description in Gmelin, a powder capable practically of being relied on to evolve carbonic acid gas from bicarbonate of soda.

Professor Doremus states, that the paragraph in Gmelin does not contain [illegible]

JUDGE BLATCHFORD'S CONCLUSIONS.

[illegible] and affirmative, while the latter is merely negative. As the acids produced by Professors Seeley, Barker and Silliman were not prepared according to the process described in the plaintiffs' patent, or according to the process described in the defendant's patent, [illegible]

[illegible] in a mixture of muriatic acid and water, filters the product, adds sulphuric acid, and dries the resulting mass by heat till it crumbles into a powder which is white and acid, and can be used, in connection with bicarbonate of soda, to liberate carbonic acid, to make bread. Bone black is burned bones. The muriatic acid dissolves the phosphate of lime in the bones from the carbon, the filtering gets rid of the carbon, the action of the sulphuric acid creates sulphate of lime, acid phosphate of lime, and free phosphoric acid, and the heat drives off the muriatic acid. Horsford removes the carbon from the bones by fire before he applies the sulphuric acid, while the defendant removes the carbon from the bones by muriatic acid, and then gets rid of that acid by heat. Horsford burns away the carbon from the phosphate of lime in the bones, while the defendant dissolves away the phosphate of lime from the carbon. The products produced by the two processes are substantially identical with each other and with the product produced by the process of Berzelius and Gmelin, as powders containing phosphoric acid as an available agent to decompose alkaline carbonates, for the purpose of liberating carbonic acid, to give porosity to dough, but the three processes differ each from the other, in substance. It appears, from the evidence, that the use of sulphuric acid, to act on what is indifferently known as bone earth, or bone ash, or bone phosphate, being common bones containing phosphate of lime, and thus form sulphate of lime and liberate sulphuric acid or an acid phosphate of lime, was well known before the date of the alleged invention of Horsford. The defendant does not, by the use of the process described in his patent, infringe the second claim of the plaintiff's patent, considered as a claim to the process described in that patent for making the pulverulent acid therein described. If the second claim be considered as a claim to the acid, as a product, the conclusions arrived at in regard to the first claim apply to it.

As already remarked, the third and fourth claims of the plaintiffs' are not involved in the case. The questions, so largely discussed by the counsel for the plaintiffs, on the argument, as to whether Horsford was not the first person who used, as a substitute for yeast, a powder containing phosphoric acid as its active agent, and as to whether he is not entitled to a patent for applying phosphoric acid, in connection with an alkaline carbonate, to the raising of dough, and as to whether the third and fourth claims of the plaintiffs' patent are not valid, as containing inventions which involved the necessity of experiments, to determine whether phosphoric acid, when artificially introduced into bread, would be healthful, and whether and how the acid could be mixed with flour and with an alkaline carbonate, and remain inactive until moistened or heated, are questions which will arise on the patent when a suit is brought on it for the infringement of its third and fourth claims, but they are not presented in this case.

It may be that there are claims which Horsford could make and hold in reference to certain constituents and qualities of the pulverulent phosphoric acid that is made by this process, but the broad claim made to the acid described, is not tenable.

The bill must be dismissed with costs.

W. Whiting and C. A. Seward, for the plaintiffs.
E. W. Stoughton and C. M. Keller, for the defendant.

Answers to Correspondents.

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

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

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

C. P. P., of Kansas.—The chemical symbol HO, signifies one equivalent of hydrogen combined with one equivalent of oxygen. The equivalent of hydrogen being 1 and that of oxygen 8, the equivalent of HO, or water, is 9. The equivalent of a substance in the old nomenclature is based upon the weights in which, or in some multiple of which, it generally combines with other bodies. The new nomenclature takes into account the volumes of substances when in a gaseous state, as it has been found that generally the molecules of compound bodies when reduced to the gaseous state occupy equal volumes, and that, also, a simple relation exists between the volumes of any two gases which combine together. It also makes a distinction between the terms equivalent and atomic weight and from the above considerations as well as others equally forcible, makes the atomic weights of many substances just double the numbers assigned in the old nomenclature as their equivalents. Hence, according to the new nomenclature, water is represented by H_2O. In our paper when we find occasion to use chemical formulæ we still use the old nomenclature, as many of our readers, who have all their lives been accustomed to it, have not probably found time to post themselves upon the new, which is now generally adopted in scientific schools, and in very recent treatises involving the use of chemical symbols.

A. M., of La.—We believe that no cheap ice machine suitable for use in families has yet been introduced. A cake of ice weighing 20 lbs may be kept easily 48 hours in a good refrigerator before it melts away, if the box is not too frequently opened. You can filter and cool water by passing it through an underground filter, but with the low head you have got it will not enter the house with much force. It will, however, probably answer your demands.

R. H., of N. Y.—You can cleanse barrels from must, by burning a small quantity of sulphur in each, after which they should be well rinsed with cold water.

M. L., of Vt.—The term *isomeric* is applied to compound chemical substances, which, having the same elements combined in the same proportions, still exhibit different properties.

A. A. S., of Wis.—The greater the hight to which a given quantity of water is raised in a given time, the greater the power required to raise it.

J. B., of Mass.—You will not in our opinion be able to punch wires in the way you described. The temper is already out of annealed wire and we don't see why you should seek to do what is already done.

W. F., of Pa.—Good pine or cedar is the best timber for making vats, etc., for holding boiling water. Soluble glass will not be of service to you for such purposes.

S. H., of Ind.—As soon as we can get a locomotive constructed that will run as fast as the initial velocity of a cannon ball we will try the experiment you suggest, and shall expect to find that the ball will drop perpendicularly from the mouth of the cannon to the ground.

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.

Beehive.—George A. Robinson, Mount Pulaski, Ill.—This invention relates to a new and useful improvement in beehives.

Blind Fastening.—Leonard D. Howard, St. Johnsbury, Vt.—This invention relates to a new and improved fastening for blinds and shutters of windows.

Self-acting Mule.—C. J. Greene, Olneyville, R. I.—This invention relates to improvements in selfacting mules, such as are known as Mason's mules, the object of which is to provide more simple and reliable "backing off" and "winding on" motions.

Hair-curling Apparatus.—Mrs. Martin Adkins, Oswego, N. Y.—This invention relates to improvements in hair-curling implements. It consists in the application to a hollow heating and curling mandrel of a combing, pressing, and spirally-laying apparatus, whereby the operation may be rapidly and accurately accomplished.

Grinding Edge Tools.—Lorenzo Zimmerman, Waukesha, Mich.—This invention relates to a new and useful apparatus for holding edge tools in grinding them on a grindstone, and consists in an adjustable bar connected with the frame of the grindstone at its back end, with an adjustable lever attached thereto, with a jaw on the end of the lever for holding the tool to the bar and to the stone.

Gage for Sewing Machines.—Mrs. Anna P. Rogers, Quincy, Ill.—This invention consists of an adjustable gage plate having a recess in its front edge, in which a presser pad having inclined serrated grooves on the lower face, is arranged and connected to the said gage plate by an adjustable spring which governs the pressure of the pad upon the cloth.

Gage Attachment for Boring Instruments.—Arthur Emory, New York city.—This invention relates to improvements in apparatus for indicating the position of boring instruments, [illegible]

Plastering Machine.—Thomas McKinley, New York city.—This invention relates to a new and improved method of plastering, [illegible]

Refrigerator.—S. E. Scoggins, Baltimore, Md.—The object of this invention is to provide for public use a simple, cheap, and convenient refrigerator, which shall be properly ventilated, and shall be capable of keeping food, etc., nearly at the freezing point.

MECHANICAL MOTION.—Nelson Read, Winchendon, Mass.—This invention relates to a new and useful improvement in means for transmitting motion from a rotary driving shaft to two or more rotary counter shafts. The object of the invention is to prevent irregularity of motion hitherto caused in crank connections by the difficulty of the crank in passing the centers of the shafts.

MEDICAL COMPOUND.—Thomas J. Butcher, Wenona Station, Ill.—This invention relates to a new and improved composition for medical purposes.

VENTILATING APPARATUS.—E. L. Roberts, Brooklyn, N. Y.—This invention relates to improvements in ventilating apparatus for buildings, and has for its object to provide a simple and efficient arrangement of passages, heater, and valve devices, which, while governing the volume of air admitted, either to cause it to pass into the room through a cold air passage or through a passage bringing it in contact with a heater, will always admit a full volume of air, thereby keeping up the maximum degree of circulation; the arrangement being such that a movement of a single hand-crank or other valve operating device effects the necessary valve adjustment for causing the air to pass in either direction.

PEDECYCLE.—Geo. Brownlee, Princeton, Ind.—This invention relates to a new device which is to be used for skating on ordinary roads, to be attached to the feet and rolled over the ground. The invention is also applicable to other vehicles, such as velocipedes, and wheelbarrows, and consists chiefly in suspending the weight of the rider or load to be conveyed from the top of the wheel.

EYE GLASSES.—Richard Straubel, Williamsburgh, N. Y.—The object of this invention is to so construct the frame of a pair of eye glasses that the glasses when applied will be in a horizontal line as they are in spectacles, and that when the instrument is folded together, the ends of the U-spring will not project to be caught in the pockets or elsewhere.

LACE MACHINES.—Geo. Osborne, Brooklyn, N. Y.—The object of this invention is to so construct lace machines used for making fine silk or other net work of the kind used for invisible coverings of ladies' chignons and for other purposes, that the operation can with very fine material be successfully carried on.

VELOCIPEDE.—T. N. Morse, Fairhaven, Mass.—This invention relates to certain improvements in two and three-wheeled velocipedes, whereby their construction is simplified and their mode of operation facilitated.

HAY ELEVATING FORK.—T. C. Kelly, West Liberty, Pa.—The object of this invention is to provide a simple and effective hay elevating fork for raising hay by horse or other power.

PORTABLE AND ADJUSTABLE SCAFFOLD.—F. Stein and H. Haering, New York city.—The object of this invention is to so provide portable and adjustable scaffolding to be used in erecting buildings, and conveniently adapted for moving from place to place, and for erection independently of the walls of the building, and whereby the flooring may be adjusted as to hight, by the persons thereon.

VENTILATING CHIMNEYS.—J. J. Pemberton, Oakland, Ill.—The object of this invention is to provide an improved means for ventilating chimneys of fireplaces, grates, etc., by the admission of the external atmosphere thereto, to facilitate the draft, to prevent smoking, also to facilitate combustion, and to prevent the cold air from rushing in through doors, windows, and cracks chilling the room.

WAGON BRAKE.—Irvin Willits, Deer Plain, Ill.—This invention is intended to provide a very reliable brake which will always be brought into action when the animals cease to drawn, and hold back sufficiently to allow the traces to slacken. The arrangement of the brake bar is such that it may rest on the ends of the hounds of the axle, when the brakes are resting on the wheels, so that the action of the brake shall cause no pressure upon the necks of the animals.

METALLIC KEGS.—Wm. Hill, Pottsville, Pa.—This invention relates to a new and useful improvement in the manner of putting in the heads of kegs for containing powder and other articles, when the same are made of metal; and it consists in the peculiar form of joint made, and the bearings obtained for securing the contents and making the keg strong and durable.

BOLTS FOR FOLDING DOORS.—E. L. Roberts, Brooklyn, N. Y.—This invention relates to improvements in sliding bolts for folding doors, such as patented March 15, 1859, 23,262, the object of which it to provide for sliding the upper fastening bolt, and the laterally moving guard bolt, whether the lower slide bolt coincide with its mortise so as to fall into it or not, as it frequently happens that it does not on closing the door, owing to working or springing, which in the arrangement described in the aforesaid patent prevents the movement of any of the bolts until the said lower bolt is adjusted to coincide and pass into its notch.

KNITTING MACHINES.—M. L. Roberts, New Brunswick, N. J.—This invention consists in a means of adapting them to be capable of knitting plain tubular goods with great rapidity. Also, in an arrangement of means whereby they may be readily adjusted from the conditions of a machine such as represented in a former patent, to the conditions more especially adapted for knitting the said plain tubular goods and from that to the said first mentioned condition.

WATER GAGE.—David Lithgow, Philadelphia, Pa.—This invention relates to a new and useful improvement in water gages for steam boilers and consists in providing means for excluding the steam and heat from the glass gage tube, and thereby protecting the glass tube from damage from expansion and contraction by heat.

APPARATUS FOR THE MANUFACTURE OF BROMINE.—Herman Lerner, Pomeroy, Ohio.—This invention relates to the common apparatus used for the distillation of bromine from the bitter or refuse water left after the manufacture of salt from the saline products of certain earth wells, or from sea water.

CARRIAGE.—John C. Ham, New York city.—This invention has for its object to improve the construction of the front part of the bodies of carriages so as to make them more convenient and comfortable for those riding in them, at the same time that their beauty and elegance are greatly increased.

COFFEE CLEANER AND POLISHER.—James W. Brady, Catonsville, Md.—The object of this invention is to provide for public use a cheap, durable, and conveniently operated instrument, by means of which coffee or other similar article can be easily, quickly, and effectually cleaned and polished.

WINDOW SASH ADJUSTER.—J. S. Elkins, Marquette, Wis.—The object of this invention is to provide for public use a simple, cheap, and convenient device for adjusting and controlling both sashes of a window, setting either or both of them, at the same time, at any required hight, and operating without the use of weights or springs.

STUMP PULLER.—D. C. Frazeur and Peter Ginter, Siddonsburg, Pa.—The object of this invention is to provide for public use a simple, convenient, and effective apparatus for pulling stumps.

CHAIR.—James Lee, New York city.—This invention has for its object to furnish an improved chair, which shall be simple in construction, strong, and durable, and at the same time so constructed and arranged as to fit closely to, and support the lower part of the sitter's back, which chairs constructed in the ordinary manner, leave wholly unsupported.

ORNAMENTAL BACK FOR OPEN FIREPLACES.—William H. Jackson, New York city.—The object of this invention is to construct ornamental back and sides for open fireplaces, which may be inserted in the said fireplaces forming the back of a grate, as may be required, and thus relieve the eye from looking on a blackened soapstone, as now used in handsomely furnished fire-places.

STEAM BOILER.—Charles H. Franklin, Jr., New York city.—The present invention relates to a certain new and useful improvement in the construction of steam boilers by the introduction of a third combustion chamber, the object of which is to consume all the smoke and gases from the furnace, and at the same time give a greater heating surface than has heretofore been given to steam boilers.

BEEHIVE.—Hiram Filson, Monongahela City, Pa.—This invention has for its object to furnish an improved beehive, which shall be so constructed and arranged as to not only adapt it to the natural habits of the bees, but also allow all its parts to be conveniently and successively taken away.

COMBINED DRILL AND SAW GUMMER.—Wm. C. Marr, Peru, Wis.—This invention has for its object to furnish a simple, convenient, and effective machine, which may be readily used as a drill or saw gummer, as occasion may require, doing its work equally well in either capacity.

COMBINED PLOW, CULTIVATOR, AND POTATO DIGGER.—H. B. Smith, Tremont, Ill.—This invention has for its object to furnish an improved combined plow, cultivator, and potato digger, which shall be so constructed and arranged as to be easily adjusted and operated, and which will do its work well in either capacity.

POTATO DIGGER.—John Sherwood, Ottumwa, Iowa.—This invention has for its object to furnish a simple, convenient, and effective potato digger, which shall be so constructed and arranged as to do its work easily and thoroughly, leaving the potatoes spread over the surface of the ground.

IMPROVED ATTACHMENT TO PUMPS.—J. W. Williams, Syracuse, N. Y.—This invention relates to a new and improved attachment, by means of which the lower or stop valve box and valve may easily be removed from any pump, when from its being clogged or out of repair it becomes necessary to do so.

NEEDLE PROTECTOR FOR SEWING MACHINES.—Thomas Huckans, New Baltimore, and J. Wesley Carhart, Troy, N. Y.—This invention relates to a new and improved protector for the needles of sewing machines, whereby the needle is prevented from being broken or injured during the operation of sewing.

CLOTHES RACK.—Elias Werden, Pittsfield, Mass.—This invention relates to a new clothes rack, which is of very simple construction, and which can, when not used, be folded together into a small space. The invention consists in fitting upon four vertical parts connecting rods, which are arranged in sections horizontally above each other, every section being supported by shoulders of the posts.

CLARINET.—Jacob Rebhun, New York city.—The object of this invention is to construct and arrange the keys and levers of a clarinet, that difficult passages which could heretofore not be produced, such as various kinds of trills and shakes, can without difficulty be obtained, and that the fingers will be relieved from the great strain to which they are subjected on the ordinary instruments.

TACHYDROME.—Simon Wortmann, New York city.—This invention relates to a new vehicle, which is to be propelled by the upper and lower extremities of the person or persons th at it supports, and which is provided with a fly wheel, in such manner that the same may at will be thrown into or out of gear. This fly-wheel will gather power in going down hill, and will then give it up in going up hill, thereby facilitating the ascending of hills, and preventing too great rapidity while going down hill. The invention consists in the general combination of parts, whereby two persons may be accommodated on the vehicle, and also in the arrangement of the fly wheel.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING JULY 27, 1869.

Reported Officially for the Scientific American.

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92,926.—HAIR-CURLING APPARATUS.—Marcia Adkins, Oswego, N. Y.
92,927.—GUIDE-ATTACHMENT FOR BORING INSTRUMENTS.—Arthur Amory, New York city.
92,928.—VELOCIPEDE. — Solomon Andrews, Perth Amboy, N. J.
92,929.—CARPET SWEEPER.—J. B. Baker (assignor to himself Hiram R. Olmstead, and Richard W. Jones), Syracuse, N. Y.
92,930.—TOBACCO BOX.—George H. Bliss, Brooklyn, N. Y.
92,931.—GAS HEATER.—A. L. Bogart, New York city.
92,932.—SUGAR-BOILING APPARATUS.—Martial Bonnin and Charles Escudier, New Iberia, La.
92,933.—MANUFACTURE OF BRAID.—John W. Bowers, Newton, Mass.
92,934.—METHOD OF PRESERVING THE AROMATIC PRINCIPLE OF HOPS.—Edwin D. Brainard, Albany, N. Y.
92,935.—MILLERS' STAFF.—Potto Brown, Houghton, and Bateman Brown, Huntingdon, England. Patented in England, June 23, 1868.
92,936.—PEDECYCLE.—George Brownlee, Princeton, Ind.
92,937.—MEDICAL COMPOUND.—Thomas J. Butcher, Wenona Station, Ill.
92,938.—BRAIDING MACHINE.—James D. Butler, Lancaster, Mass.
92,939.—CORN POPPER.—Wm. F. Collier, Worcester, Mass.
92,940.—BOBBIN FOR SPINNING.—John H. Crowell, Providence, R. I. Antedated July 23, 1869.
92,941.—CONDENSER FOR STILLS.—T. J. Dean, St. Louis, Mo.
92,942.—HAND MIRROR.—W. U. Dudley, New York city, assignor to himself and Lawrence W. Clark, Brooklyn, N. Y.
92,943.—MACHINE FOR GENERATING AND CARBURETING GAS.—Cleaveland F. Dunderdale, New York city.
92,944.—STOP-MOTION FOR SILK STRETCHING AND WINDING MACHINE.—P. Dunham, Leeds, Mass.
92,945.—GRAIN DRILL. — Josephus Easterday, Frederick county, Md., and J. B. Crowell, Greencastle, Pa.
92,946.—FODDER CUTTER.—John Eiberweiser (assignor to himself and Frederick Groene), Cincinnati, Ohio.
92,947.—BEEHIVE.—Hiram Filson, Monongahela City, Pa.
92,948.—FRONT GEAR FOR WAGON.—A. Finley, Bainbridge, Ind.
92,949.—SPRING BED.—Jeremiah Fisk, Augusta, Me.
92,950.—SHOES.—Wm. S. Foster, Montgomery, Ala.
92,951.—CORN AND SEED PLANTER.—Daniel D. Franklin (assignor to himself and John S. Underwood), Flora, Ill.
92,952.—STEAM GENERATOR. — Charles H. Franklin, Jr., New York city.
92,953.—THREE-HORSE CLEVIS.—Samuel H. Frederick, Matteson, Mich.
92,954.—HOSE COUPLING.—J. H. George, Newark, N. J.
92,955.—MATCH SAFE.—John Gibbs, Brooklyn, E. D., N. Y., assignor to himself and Calvin H. Carter, Waterbury, Conn.
92,956.—GOVERNOR FOR STEAM AND OTHER ENGINERY.—Thomas Gill, assignor to himself, John Stark, and John Stark, Jr., Waltham, Mass.
92,957.—STEAM PUMPING ENGINE.—Roscoe J. Gould, Newark, N. J.
92,958.—MULE FOR SPINNING.—C. J. Greene, Olneyville, R. I.
92,959.—DEVICE FOR CLEANING PLOWS.—Richard Groom, Albany, N. Y.
92,960.—MACHINE FOR MAKING CORD.—William Guest, London, assignor to James Buckingham, Walworth, England.
92,961.—HEDGE SETTER.—John H. Hobart (assignor to himself, Elias P. Read, and T. W. McFarland), Ottawa, Ill. Antedated July 5, 1869.
92,962.—COMPOUND FOR CUTTING AND POLISHING.—James P Hall, New York city.
92,963.—WHIFFLETREE.—Israel C. Hall, Sanbornton, N. H.
92,964.—CARRIAGE.—John C. Ham, New York city.
92,965.—SEWING MACHINE FOR WORKING BUTTON HOLES.—Alexander Harroun, Jr., Onondaga, Ill.
92,966.—STREET REFLECTOR FOR WINDOWS.—Otto Hennig, Chicago, Ill.
93,967.—CORN POPPER.—Benjamin B. Hill, and John R. Hill, Worcester, Mass.
92,968.—GANG PLOW.—Laban Holloway, San Francisco, Cal.
92,969.—SCREW WRENCH.—H. A. House, Bridgeport, Conn.
92,970.—SHUTTER FASTENER. — Leonard D. Howard, St Johnsbury, Vt.
92,971.—GRAIN REGISTER.—Wm. C. Howard, Belle Plaine Iowa.
92,972.—NEEDLE PROTECTOR FOR SEWING MACHINE.—Thos Huckans, New Baltimore, and J. Wesley Carhart, Troy, N. Y.
92,873.—HARNESS BUCKLE. — James Ives, Mount Carmel Conn.
92,974.—ORNAMENTAL BACK FOR FIRE-PLACE.—Wm. H. Jackson, New York city.
92,975.—HORSE HAY FORK.—Thomas C. Kelly, West Liberty, Pa.
92,976.—VELOCIPEDE.—John Lauer, Chicago, Ill.
92,977.—CHAIR.—James Lee, New York city.
92,978.—TURRET FOR VESSELS.—Johan Linnemann, Copenhagen, Denmark.
92,979.—WATER GAGE.—David Lithgow, Philadelphia, Pa.
92,980.—PROBANG, OR INSTRUMENT FOR TREATING DISEASED ORIFICES.—George S. Lovell, and Mary F. Lovell, Philadelphia, Pa.
92,981.—METHOD OF EXTRACTING IRON AND OTHER OXIDES FROM CLAY, PORCELAIN-EARTH, ETC.—Wm. John Lynd, Golden City Colorado Ter.
92,982.—CLOTHES DRYER.—Henry G. Mack, Oswego, N. Y.
92,983.—COMBINED DRILL AND SAW GUMMER.—Wm. C. Marr, Peru, Wis.
92,984.—CORN PLANTER.—Daniel McCullough, Oxford township, Ontario, Canada, assignor to himself, Wm. J. Scott, Jr., and Patrick Harty.
92,985.—PLASTERING MACHINE.—Thomas McKinley, New York city.
92,986.—CARD CASE.—Geo. V. Metzel, Baltimore, Md.
92,987.—COFFEE POT.—Elie Moneuse and Louis Duparquet, New York city.
92,988.—FILTERING TUBE.—Daniel Moore and Edwin Moore, Brooklyn, N. Y.
92,989.—HAY AND MANURE FORK.—Edwin Moore, Brooklyn, E. D., N. Y.
92,990.—THROTTLE VALVE GEAR.—Samuel Moore, Providence, R. I.
92,991.—VELOCIPEDE.—T. N. Morse, Fairhaven, Mass.
92,992.—PLOW.—Wilson Noble, New Haven, Conn. Antedated July 3, 1869.
92,993.—COMPOSITION FOR CURING CORNS.—Geo. Oakley, Quincy, Ill.
92,994.—NAIL MACHINE.—Geo. Osborn (assignor to himself, Fred'k Leonard, and J. C. Osborn), Lakeville, Mass.
92,995.—LACE-MAKING MACHINE.—Geo Osborn Brooklyn, N. Y., assignor to A. G. Jennings, New York city.
92,996.—GUIDE FOR GANG SAW GATES.—R. A. Parsons (assignor to himself and Ten Brock & Noyes), Clinton, Iowa.
92,997.—COTTON-SEED HULLER.—George H. Peabody, New York city.
92,998.—ZINCING IRON.—J. H. Peake, Washington, D. C.
92,999.—VENTILATOR FOR CHIMNEY.—J. J. Pemberton, Oakland, Ill.
93,000.—SCRAPER.—T. G. Phelps, Belmont, Cal.
93,001.—PITCHER FOR COOLING LIQUID.—Herman Pietsch, New York city.
93,002.—FINISHING SPLIT LEATHER. — Joel Putnam, Danvers, Mass.
93,003.—MOLD FOR CASTING THE CYLINDER AND DIAL BOX OF WATER METERS.—H. F. Read, Brooklyn, N. Y.
93,004.—MECHANICAL MOVEMENT.—Nelson Read, Winchendon, Mass.
93,005.—CLARINET.—Jacob Rebhun, New York city.
93,006.—BOLT.—E. L. Roberts, Brooklyn, N. Y.
93,007.—VENTILATING APPARATUS.—E. L. Roberts, Brooklyn, N. Y.
93,008.—KNITTING MACHINE.—Mark L. Roberts, New Brunswick, N. J.
93,009.—BEEHIVE.—G. A. Robinson, Mount Pulaski, Ill.
93,010.—GUIDE FOR SEWING MACHINES.—Anna P. Rogers, Quincy, Ill.
93,011.—ADJUSTABLE MOLDBOARD AND COULTER.—G. D. Rowell, Menomonee Falls, Wis.
93,012.—METHOD OF MANUFACTURING VINEGAR.—Francis Schleifer, San Francisco, Cal., assignor to himself and Francis Cutting. Antedated July 16, 1869.
93,013.—HARVESTER.—W. A. Sharpe, Syracuse, N. Y. Antedated July 16, 1869.
93,014.—STOP FOR PREVENTING RETROGRADE MOTION IN SEWING MACHINES.—Wesley Sherman and Giles Bishop, Middletown, Conn.
93,015.—POTATO DIGGER.—John Sherwood, Ottumwa, Iowa.
93,016.—VELOCIPEDE.—D. R. Smith, San Francisco, Cal., assignor to himself and Norbert Landry.
93,017.—CULTIVATOR.—Walter Smith, Boonville, Ind.
93,018.—COMPOSITION FOR PAVEMENTS, ROOFING, ETC.—Hiram Staples (assignor to himself and E. M. Dudley), Nashua, N. H.
93,019.—ADJUSTABLE SCAFFOLD.—Francis Stein and Henry Haering, New York city.
93,020.—EYE GLASS.—Richard Straubel, Williamsburgh, N. Y.
93,021.—STEAM GENERATOR FEED DEVICE.—J. B. Tarr, Fairhaven, Mass. Antedated July 12, 1869.
93,022.—TOY HOOP.—C. L. Taylor, Norwich, Conn.
93,023.—BREECH-LOADING FIRE-ARM.—G. H. Todd (assignor to himself and C. W. Kennedy), Montgomery, Ala.
93,024.—FOUNTAIN PEN.—W. R. Walker, Concord, N. H.
93,025.—CLOTHES RACK.—Elias Werden, Pittsfield, Mass.
93,026.—SLIDING CALLIPER.—A. E. Whitmore, Boston, Mass.
93,027.—GATE.—Maximilian S. G. Wilde, Somerville, assignor to himself and J. H. Noble, Pittsfield, Mass. Antedated July 15, 1869.
93,028.—WAGON BRAKE.—Irvin Willits, Deer Plain, Ill.
93,029.—DETACHABLE FOOT VALVE AND SEAT FOR PUMPS.—J. W. Williams, Syracuse, N. Y.
93,030.—VELOCIPEDE.—Simon Wortmann, New York city.
93,031.—GRINDING EDGE TOOLS.—Lorenzo Zimmerman, Waukeshma, Mich.
93,032.—APPENDAGE TO BLAST PIPES OF BLAST FURNACES.—J. L. Agnew, Negaunee, Mich.
93,033.—BROOM HEAD.—J. M. Allison, Salina, Pa.
93,034.—SAW-HORSE.—J. B. Andrews, Bridgeton Center, Me.
93,035.—GRAIN BINDER.—John Baker, Fairbury, Ill.
93,036.—PLOW.—John Ball, Canton, Ohio.
93,037.—WATER WHEEL.—S. H. Barnes, Lanesborough, Pa.
93,038.—COMBINED HARROW AND MARKER.—B. F. Barney, Pontiac, Ill.
93,039.—TOOL FOR FORMING LIPS ON THE NECKS OF BOTTLES.—Thomas Barrett, Charlestown, Mass.
93,040.—DEVICE FOR SUSPENDING PICTURE FRAMES AND MIRRORS.—R. E. Bean, Franklin, N. H.
93,041.—DUMPING WAGON.—Udney N. Beardsley, Lawton, Mich.
93,042.—CULTIVATOR AND HARROW COMBINED.—Hiram Benedict (assignor to himself and Allen Chaney), Detroit, Mich. Antedated July 16, 1869.
93,043.—SAWING MACHINE.—G. W. Benson and F. F. Doland, Sacramento, Cal.
93,044.—COMPOUND FOR DESTROYING INSECTS. — Benjamin Best, Dayton, Ohio.
93,045.—COFFEE CLEANER AND POLISHER.—J. W. Brady, Catonsville, assignor to M. W. Brady, Baltimore, Md.

93,046.—Refrigerator.—E. D. Brainard, Albany, N. Y.
93,047.—Bitting Harness. — Benjamin F. Brewster, Norwich, Conn.
93,048.—Dryer.—Joshua W. Brooks and Henry Rudoff, Ashley, Ill.
93,049.—Harvester Rake.—F. M. Buckles (assignor to himself and J. A. Stuckey), Altona, Ill.
93,050.—Potato Digger.—John M. Burke, Dansville, N. Y.
93,051.—Steam and Air Engine.—Charles Burleigh, Fitchburg, Mass.
93,052.—Water Tank for Railroads.—John Burnham, Batavia, Ill.
93,053.—Steam Engine.—W. H. Carr, New York city.
93,054.—Balance Scale.—Geo. W. Chandler, Fitchburg, assignor to himself and John G. Folsom, Winchendon, Mass.
93,055.—Car Coupling.—W. H. H. Clark, Burlington, Iowa.
93,056.—Cutter Head.—M. W. Clark, Worcester, Mass.
93,057.—Machine for Ginning and Cleaning Cotton.—L. T. Clement, Smyrna, Tenn.
93,058.—Hinge.—Calvin Cole Ithaca, N. Y.
93,059.—Car Brake and Starter.—J. A. Cole, Adams, N.Y.
93,060.—Sluice and Blanket for Collecting Gold and Silver.—Ezra Coleman (assignor to himself and Almond F. Cooper), San Francisco, Cal.
93,061.—Churn.—J. A. Cozad, Mercer, Pa.
93,062.—Sheep Tagging Box.—E. D. Crawford, North Star, Pa.
93,063.—Gathering Attachment for Sewing Machines.—J. A. Davis, Watertown, N. Y.
93,064.—Tuck-Creasing Attachment for Sewing Machines.—J. A. Davis, Watertown, N. Y.
93,065.—Sewing Machine.—J. A. Davis, Watertown, N. Y.
93,066.—Apparatus and Process for the Manufacture of Salt.—J. A. Davis, Watertown, N. Y.
93,067.—Carriage Wheel.—D. P. Davis, New York city, assignor to himself, W. J. Coombs, and G. H. Gardner.
93,0 8.—Covered Clasp for Hoop Skirts.—F. E. Day (assignor to himself and L. H. Day), New York city.
93,069.—Dumping Cart.—Fred. Dengler, North Vernon, Ind.
93,070.—Center-Board for Vessels.—Jonathan Dillon, New York city.
93,071.—Sash Holder.—J. S. Elkins, Marquette, Wis.
93,072.—Apparatus for Evaporating Ammoniacal and other Liquids.—L. S. Fales, New York city.
93,073.—Valve for Hydraulic Press.—J. B. Fenby, Birmingham, England. Patented in England, Oct. 30, 1867.
93,074.—Coal Sifter.—W. C. Frederick, Chicago, Ill.
93,075.—Manufacture from Bananas and Plantains.—Joseph Fry, New Orleans, La.
93,076.—Railway Frog.—W. B. Gage, Saratoga Springs, and W. H. Staats, Crescent, N. Y.
93,077.—Gang Plow.—C. F. Gay, Albany, Oregon.
93,078.—Hasp Lock.—E. L. Gaylord, Terrysville, Conn.
93,079.—Sash Holder.—Lewis Gibbs, Canton, Ohio.
93,080.—Hand Cultivator.—J. H. Gill, Mount Pleasant, Ohio.
93,081.—Beehive.—Miller Graham, Coshocton, Ohio.
93,082.—Scroll-Sawing Machine.—T. B. Greene and C. Greene, Abington, Ind.
93,083.—Manufacture of Sheet and Plate Iron.—N. C. Gridley, Milwaukee, Wis.
93,084.—Stench Trap.—J. S. Haley and Samuel Worrell, New York city.
93,085.—Metallic Kegs.—Wm. Hill, Pottsville, Pa.
93,086.—Composition Dental Plate.—Asa Hill, Norwalk, Conn.
93,087.—Lamp Burner.—George Hillegass, Philadelphia, Pa. Antedated July 21, 1869.
93,088.—Calendar Movement for Time-Pieces.—Ervin Homrighous, Shelbyville, Ill.
93,089.—Projectiles for Ordnance.—B. B. Hotchkiss, New York city. Antedated July 20, 1869.
93,090.—Hand Stamp.—T. S. Hudson, East Cambridge, Mass.
93,091.—Razor Strap.—Jabez Jenkins, Philadelphia, Pa.
93,092.—Oil Can.—W. E. Jenkins. Auburn, N. Y.
93,093.—Embroidering Attachment for Sewing Machines.—W. T. Johnson, Ottumwa, Iowa.
93,094.—Meat Cutter.—August Klein, New York city.
93,095.—Spittoon.—J. M. Klingenmeier (assignor to John H. Miller), Buffalo, N. Y.
93,096.—Spring-Bed Bottom.—Alois Kneppler, East New York, N. Y.
93,097.—Screw Press.—F. H. Laforge and Geo. E. Somers, Waterbury, assignors to themselves and N. A. Baldwin, Milford, Conn.
93,098.—Detachable Horseshoe Calk.—Perley Laflin, Warren, assignor to himself and Z. E. Cary, West Brookfield, Mass.
93,099.—Apparatus for Making Bromine.—Herman Lerner (assignor of three fourths of said invention to August Mayer, Geo. Bauer, and Henry Bectanus), Pomeroy, Ohio.
93,100.—Fulling Mill.—Wm. B. Lodge, Danbury, Conn. Antedated July 23, 1869.
93,101.—Attachment for Gas Burner.—J. C. Love (assignor to himself and Silas Fuller), Philadelphia, Pa.
93,102.—Compound for Rendering Fabrics Water Repellent.—R. O. Lowrey, Salem, N. Y.
93,103.—Boots and Shoes.—John Macintosh and William Bogett, London, Great Britain. Antedated July 22, 1869.
93,104.—Hot-Water Apparatus.—H. L. McAvoy, Baltimore, Md.
93,105.—Hydrocarbon Burner.—Edmond P. McCarthy, San Francisco, Cal.
93,106.—Apparatus for Bending Clevis Blanks.—Thos. Meikle, Louisville, Ky.
93,107.—Press for Operating, Bending, and Shaping Dies.—W. D. Mendenhall, Farmington, Ill.
93,108.—Drill Chuck.—G. W. Miller, Woonsocket, R. I.
93,109.—Galley Rest.—Edward Morgan, Washington, D.C.
93,110.—Roller Skate.—W. R. Morris, Cincinnati, Ohio.
93,111.—Trace Fastener.—F. B. Morse, New Haven, Conn.
93,112.—Door Latch.—Jacob Mosher, Mendota, Ill. Antedated July 24, 1869.
93,113.—Method of Exploding Nitro-Glycerin.—Geo. M. Mowbray, Titusville, Pa.
93,114.—Skate.—J. W. Nathan, Chicago, Ill.
93,115.—Harrow.—A. A. Nuquist, Oneida, Ill.
93,116.—Corn Planter.—John I. Patton, Tiffin, Ohio.
93,117.—Lamp Burner.—John M. Perkins, Cleveland, Ohio.
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93,129.—Paint.—F. C. Semelroth, Logansport, Ind.
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93,131.—Preparation of Iron for Medical Purposes.—J. E. Siebel, Chicago, Ill.
93,132.—Sash Fastener.—H. B. Snyder, Cherry Grove, Ohio.
93,133.—Balance Slide-Valve.—Antoine Steber, Utica, N.Y.
93,134.—Sack Holder.—David Strollum, Union City, Ind., assignor to himself, Wm. A. Skellen, and E. M. Glick, Shelby county, Ohio.
93,135.—Machine for Varnishing Floor Oil-Cloth.—C. W. Stront, and Amos Wilder, Hallowell, Me.
93,136.—Water Wheel.—B. J. Talbott, Iowa Falls, Iowa.
93,137.—Alloy for Sabot of Projectile.—Thos. Taylor, Washington, D.C. Antedated July 15, 1869.
93,138.—Gig Sawing Machine.—Alex. Thompson and Zera Waters, Bloomington, Ill.
93,139.—Construction of Hot-Water Boilers.—John Trageser, New York city.
93,140.—Corn Planter.—W. F. Tunnard, East Baton Rouge parish, La.
93,141.—Chewing-Gum Compound.—Amos H. Tyler, Toledo, Ohio.
93,142.—Concrete Pavement.—A. Van Camp, Washington, D. C., assignor to himself, and M. M. Hodgeman, St. Louis, Mo.
93,143.—Liniment.—W. H. Wallack, Corunna, Ind.
93,144.—Combined Abdominal and Uterine Supporter.—Zera Waters, Bloomington, Ill.
93,145.—Oven.—W. C. Wedge, Chicopee, Mass.
93,146.—Railway-Car Truck.—Ashbel Welch, Lambertville, N. J.
93,147.—Binding Attachment for Sewing Machines.—Washington Wendell, Milwaukee, Wis.
93,148.—Shingle Machine.—G. F. White, Aurora, Oregon.
93,149.—Breech-Loading Firearm.—Eli Whitney, C. Gerner, and F. Tiesing, New Haven, Conn., said Gerner and Tiesing, assignors to Eli Whitney.
93,150.—Railway Car Axle-Box.—W. E. Wilcox (assignor to himself and T. H. Wills), Peoria, Ill.
93,151.—Railway Car Axle-Bearing.—W. E. Wilcox, Peoria, and T. H. Wills Beardstown, Ill.
93,152.—Rain-Water Spouting.—Garret Williams, West Middleburg, Ohio.
93,153.—Coffee Pot.—P. B. Willoughby and H. G. Phelps, Judd, Wis.
93,154.—Combined Plow, Cultivator, and Potato Digger. H. B. Smith, Tremont, Ill.
93,155.—Manufacture of Iron and Steel.—J. J. Johnston, —Allegheny City, Pa.

REISSUES.

33,068.—Ventilating Cap for Tents.—Dated August 20, 1861; reissue 3,565.—Thomas Boyd, Boston, Mass.
59,951.—Saw.—Dated Nov. 27, 1 66; reissue 2,695, dated July 23, 1867; reissue 3,566.—E. M. Boynton, Grand Rapids, Mich., assignee of Alfred Boynton.
86,380.—Manufacture of Tarred Paper, Pasteboard, etc.—Dated Feb. 2, 1869; reissue 3,567.—H. F. Evans, Beloit, Wis.
29,479.—Device for Separating Coal from Slate.—Dated August 7, 1860; reissue 3,568.—L. P. Garner, Ashland, Pa.
76,925.—Blast Gun.—Dated April 21, 1868; reissue, 3,569.—Chas. Kirchhof, Newark, N. J.
81,010.—Case for Rotary Blower.—Dated August 11, 1868; reissue 3,570.—P. H. Roots, and F. M. Roots, Connersville, Ind.
78,328.—Cutlery.—Dated May 26, 1868; reissue 3,571.—Moses Rubel, Chicago. Ill.
18,175.—Type-Setting and Distributing Machine.—Dated Sept. 15, 1857; reissue 3,572.—The Alden Type-Setting and Distributing Machine Company, New York city, assignees, by mesne assignments, of Timothy Alden.

DESIGNS.

3,585.—Coal-Hod Spout.—W. H. Brown, Rochester, N. Y.
3,586.—Teapot Handle.—L. C. Clark, Plantsville, Conn.
3,587.—Gate.—J. J. Ferris, Philadelphia, Pa., assignor to himself and Murphy and Brown. Antedated May 18, 1869.
3,588.—Fork or Spoon Handle.—E. C. Moore, Yonkers, N. Y., assignor to Tiffany and Company, New York city.
3,589.—Box.—J. J. Philbrick, Zanesville, Ohio.
3,590 and 3,591.—Plates of a Stove.—Garrettson Smith, and Henry Brown (assignors to Abbott and Noble), Philadelphia, Pa. Antedated June 29, 1869. Two Patents.
3,592.—Casket Handle.—H. C. Wilcox (assignor to the Meriden Britannia Company), West Meriden, Conn.

EXTENSION.

Mortising Window Blinds.—Jos. A. Peabody, of Philadelphia Pa.—Letters Patent No. 13,271, dated July 17, 1855.

NEW PUBLICATIONS.

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 the Alkalies, Fatty Substances, etc., etc. By Professor 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. 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. Philadelphia: Henry Carey Baird, Industrial Publisher, 406 Walnut street. London: Trubner & Co., 60 Paternoster Row.

That this work was not called a cyclopedia of the soap manufacture was not, certainly, that the extent of the information contained in it would not justify the title. It is a very thick octavo volume, containing 807 pages of carefully-prepared matter pertaining to one of the most important branches of industry. The best review that could be given of it would be the transcription of its copious index, in itself occupying 25 full pages. The topics comprised in this extended list, not one of which is superfluous, are each discussed with clearness, force, and simplicity, the author never losing sight of the practical bearings of his subject, and treating the whole in the happy style which has made his other industrial works deservedly popular. It would be useless for us to attempt an elaborate review of this work in the limited space we could spare for the purpose. Our readers will find in another column an extract from it, containing general observations on the industrial fatty bodies. The work is undoubtedly the most complete treatise upon the subject ever published. Price, by mail, free of postage, ten dollars.

A Compendious Manual of Qualitative Chemical Analysis. By Charles W. Eliot, Professor of Analytical Chemistry and Metallurgy, and Frank H. Storer, Professor of General and Industrial Chemistry, both in the Massachusetts Institute of Technology. New York: D. Van Nostrand, Publisher, 23 Murray street, and 27 Warren street.

This treatise is confined to the theory and practice of qualitative analysis in the wet way, and is intended to form an introduction to the study of chemical analysis, but comprises all that is requisite to meet the wants of those who do aim at becoming professional experts. The latter class of students will find, however, that the study of this work will be an excellent preparation for a more extended course. It is further confined to the examination of inorganic solids and liquids. The metallic elements are put into seven classes: Class first being those precipitated as chlorides; class second those precipitated as sulphides insoluble in dilute acids, and not redissolvable alkaline liquids; class third, those precipitated as sulphides insoluble in dilute acids, but redissolved by alkaline liquids; class fourth those precipitated by ammonia usually as hydrates—namely, iron, aluminum, and chromium, together with certain salts which require an acid solvent; class fifth, those precipitated as sulphides insoluble in alkaline fluids; class sixth, those precipitated as carbonates; and class seventh, remaining elements distinguished by special tests.

While we do not approve this classification for an extended course of analysis, we are inclined to believe that for the purposes of the present treatise it is a good one, and that for the examination of such substances as do not contain the more rarely occurring elements it will be found more serviceable than many which have preceded it. Altogether, we like the book, and would recommend it particularly to those who are desirous of pursuing a course of analysis without a personal instructor. Such will find a full catalogue of the necessary apparatus and reagents appended.

Wedlock; or, the Right Relations of the Sexes; Disclosing the Laws of Conjugal Selection, and showing who may and who may not Marry. By S. R. Wells, 389 Broadway, New York city. 12mo, pp. 238, cloth, $1·50. For sale by all booksellers.

We are in receipt of the "Twelfth Annual Report of Commissioners of the Central Park, for the Year ending December 31, 1868." It is an ably-written and interesting document.

APPLICATIONS FOR EXTENSION OF PATENTS.

Machine for Sawing and Edging Clapboards.—Aretus A. Wilder, of Detroit, Mich., has applied for an extension of the above patent. Day of hearing Oct. 11, 1869.

Mill for Grinding Apples.—W. O. Hickok, of Harrisburg, Pa., has petitioned for the extension of the above patent. Day of hearing, November 1, 1869.

Loom.—James O. Lynch, of Ballston Spa, N. Y., has applied for an extension of the above patent. Day of hearing October 11, 1869.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

2,024.—Water Meter.—Pratt, Whitney and Co., Hartford, Conn. July 5 1869.

1,557.—Stop Cock.—Z. E. Coffin, Newton Center, Mass. May 29, 1869.

1,985.—Breech-Loading Firearm.—R. E. Stephens, Owensound, and Jas. Ferrier and G. D. Ferrier, Montreal, Canada. July 1, 1869.

2,006.—Liquid Meter.—J. P. Smith, Cleveland, Ohio. July 2, 1869.

2,009.—Spring for Railroad Cars, etc.—P. G. Gardner, New York city. July 3, 1869.

2,018.—Implement for Drawing Nails.—Willis Churchill, New York city. July 3, 1869.

2,025.—Manufacture of Bar Iron and the Machinery for Rolling the same into Various Forms.—Jas. Montgomery, New York city. July 5, 1869.

2,037.—Refrigerator.—Wilson Bray, Stockton, N. J. July 6, 1869.

2,050.—Puddling Furnace.—James Montgomery, New York city. July 7, 1869.

2,052.—Chandelier.—I. P. Frink, New York city. July 7, 1869.

2,054.—Preparing and Preserving Meat.—A. S. Lyman, New York city July 7, 1869.

2,103.—Apparatus for Generating Hydrogen Gas, and for Carbureting Hydrogen Gas or Atmospheric Air for Illuminating and other Purposes.—C. F. Dunderdale, New York city. July 12, 1869.

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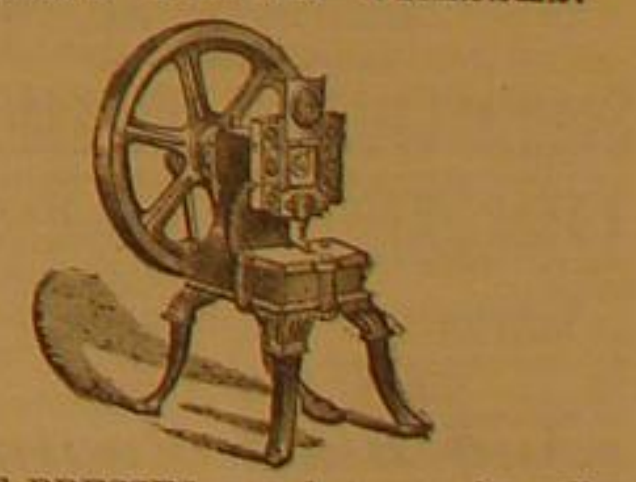

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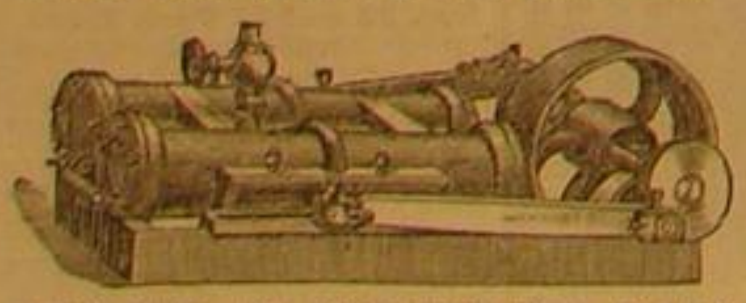

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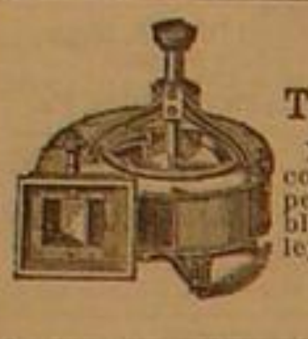

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SCIENTIFIC AMERICAN

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New Mode of Making Illuminating Gas from Light Hydrocarbon Oils.

The manufacture of illuminating gas on a small scale suitable for private dwellings, railway cars, locomotives, steamers, etc., has long engaged the attention of scientific men, but up to a recent date all attempts have failed to meet the wants of the community or the wishes of the inventors. Indeed, all the different machines have been made substantially on the same principle, viz., a machine for forcing or blowing air through or over some hydrocarbon or material saturated with hydrocarbon oil. Since Oliver P. Drake, of Boston, made his gas machine, twenty years ago, up to the present time, all improvements have been merely attempts to perfect the Drake plan, and were subject to the same difficulties, viz., the deterioration of the liquid, the variation of pressure, the change in density, the variable effects of the temperature, the great cost of the air-forcing apparatus, etc.

Mr. Hiram S. Maxim, of New York city, the inventor of this new mode, being long associated with the gas machine interest, both in Boston and New York, as draftsman and engineer, for over forty different machines, all on the old system, and knowing all the advantages of that system, has boldly deviated therefrom, and now presents to the public a gas machine, simple, compact, and reliable, operating every day in the year alike, and entirely different in principle and construction from any other heretofore made.

His first experiment on this new mode was made in the winter of 1866-7, and consisted of a two-light machine, holding two quarts of liquid, with a heating chamber underneath feeding its own flame, the size and heat of the flame being governed and controlled by the pressure of the gas generated.

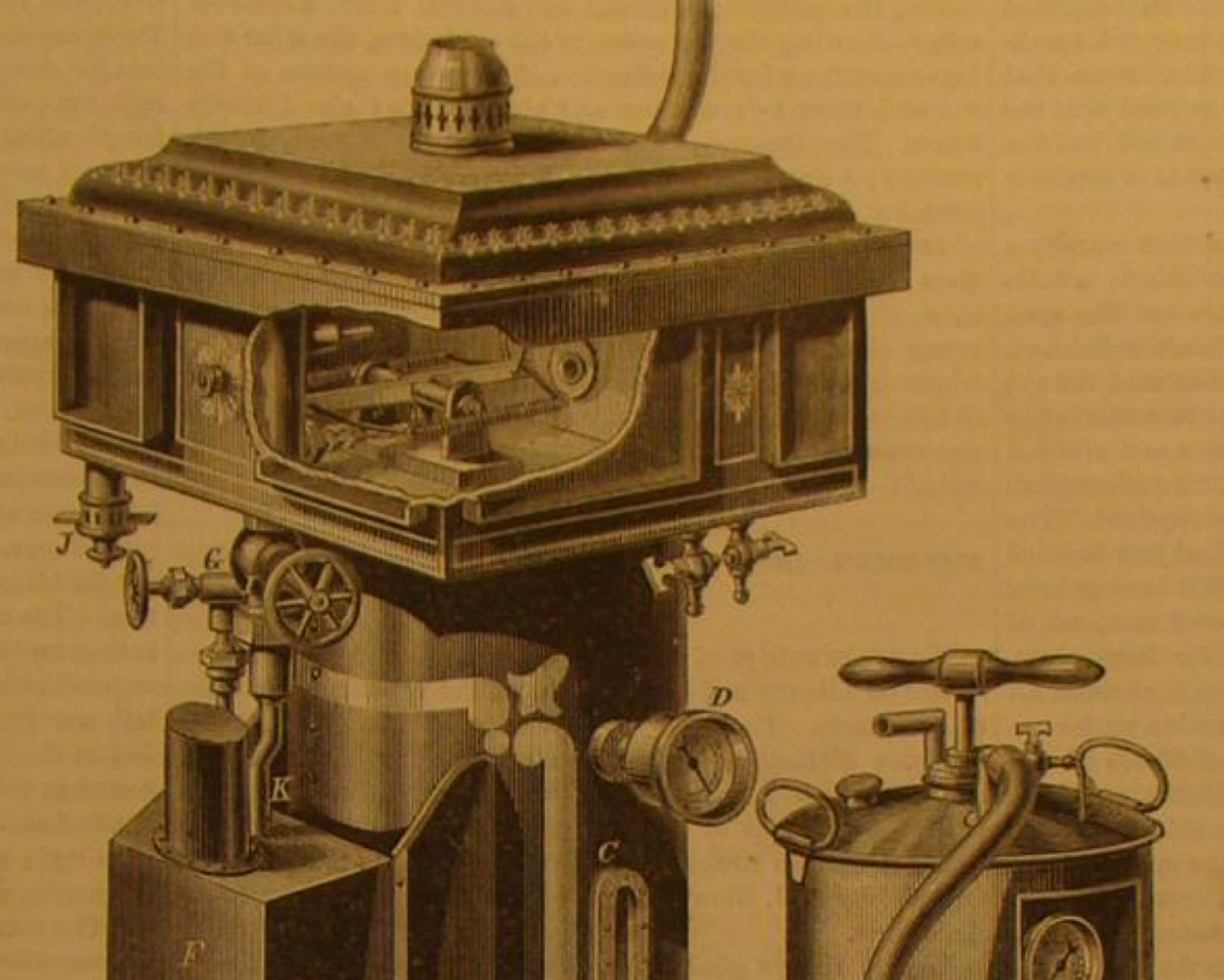
His next was a modification of this first, heated by steam, controlling the steam in the same manner that the flame was controlled on his first machine, and designed for and used as a locomotive head-light. It consisted of a horizontal cylindrical tank, placed under the reflector, and divided into two connected compartments filled with gasoline. Around one of these steam circulated, and in the other was a coil of steam pipe. Steam came direct from the locomotive boiler, passed through a gas superheater on top of the tank, and downward into a steam jacket surrounding a portion of the liquid contained in an elastic shell, then through the coil in the other compartment, and out. As the liquid became heated in the elastic shell, it evolved gas until a pressure was generated sufficient to expand the head of the shell, which operated on a steam valve and stopped its flow. When the pressure was relieved the shell collapsed and allowed a fresh supply of steam to flow. The vapor generated by the heat of the steam passed upward and through the superheater around the steam pipe, and into and through an argand burner. This was patented through the Scientific American Patent Agency, Nov. 26, 1867.

All attempts to burn the pure vapor with this machine were unsatisfactory, the flame being very sensitive; hence, in the spring of 1868, he discovered a mode of injecting air into the vapor before it reached the burner, and it was found that carbonated air made by this process was very far superior to that made in the ordinary way. This was patented for railroad cars through the Scientific American Patent Agency, June 2, 1868.

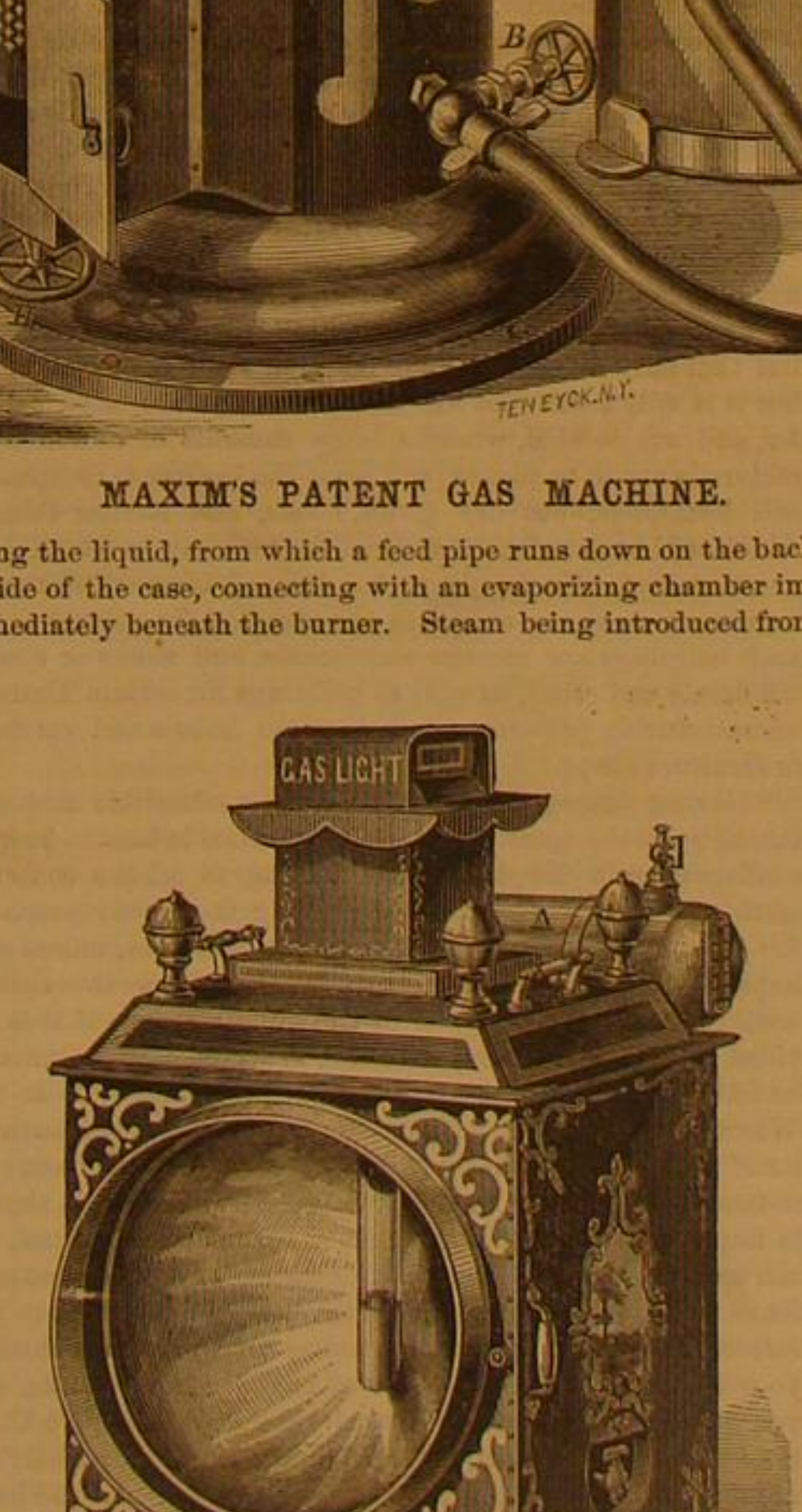
Another apparatus, having automatic valve gear for controlling the flow of vapor, and embracing the main features of the machine shown in the engraving, was also patented through the Scientific American Patent Agency, Sept. 8, 1868. In all these the whole body of liquid used was heated. The waste of liquid and the expense of heating the mass for a small number of burners, led to the invention of a mode of heating only a small portion at a time. A small heater connected with the tank containing the liquid, under a pressure of air was found to work admirably. An apparatus of this kind was patented by H. S. Maxim and James Radley, May 4, 1869, which is fully shown in the accompanying locomotive steam head-light and house-machine engravings.

The first head-light made under this patent had the tank containing the liquid in the corner of the head-light, the liquid and air being forced in by a special pump and can, used for both house-machine and head-light, and constructed to pump either liquid or air. This pump can is shown at the right of the large engraving, and is only attached while filling the tank. It was found, however, that by placing the tank on top of the head-light case the gravity of the liquid gave abundance of pressure, therefore the use of the compressed air in the steam-gas locomotive head-light was dispensed with.

The smaller engraving represents an improved steam gas locomotive head-light in perspective. A is the tank containing the liquid, from which a feed pipe runs down on the back side of the case, connecting with an evaporizing chamber immediately beneath the burner. Steam being introduced from



MAXIM'S PATENT GAS MACHINE.



the boiler of the locomotive on the opposite side of the case, circulates around the vaporizing chamber, converting the liquid into vapor, and passing up from the heater the hot air is injected, and the gas flows through the burner. The pipes for the inlet and outlet of steam are so arranged that but one hole is made in the case.

The larger engraving is a perspective view of an improved apparatus equally applicable to dwelling houses, factories, churches, hotels, steamers, etc.

To operate the machine, gasoline is pumped in at the cock, B, until the liquid reaches the top of the gage, C, then air is forced in until a pressure of 25 lbs. is indicated on the gage, D. A combined air and liquid pump can, E, goes with each machine, which, as above stated, is detached from the machine after charging with air and gasoline. The compressed air acts as an elastic spring on the gasoline, forcing it into a retort contained in the case, F, from the bottom of the tank. The gasoline is forced up through a small pipe inside of the tank and out through the cock, G, thence downward and into the bottom of the above-mentioned retort, with a force equal to the pressure of the air in the tank. Under the heater and inside of the heater case is a small cup surrounding the bottom of the burner, which, being filled with alcohol and ignited, heats the burner, and when nearly burned out, the heater cock, H, can be opened, and the apparatus will furnish its own heat. After ten minutes the cock, I, can be opened, and the machine is ready for use. The flame can be left burning all the time in the heater, all further attention being to fill the tank more or less often as the fluid is consumed.

In the density regulator, J, are holes to admit air, which, when wide open, makes the gas poor or thin. Being half closed, the gas will be, and will remain, at the right density, no matter what number of lights are used. By this regulator the quality of the gas can be changed at will, and permanently set to furnish gas of the required density. Gas made by this mode stands a more severe test, without any appreciable varying of the lights or the quality of the gas, than even the street gas. The heat is applied to the top part of the generating retort, leaving the lower end comparatively cool, so that a small quantity of gasoline remains at the bottom, while the top is filled with hot vapor. As the vapor is forced up through the pipe, K, the gasoline rises until it boils sufficiently to generate more vapor and fill the space.

The square top is a gasometer so arranged that, as the gas is drawn off the top falls and trips a small valve, which admits more of the hot vapor, and again rises.

As the vapor escapes from the retort with great velocity it draws a current of air through the density regulator, J, mixing it thoroughly with the gasoline vapor in the gasometer.

A machine three feet in hight and fourteen inches square is calculated to supply sixty burners, and the light given is as steady and agreeable to the eye as that of the illuminating gas now in use, while its cost is far less.

Having ourselves had much experience in the working of such machines we were inclined to discredit some of the statements made in regard to this one, particularly those made in regard to its performing good work in cold weather, where the gas requires to be conveyed through long pipes. On other machines the gas, under such circumstances, often becomes so impoverished by condensation that it fails to give a good light. We therefore took the trouble to personally inspect the working of this machine, and at our request the gas was passed through ten feet of lead pipe coiled and immersed in a freezing mixture of salt and pounded ice; and, that the test might be still more severe, only one burner was used, so that the gas was forced to pass very slowly through the refrigerating section of pipe. Under these circumstances there appeared to be no difficulty whatever in adjusting the density regulator so that the flame at the burner should remain undiminished.

Further information may be obtained by addressing Radley, McAlister & Co., 162 Greenwich street, New York.

The control of these inventions, so far as they relate to the lighting of buildings, has been transferred to M. H. Strong and Thos. E. Hastings, either of whom may be addressed at No. 19 Cliff street (Room No. 10), New York, where a machine may be seen in operation.

MR. FISK'S private office is only equaled in its gorgeous appointments by Mr. Jay Gould's, and both are unique. A restaurant is one of the appurtenances, and the whole building, which was once a theater, is now a palace. The Erie shareholders seem to have a good show for dividends.

THE GREAT CLOCK OF BEAUVAIS CATHEDRAL AND THE STRASBOURG CLOCK.

From the remotest periods man has felt his way towards measuring that impalpable agent, ceaselessly-progressing, never-resting time. He has measured it by torches of pitch which should burn regularly. He has invented the hour-glass and the clepsydra, where grains of sand or drops of water falling from one vessel into another indicated its passage. He has invented the sun dial. What has he not imagined, from the time when, having discovered the mariner's compass in 1303, he perceived and applied the principle of gravity as it exists in the pendulum. This was the great advance, the chief step forward which opened the door of discovery to the learned to the mysteries of astronomy. By the exact measurement of time some of the greatest natural problems had been solved. But that man who would ask of horology nothing more than the indication of the time for his repasts and his repose, is profoundly indifferent to its aim and object. However, an inventive genius constructed the clock of the cathedral of Strasbourg which indicates a mass of things unrecorded in the almanacs of the period. This was regarded with the veneration with which a saint was invested, speaking a dead language unknown to the multitude. Since that time, mechanical invention has become so general that the clock of Alsace has ceased to be a mystery to all but the learned, the possession of a time-keeper being now common to most of us.

Something novel was further desired, and this novelty a clock-maker of Beauvais has given us. But this is a little history. Do you know the cathedral of Beauvais? The span of its roof leaves a space of full 50 yards. This is unfinished, and for 200 years nothing but an ugly wall saluted the eye as a blemish on this colossal monument. To cover this defect the chief inhabitants (to the number of 10) met and clubbed together to place there an ornamental clock. To accomplish this purpose, money and an horologist were required. The clock-maker was at hand, a fellow townsman had just finished a splendid work for Besancon. A sum of £1,600 having been collected, the work was begun. Twenty workmen, ten of whom are clock-makers, have been at work for four years. The accomplishment of this great work leaves far behind all previous attempts in this direction. The result is a work composed of 14 different movements consisting of 90,000 pieces, weighing over 35,000 pounds, and costing £5,600, or £4,000 more than the sum first collected, but against this excess is to be reckoned a *chef d'œuvre* which future ages may well be debited with. The body of the clock is 36 feet high, it is made of sculptured oak in columns, and measures 16 feet in breadth by nearly nine in depth; the whole is finished in the Byzantine style of decoration. The figure of the Supreme Being from the summit of the clock, at every hour, by a solemn gesture, calls attention to the saints who are at their alcoves yielding attention to the sounds which accompany the crowing of a fine cock.

The main dial, there are 50 in all, is occupied by the figure of the Saviour enameled on copper, the largest work in enamel existing; it cost £130. Above their divine Master the 12 apostles, also in enamel, figure in a circle artistically expressive of devotion. Two hands of steel covered by platinum, move over this dial through twenty-four divisions; it is pierced, as are all the others, and shows the pendulum, weighing nearly one cwt., which renews its impulse from a steel ball weighing a gramme, or about the 32d part of an ounce. This impulse is thoroughly the product of mechanical inventiveness, and is, as it were, an allegory exhibiting the submission of brute force to intelligent direction. This movement impels the 14 others, and is wound up weekly, being driven by weights in the usual way The other dials indicate: The days of the week. The movements of the planetary bodies. Sun-rise. Sun-set. The seasons. The signs of the Zodiac. The duration of daylight. The duration of night. The equation of time. The dates. The saints' days. The months. The phases of the moon. The age of the moon. The time at the principal cities of the world. The solstices. The movable feasts. The age of the world. The year of the century. The bissextile years. The longitudes. The number of the century. This portion of the machinery exhibits no indication more than once in 100 years, but nothing more is required than to wind the machine every eighth day. Other dials show further: The tides. The eclipses for all the world, both total and partial. At the hour when the sun or moon is eclipsed in the heavens, to the minute even, the sun or moon suffers obscuration on the clock. To form a correct appreciation of the enormous work and calculation in this great machine, unequaled anywhere, which has its separate movement from that which shows seconds of time to those which indicate events occurring not oftener than once in 100 years, it must be remembered that three centuries out of four the last year leaps its bissextile. In these years the clock has to leap from February 29, and goes from the 28th to the 1st of March. Here is a movement occurring only in 400 years. What is left but to admire the inventive genius which has combined in one harmonious whole and subjected to a uniform direction 90,000 separate pieces, all united to measure and indicate the footsteps of time, showing the positions of the smaller and the greater heavenly bodies in both worlds; even those we see nothing of, which exist in the other hemisphere, and of which this clock faithfully records the rising and setting. The inhabitants of Beauvais possess a wonder of the world, and we are indebted to them for showing it at the Exhibition of Paris, where its modest inventor explained its operations, and who by a remarkable coincidence bears a name strictly in harmony with his devotion to exact science. His name is Verite.

Mr. Steckelburger, of Strasbourg, jealous for the honor of his native town, protests as follows against the assumption that the Beauvais clock is unequaled: "Mr. Mauremont says that the astronomical clock of Strasbourg has no longer any secrets for anybody. For a very good reason, indeed! He is speaking of that which was constructed in 1574 by Isaac Haberecht. How could this poor machine have any secrets for any one, since it was taken down 30 years ago, and the various parts placed in the religious establishment of Notre Dame, where it may still be seen. But this is not the clock we have to do with; the present clock dates from 1842; it is that constructed by Mr. Schwilgue.

"I could not suppress a smile at the catalogue of indications said to be shown by the Beauvais clock, for our cathedral clock shows all these and some besides. It shows all the wonderful things in the almanacs, and all the astronomical calculations possible and perpetual. It contains an ecclesiastical computator with all its indications; the golden number, the epacts, dominical letter; solar cycle, etc.; a perpetual calendar with the movable feasts, a planetarium on the Copernican system, showing all the mean equinoctial revolutions of every planet visible to the naked eye; the phases of the moon; the eclipses; apparent and sidereal time; a celestial sphere showing the precession of the equinoxes, the solar and lunar questions for the reduction of the mean motion of the sun and moon to true time and place. What else I hardly know. The Beauvais clock makes a change in every fourth century; a great merit! The precise indication is exhibited here, but ask an astronomer what is meant by the precession of the equinoxes. He will tell you it is a movement in the stars describing a complete revolution round the earth in the space of about 25,000 to 26,000 years. Well, Sir, in the Strasbourg clock is a sphere following exactly this motion, and whose rotation is of that kind as to ensure one revolution in 25,920 years. The thing can be measured and indicated; it is unnecessary to await its accomplishment: it would be too remote."—*Mechanics' Magazine.*

AMERICAN INSTITUTE OF ARCHITECTS.--FIRE-PROOF CONSTRUCTION.

We are in receipt of two pamphlets published by the Committee on Library and Publications of the American Institute of Architects. The first is a paper upon "The Architectural Societies of Europe," giving an account of their formation and methods of administration, with suggestions relating to the proper means of insuring the largest success of a National American Architectural Society, with its local dependencies. By A. J. Blow, Fellow of the American Institute of Architects.

We are always glad to notice the progress of scientific and mechanical associations, and we have always maintained in these columns their general utility. We cannot, however, notice at length this able paper, although its perusal has afforded, and will afford, all who attentively peruse it, both instruction and pleasure.

The second paper, however, entitled "Remarks on Fire-Proof Construction," is of such practical importance that we take pleasure in giving place to some of its valuable statements and suggestions, although we do not wish it inferred that we indorse all the conclusions of the author. The paper is from the pen of P. B. Wight, F. A. I. A.

Mr. Wight defines a fire-proof building as one which cannot burn, and which contains nothing that can burn.

"It is very seldom that any building is required for such use that only non-combustible material shall be placed in it; but it is still a fact that fire-proof buildings are often called for, and are needed, wherein large amounts of combustible materials are to be placed; not what the insurance companies call hazardous, but dry goods, books, and similar things, which will burn independently of the building in which they are contained. To supply such a demand is one of the most important problems offered to the architect for solution. Of such buildings are storage warehouses, and stores or shops, wholesale and retail, as well as buildings for certain kinds of manufacturing processes, such as sugar houses and carriage or furniture shops.

"Having devised a building of non-combustible material throughout, the question which next arises is how to keep a conflagration in one part from extending to all the contents of the building. The idea of making them only partially fire-proof is not to be considered for a moment, unless perhaps the material contained is so highly inflammable that it would destroy the material of the building, even if it is divided into fire-proof compartments, in which case it seems to be folly to go to the expense of fire-proof materials at all. When you know that no part of your building can burn of itself it is evident that every atom of it will offer some resistance to the enemy confined within. I believe, too, that it is impossible to smother or choke a fire once commenced, by the use of closed compartments. Accident or carelessness may leave some openings which will facilitate a draft in some unforeseen way. And even supposing that you have shut in your fire by some arrangement of closed compartments, can you give your compartment less air than a charcoal pit? Clos it as much as you will, your confined goods, if the barriers are not forced by the immense power generated by the heat, will at last be reduced to charcoal: for you cannot open a door or window upon such a smouldering fire but that it will instantly burst into flames.

"Storehouses are the only class of buildings which admit of division into air-tight compartments, and there is a practical objection to them in even buildings of this class: but few kinds of goods can be preserved without good ventilation. It seems, therefore, that the compartments should be open and accessible from without, but carefully divided from each other. If so, they afford good facilities to those employed in extinguishing fires; and I think that in a building thus arranged, there would be a more reasonable chance of a portion of its goods being saved."

The division of buildings into horizontal compartments, rather than vertical ones, is so much more desirable, where land is expensive, that inventors have almost exhausted their ingenuity in devising thoroughly fire-proof floors. It is obvious, however, that the division of a building by vertical fire-proof partitions, is a matter so easy of accomplishment, that it is questionable whether the horizontal division, so beset with practical difficulties, so expensive, and withal so much less to be depended upon, even when the best systems of construction are used, is ever economical, even where ground is expensive. Mr. Wight even questions whether it is of any use to build iron floors, or floors with iron supports, for buildings to contain goods; considering brick piers and groined arches as alone reliable.

"Several fires occurring recently in the Brooklyn warehouses have warned their owners to take extra precautions, even though none of these warehouses is fire-proof. One of the best is known as the Pierrepont Stores, near the Wall-street ferry, and the arrangement of them is well worthy of notice. These are about three hundred feet in length, and are divided into six compartments by fire-proof party walls; the width of each compartment is consequently about fifty feet, and the length about two hundred feet. The floors are of wood, and it would have been useless to make them of iron and brick; for the goods taken in them are mainly sugars, and it would be folly to attempt to arrest a fire of such combustible material in its ascending course, by any practicable device. But what is most interesting in these buildings is that each is fortified against its neighbor. Recently the party walls were carried up about six feet above the roofs and were pierced with embrasures, through which firemen can play from the roof of one building upon the flames in another, with perfect safety to themselves. Here is an instance wherein capital would have been wasted on the expensive materials required for fire-proof floors.

"Buildings for manufacturing purposes next demand attention. The extra cost of fire-proof construction in a manufacturing building is small when compared with that of a bank or public building. The walls and ceilings require neither lath nor furring, and the floors may be of flags or slate, bedded on the brick arches, or what is better, plates of cast iron bolted to the beams—which will presently be described. All inside finish may be discarded and iron doors, of No. 16 iron, with light wrought-iron frames, hung to stone templates in the jambs, are the only coverings required for the openings.

"The most extensive attempt to build a fire-proof building for manufacturing purposes was the enterprise of Harper & Brothers. This was one of the pioneer buildings of the new dispensation. The Harper girder is well known; it is an ornamented cast-iron beam, with a tie rod, and was the father of the truss beam, now so extensively used for supporting the rear walls of stores. It has been succeeded by the built-up beam, now generally used for girders, and the double rolled beam. It was eminently a constructive beam, using iron according to its best properties—cast iron for compression and wrought iron for tension."

Of banks and insurance buildings we certainly have a large number which are to all intents fire-proof, though but few are thoroughly so. It is generally admitted that such buildings are not in danger from their contents, and to this belief may be ascribed the fact that we already have so many of this class. Mr. Wight considers the Continental Bank, the American Exchange Bank, the Mutual Life Insurance Company's building, the Park Bank, and the City Bank building, in New York, as absolutely fire-proof. Nothing less than a bonfire of all the furniture, books, and paper, that could be collected together in any one room of any of these buildings, would endanger its destruction. They are safe from any ordinary casualty. But in all the rest there is enough woodwork to make the word "fire-proof," as applied to them, of very doubtful significance. In nearly all the so-called fire-proof bank buildings the rates of insurance are as high as in ordinary business buildings.

"And, first, how shall floors be constructed? Before the 'iron period,' when our Washington Capitol, our City Hall, our old Exchange and Custom House were built, the Roman and Medieval vaults only, were used—either of stone or of brick plastered. When the width of a room was too great for one span, granite columns or brick piers were used, as in our old Exchange, now the Custom House. The floors above the vaults were leveled up and paved with flags or marble tiles. As far as grace, strength, and absolute relief from the dangers of fire were concerned, this was a perfect system. But now space is demanded; there must be no more heavy piers and no great thickness of floors. We are therefore forced to use a material which, though not combustible of itself, will do little work if exposed to great heat; and in this is seen the great difference between our fire-proof buildings of the brick period and those of the iron period, and the inferior fire-proof qualities of the latter.

"The problem now is, to use the minimum of brick and the maximum of iron. The problem might be put thus: 'Given iron, make as nearly fire-proof buildings as possible out of it.' What then has been done with it thus far? For columns, we have used cast tubes of all shapes and sizes and the wrought-iron pillars of the Phenix Iron Company; for girders, we have used compound beams of cast iron with wrought ties—built-up beams of various forms of rolled and plate iron, bolted and riveted together—and common rolled beams, used double; for floor beams we first used deck beams for wide spans, and railroad iron for narrow spans; these have now been superseded by the I-beam of various sizes. The rolling mills now have on their circulars I-beams of great dimensions and suitable for girders, but refuse to fill any but large orders." Indeed Mr. Wight believes that only one mill has rollers for beams larger than thirteen inches, while the others will not put up machinery until they get large enough offers. "So we are thus far deprived of large smooth beams of one piece, for girders of long span—beams which no one would desire to hide from view, but which might honestly tell their use to every beholder. For supports between beams we have had Peter Cooper's *terra cotta* pots and the four-inch brick arches. The former are out of use, and the latter are almost universally employed. Corrugated iron—first used in the Columbian Insurance building by Mr. Diaper—has also gone out of use. The destruction of the Fulton Bank, a so-called fire-proof building, sealed its fate as far as floors are concerned. We have also had the experiment of stone floors in the American Exchange Bank, by Mr. Eidlitz, and repeated by another architect in the Mutual Benefit Life Insurance Building at Newark, N. J. The stone slabs, brick arches, and the Parisian floors—of plaster or concrete, bedded upon bar iron gratings inserted between the beams—are the only practical system of fire-proof floor construction now in use." The only attempt to lay the floor *on* the beams, of which Mr. Wight had knowledge, is in the sugar house above mentioned. This has suggested to him several methods of laying rigid floors upon beams at considerable spaces (three to five feet) from one another. Preliminary to so doing Mr. Wight suggests the revival of the deck beam, or the I-beam with a better form for the bottom flange, and the adoption of cast-iron shoes for the bearings.

(To be concluded next week.)

ON RIVETS AND RIVETING.

(Condensed from Van Nostrand's Magazine.)

BY MARTIN BALCKE.

The following remarks do not refer to riveting for the purpose of merely uniting two parts of machinery or two sheets of iron, but they apply to rivetings which require a higher degree of strength and solidity, as, for instance, for boilers and working parts of machines. It is a general rule for all constructions, especially for those in iron, to distribute the strain which has to be withstood by a certain part of a machine, as evenly as possible over the solid mass of the said part. This rule is also very important in the use and arrangement of rivets. The simplest and safest way to carry out this rule is to calculate directly the areas of the working sections, and to see that the strain which acts on any part of a section, does not exceed certain limits generally conceded to the respective materials. This is the way also to avoid the use of empirical formulæ, the most important coefficients of which are always dictated by the personal opinions and notions of their authors.

The force necessary to tear a wrought-iron bar of a certain section, is so nearly equal to that required for cutting or shearing the bar, that both may be considered as equal in calculations, for practical purposes. The limit of elasticity of soft wrought iron, as generally used for rivets, is at a pressure of about 18,000 lbs. on the square inch. With boilers the strain of tension per square inch of section of the material, ought not to reach 9,000 lbs.; because continued heating and long use weaken the material considerably.

In the construction of stationary boilers, one square inch of section, taken through the riveting, ought generally not to be strained above 12,000 lbs. But if a riveted part of a machine has to sustain a strain acting alternately in two different and opposite directions, this strain should never exceed 2,000 lbs. per square inch of section.

If a quite uniform distribution of the strain over all the sections cannot practically be obtained, at least the tension of the sections which are exposed to the highest strains ought to be kept within the above-mentioned limits.

The shape of the head of a rivet is dependent on the kind of strain to which the rivet is subjected. This strain can have the tendency of tearing or of shearing the rivet, or of both simultaneously. If a rivet has to withstand a tearing strain, the hight of its head must be such that the cylindrical surface which would make its appearance when the head of the rivet would be stripped off, is equal to the area of a cross-section through the rivet—that is, the hight of the head has to be one half of the radius, or one fourth of the diameter of the rivet.

Practical experiments on the strength of rivets have come to the same result, and have besides shown very distinctly that the rivet holes should never have sharp edges, and that the head of a rivet ought to be connected with the shaft by a conical part. Whenever this part is omitted, and when, consequently, the rivets have sharp corners below their heads and the rivet holes sharp edges, the rivets break close to the head, when subjected to a strain of tension and when the heads are strong enough not to be stripped off. When, on the contrary, the rivets have a conical connecting part between their heads and shafts, they extend considerably before they break, and the rupture finally occurs in the middle of the shafts. All experiments have given this result without exception.

Rivets subjected to a shearing strain only, would theoretically not require any head at all. But it is good also in this case to make the heads of the rivets as high as above determined, because generally a close contact of the riveted parts is desirable, and because the rivets, being set in red-hot, have to resist the strain of tension produced by their contraction in cooling.

If the heads of rivets have to be countersunk, their best shape is that of a truncated cone, the angle at the point of which cone would be of 75°.

The sectional area of the shaft of a rivet, expressed in square inches, is found by dividing the actual and total strain on the rivet, by the strain practically admissible on the square inch of the respective material.

We will now examine the riveting of simple round boilers. The shearing strain in pounds on every rivet in the length rows is equal to one half the diameter of the boiler in inches, multiplied by the rivet distance in inches, multiplied by the steam pressure in pounds less 15 pounds atmospheric pressure.

The strain upon every rivet distance in rows round the boiler expressed in pounds is equal to one fourth the diameter of the boiler in inches, multiplied by the distance between any two rivets in the same row round the boiler taken in inches, multiplied by the steam pressure per square inch in pounds, less 15 pounds atmospheric pressure.

Now, to obtain an even distribution of the total pressure in the boiler over all its sections, the sectional area of a rivet has to be equal to the sectional area of the plate between two rivet holes, and equal also to the double area of a section through the plate, from a rivet hole to the edge. That is, the sectional area of the rivet in square inches must equal the distance between any two rivets in a row round the boiler in inches minus the diameter of the rivet, multiplied by the thickness of the boiler plate in inches; or, conversely, the distance in inches between any two rivets in a row round the boiler must equal the sectional area of the rivet in square inches, divided by the thickness of the boiler plate in inches, plus the diameter of the rivet.

From this we conclude that the rivet distance is dependent on the diameter of the rivets, and, reciprocally, the diameter on the distance. To determine these, it is necessary to take into consideration the possibility of making and keeping the boiler tight, which possibility depends principally on the relation between the thickness of the plate and the rivet distance. Let us consider a special case to explain this more fully. We suppose a simple cylindrical boiler to have a diameter 42 inches; the thickness of the plate, 0·3 inches; the excess of the steam pressure over the atmospheric pressure, 42 lbs. Under these conditions the strain of tension per square inch of plate section, taken parallel to the axis of the boiler, is—

$$\frac{21 \times 42}{0{\cdot}3} = 2{,}940 \text{ lbs.}$$

In taking the areas of the rivet sections equal to those of the plate sections contained between two rivet holes, according to the above rule, and in calculating the following items for three different rivet diameters, for the sake of comparison, we find—

The rivet diameter being ⅝ in., ¾ in., ⅞ in.

Area of rivet section (sq. in.), 0·307, 0·442, 0·601.

Distance between rivets (inches), 1·648, 2·22, 2·878.

Shearing strain on a rivet (lbs.), 1,453, 1,959, 2,538.

Strain per square inch on a section through the plate, or through the rivets in the length rows of the boiler (lbs.), 4,730, 4,430, 4,220.

[The shearing strain on rivets and the strain per square inch of section in the rivet rows round the boiler, are one half of those in the length rows.]

The strength of the riveting compared to the strength of the simple plate is 0·62, 0·66, 0·70, for the three different rivet diameters.

The advantages and disadvantages of the one or other of the chosen rivet diameters are clearly shown by these figures. The ⅝-in. rivets produce a very small comparative strength of the riveting (0·62). The ⅞-in. riveting has a great comparative strength; but the distance between the rivets (2·878 in.) is too large in proportion to the thickness of the plate, to allow of a good and safe tightening of the joints. The ¾-in. rivets, not showing either of the two mentioned disadvantages in a considerable degree, are evidently the best in this special case.

ON THE TEMPERATURE OF COAL MINES.

A PAPER READ BEFORE THE MIDLAND SCIENTIFIC SOCIETY, ENGLAND, BY A. LUPTON, F.G.S.

In instituting the experiments, the result of which I propose to describe to the present meeting, and which extended over a period of a year and a half, I was actuated by a desire to ascertain the amount of truth in the often-repeated statements of practical men, that the temperature of deep mines that had been at work for some time, did not exceed the temperature of shallower mines, and to reconcile, if possible, those statements with the generally-accepted observations recorded by scientific men, which tended to prove a gradual increase in the earth's temperature in descending. Owing to the kindness of the engineer, I had the opportunity of ascertaining the temperature of two shafts as they were sunk; the method of observation was as follows: A bore-hole was made in the center of the shaft bottom, from 6 to 9 feet deep; a thermometer was let into the bore-hole by means of a wire, then the top of the hole was tightly plugged with hemp and clay, in order to prevent, as far as possible, the circulation of water in the hole. The thermometer was allowed to remain in the hole for 24 hours at a time. I used maximum registering thermometers, some by Negretti & Zambra, and some by Mr. Davis, of Derby. Owing to the presence of water in both the shafts, the value of these experiments is much diminished; and, in one shaft, which attained a depth of 906 feet, the rise in temperature, as recorded by the thermometers, was only 1° for every 120 feet; in the other shaft, where there was less water, and which attained a depth of 966 feet, the rise in temperature was 1° in 73 feet. I next had a series of holes bored horizontally in the shaft sides, into each of which I put a thermometer; the holes were tightly plugged, to hinder the circulation of air in them. The temperature of these holes remained the same, winter and summer, throughout great variations of temperature in the air of the shaft. In the drier of the two shafts above-named the rate of increase in temperature varied from 1° in 70 feet, to 1° in 60 feet. I then repeated similar experiments to these last at the Hucknall Colliery, in Nottinghamshire, through the kindness of Mr. Fowler, the engineer, and found a regular increase in the temperature of the works of 1° in 60 feet; the depth of the pit is 1,250 feet. Also, by the kind permission of Mr. E. Hedley, the engineer, I took the temperature of the coal at the bottom of the Annesley Colliery; the temperature was 73°, and the depth 1,425 feet, being an increase of 1° in 60 feet. By the kindness of Mr. Carrington, I was enabled to make similar observations at the Kineton Park Colliery; the pit is 1,200 feet deep, the temperature of the coal 71°, being an increase of 1° in 55 feet. The result of all my observations is, that the permanent temperature of the earth, at the depth of 50 feet, is 50°, and the regular rate of increase in temperature, below that depth, 1° in 60 feet. Observations made by others in the North of England and South Wales seem to prove the temperature of the mines depends on the depth below the surface of the ground, irrespective of the depth below the sea-level.

The next question is, given the above rate of increase in the earth's temperature, at what depths will it be practicable to get coal? I, therefore, made some experiments to ascertain what effect ventilation would have in cooling the mines. At the Hucknall Colliery the temperature of the coal, when first the pit was sunk was 70°; ten months afterward a hole was bored, 2 feet deep, into the side of a coal head, through which a current of air had passed, and the temperature of the coal was found to be 59½°. At the Annesley Colliery, the coal, when first cut, had a temperature of 73°, whilst a bore-hole in a head that had been driven six months, had a temperature of 64°. At Kineton Park, the coal, when first cut, had a temperature of 73°; and, after three months exposure to a current of cold air, the temperature of the coal in a hole 2 feet deep was 60°. Many other experiments, at other collieries, gave similar results. With a small sensitive thermometer I found the coal, in heads that had been driven some time, was, at a depth of only 6 inches from the surface, of the same temperature as the air circulating past. From the above experiments I came to the conclusion that the passages in a mine were soon cooled by a brisk current of air, coal being a bad conductor of heat. The internal heat of the pillars of coal could not be conveyed to the surface as quickly as it is carried away by the current of air. At a depth of 10,000 feet, the temperature of the coal would probably be about 212°. According to Péilet, 1 square foot of cast iron, at a temparature of 212°, in an atmosphere at a temperature of 79°, would give out a certain number of units of heat in a minute. Supposing, for the sake of argument, that 1 square foot of coal surface would give out the same number of units of heat, under similar circumstances, I have calculated that a mine of sufficient extent to produce 1,000 tuns of coal per diem, in a seam of average thickness, would raise from 1,300,000 to 1,500,000 cubic feet of air in a minute, from a temperature of 59° to 79°. In estimating the extent of the heating surface in the mine, I have taken the face of work at a temperature of 212°; and the gate-roads less than a year old have been reckoned as having, on the average, only half the heating power of freshly cut coal, and all the roads along which a current has been passing for more than a year, are supposed to be cooled down to a temperature of 60°. It is quite possible for men to work in a current of air no hotter than 79°, and it is also an engineering possibility to produce a current of air of the above-mentioned volume; and the expense of producing such a current would probably not be an insurmountable obstacle. Having considered the subject a great deal, I have come to the conclusion that, as far as the temperature of the earth is concerned, it will be possible to work coal at a depth of even 10,000 feet.

An Apparatus for Prognosticating the Weather.

The following is the description of an instrument devised by M. Bonneville, of Paris. The instrument is composed of the motor, which imparts motion to the index needle. The motor is composed of two wooden strips, or thin blades, stuck one upon the other, of different hygrometric capacities, one of which is called the positive, and the other the negative. These strips, or thin blades of wood, are curvilinear, and assume the form of an arc of a circle. One of the extremities of this arc is fixed to a square held by screws on to a brass disk; the other extremity is loose and movable. It is connected by a silken thread passing round one of the two grooves of a pulley, with an arbor forming the axis of the index needle. The force of the motor is opposed by a spring fixed upon the brass disk, and connected by another silken thread with the arbor, round the second groove of which it is wound. The expansion of the motor, or its contraction as shown by the index, indicates the presence of much moisture in the air or the opposite condition.

IMPROVED MARINER'S COMPASS.—The Earl of Caithness is the inventor of a new mode of suspending ships' compasses, which for efficiency and simplicity is said to surpass anything yet produced. Instead of the two concentric brass rings having their axles at right angles, known as gimbals, Lord Caithness employs a pendulum and ball, which ball works in a socket in the center of the bottom of the compass bowl. The compass works, therefore, on one bearing on the ball-and-socket principle, and thus maintains its parallelism with the horizon in the heaviest weather. If we may credit the published reports of the trials, the simplicity of this invention is not more striking than its efficiency. It is stated that it has already stood the most trying tests, and the oscillation of compasses to which it is applied, as compared with the oscillation of the gimbal compass is as degrees to points.

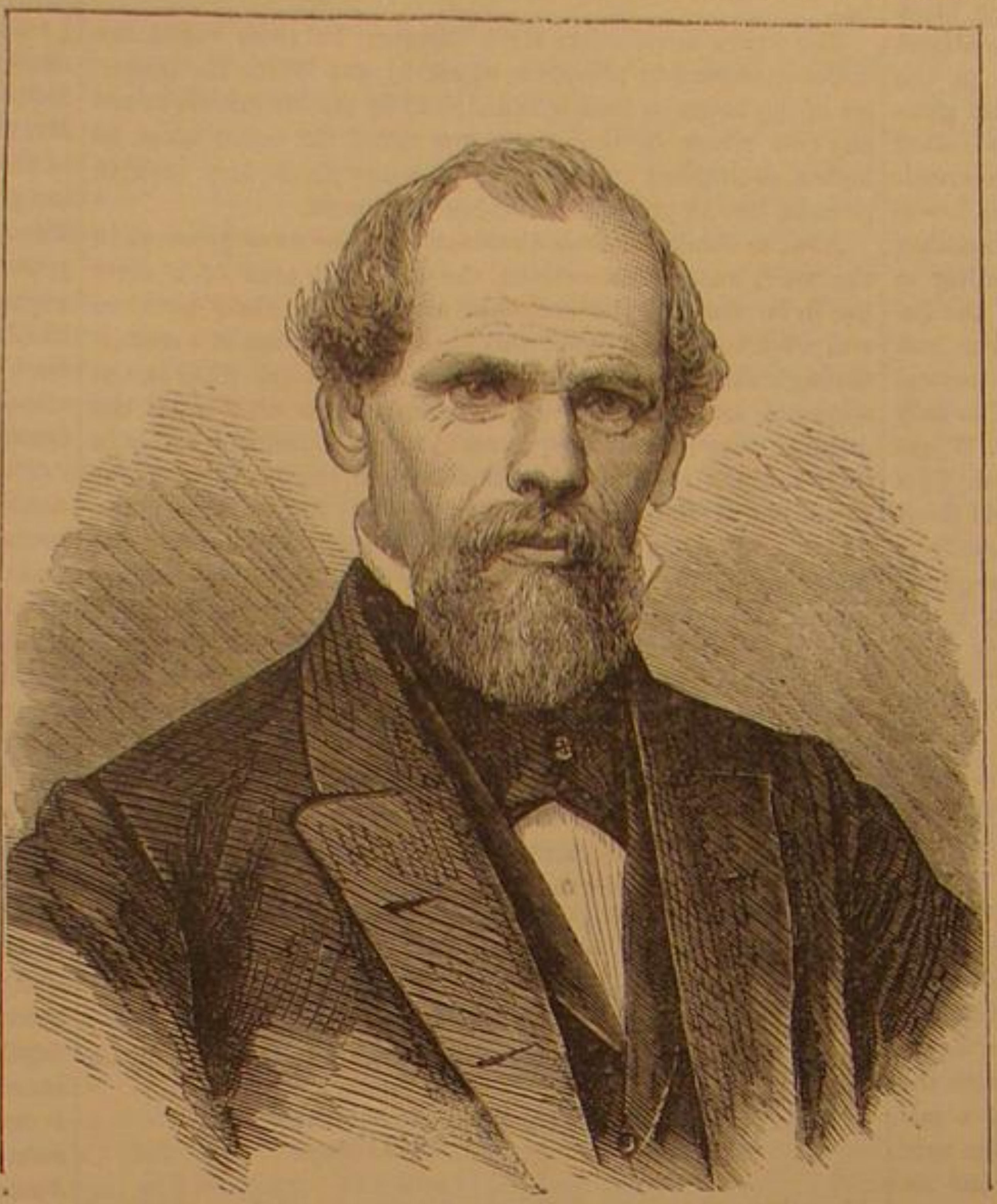
The "Sky Railway" in Running Order.

A visitor to the White Mountains describes Mount Washington Railway, which ascends the mountain in a tolerably straight course, following the general line of the old Fabyan bridle path. The depot is 2,685 feet above the level of the sea, or 1,117 feet above the White Mountain House. This leaves a grade of 3,600 feet to be ov come, as the hight of the mountain is 6,285 feet above th level of the sea. The length of the road is two miles and thirteen-sixteenths.

The heaviest grade is thirteen inches to the yard, and the very lightest one inch to the foot. A part of the course is over "Jacob's Ladder," the zig-zag portion of the old bridle path lying just above the point where the trees are left behind. The railroad takes a generally straight line, however, curving slightly, only to maintain a direct course. The rolling stock is in a much better condition than it was last year. There are two locomotives now in use, and a third is expected from the establishment of Mr. Walter Aiken, at Franklin, this week or next. These are more powerful than those in use last year. A new car has also been constructed.

The locomotive pushes the car before it up the incline, and both run upon three rails, the center one being a cog rail. The engine and car are kept upon the track by friction rollers under the side of the cog rail, and the appliances for stopping the descent are ample. By means of atmospheric brakes either the car or engine could be sent down alone at any given rate, fast or slow, and there are also hand brakes operating with equal directness upon the central wheels, together with other means of governing the machinery of locomotion. Every competent person who has examined the road and the running machinery, pronounce both as safe as they could possibly be made. The landing place at the top of the mountain is directly in the rear of the telegraph office, and but a few rods from the door of the Tip-Top House.

We this week present our readers with a portrait of the late John A. Roebling, whose obituary was published in our issue of Aug. 7th. It is well worth preserving as a souvenir of one of the most distinguished engineers of the age.



PORTRAIT OF THE LATE JOHN A. ROEBLING.

Improvement in Sadirons.

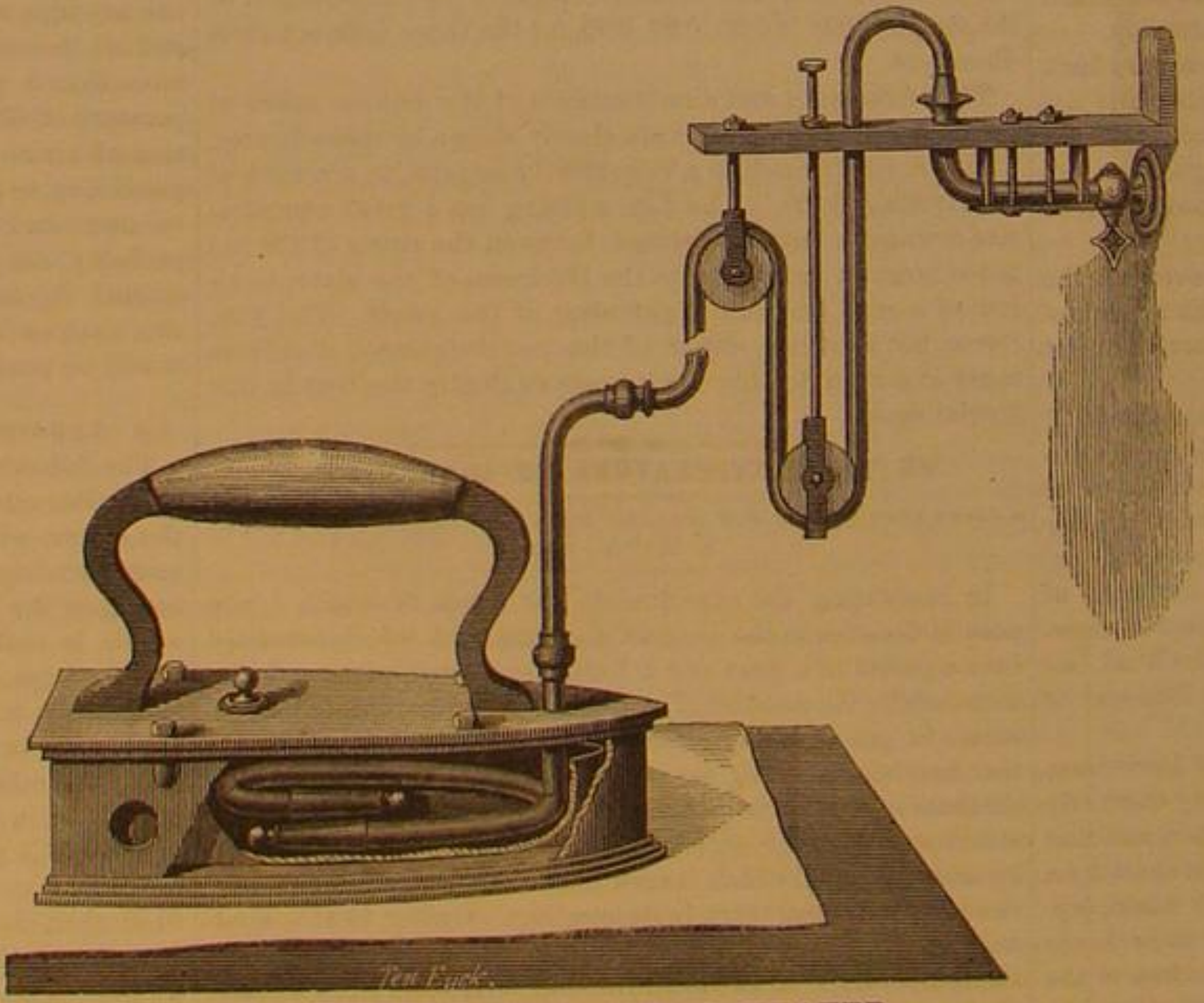
This invention consists, mainly, in so constructing a sadiron that it may be constantly and uniformly heated by a gas flame while in use. The engraving is a perspective view of the device with a portion of the sadiron broken away to show the internal arrangement of the burners employed. These are so plainly shown in the illustration that no further reference to them will be needful.

The sadiron has an interior chamber which may be called the combustion chamber, and an outer one completely surrounding the former, and inclosed by the exterior walls of the sadiron. Through these exterior walls are openings which admit air to feed the flame, and afford exit for the carbonic acid gas generated. The wall immediately surrounding the inner chamber, called the flame wall has, also openings communicating with the outer chamber, so that a fine flow of air can reach the burners, and the gases of combustion escape through the passage between the flame wall and the exterior walls of the sadiron.

The position of the burners is such as to uniformly heat the iron particularly the bottom or smoothing surface, and they are readily lighted from openings provided for the purpose.

The gas is conveyed from an ordinary bracket gas burner, having a suitable framework attached to the wall for the support of two pulleys, one fixed and the other movable, the movable one descending by its own weight; or if needful it may be weighted. A flexible tube passes over these pulleys, and the moving one takes up the slack or lets it out as wanted, to adjust the length of the tube to the motions of the hand in smoothing linen.

Patented, June 15, 1869, by Andrew J. Kennedy, of St. Louis, Mo. Address A. J. Kennedy, care of R. Radke, 515 Olive street, St. Louis, Mo.



KENNEDY'S SADIRON HEATER.

The Hoosac Tunnel.

The new contractors on the Hoosac Tunnel are pushing the work ahead quite rapidly. During the month of June they drove the heading at the east end in 160 feet, and it is in now over a mile and an eighth. The first week in July they made 30 feet and the next week 40 feet. The first and second enlargements are also being pushed ahead vigorously. They are having new drills made to operate on the roof, which they hope to have in operation in September, and by which they expect to increase their progress very materially. They are also erecting buildings near the mouth of the tunnel for four additional compressors, so as to give them more power. They will be run by steam. They have now 200 men at work at the east end, divided in three gangs, who work night and day continuously, resting only from midnight Saturday to midnight Monday. The central shaft is down about 700 feet, and is sunk at the rate of more than a foot a day. At the west end they have just got fairly at work, and they expect to make over 100 feet a month.

Black upon Cotton by Dyeing.

The old fast black upon cotton was obtained by giving a blue ground with indigo, then galling and working in sulphate of iron, sometimes with addition of logwood; alder bark, and other similar substances were also employed; and the goods usually finished in an emulsion of oil, to take off the harshness which iron mordants so generally communicate. Later on, what was called the Manchester black, was obtained by first steeping in galls or sumac, then working in the copperas vat, and afterward in logwood containing some verdigris, and repeating these operations until the desired shade was obtained. Galls are now scarcely ever used; sumac, which is cheaper, being employed in substitution; and the processes, though almost infinite in details, consist essentially of steeping in sumac, then working in an iron bath, and afterward raising in logwood.

One method said to give good results, consists in steeping in sumac for twelve hours, then working through lime water and exposing to the air until the light green color at first produced passes to a dull heavy shade; the goods are then passed through a solution of green copperas, and exposed to the air until they appeared black while in the wet state; if dried they would be found to be only gray or slate color. To fill up the color the goods are passed into the logwood bath (some authorities say it is advisable to pass them through lime water first) for a sufficient time; lifted, some copperas added and the goods raised in it; for light goods this suffices to produce a black, heavier goods require a repetition of the processes. A rapid continuous method of dyeing black on light goods is practiced in Lancashire; the goods are passed through a decoction of catechu, then immediately into a solution of bichromate of potash, next into decoction of logwood, then into green copperas, and lastly through a decoction of some red wood, as camwood or Brazil wood. The order of these liquids may be changed within certain limits.

A simpler method of dyeing by means of bichromates is also given, which consists in steeping the goods in logwood, exposing them to the air and drying, then passing them into bichromate of potash neutralized by crystals of soda, by which the logwood is "struck" of an intense black, and fixed. Velveteens are dyed black by reiterated passages in logwood and green copperas until a dark brown is produced, then passed in sumac and sulphate of copper, with sometimes addition of peachwood or Brazil wood. Fustic is an ingredient in all dyes where a brownish or jet black is desired.

Black is one of the most difficult colors to dye, and no one but a practical man understands the difficulties of obtaining regular and good results, especially when first-class colors are aimed at. It is useless to give weights and quantities when these are really only inferior elements of success; a slight change in the quality of the sumac, something different in the "ageing" or "mastering" of the logwood, some slight modification in the temperature and pressure of the "stills" in which the liquors are made, and other causes not more conspicuous, have frequently in my experience put works almost to a stand still. And when I have been called in for advice, it has been evident that chemistry could only give conjectures as to what was wrong.

These failures in producing satisfactory colors would not be apparent to an unpracticed eye; the defects would only consist in those hues and reflections of shade being wanting which were most esteemed and usually produced. Though it is exceedingly difficult in most cases to trace the actual cause of inferior results, there have been in my practice very evident occasions in which a most trivial and apparently unimportant cause has produced very embarrassing effects; the closest attention on the part of a foreman or manager is most essential in order that these things may be avoided, or if they occur that their cause may be discovered.—*Dictionary of Dyeing and Calico Printing.*

Use of Gun-Cotton in Dentistry.

This statement appears absurd at first, as if dentists used gun-cotton as an explosive agent; but the fact is, that quite recently the collodion made of gun-cotton, hardened by evaporation, as a varnish, into thin sheets, has been used as a substitute for the objectionable vulcanized rubber, as a basis for support of false sets of teeth. For this purpose different sheets are softened by ether, and pressed together in the mold, which is made in a way similar to that in use for making the platinum or india-rubber sets.

One of the objections to the vulcanized rubber sets of teeth is the dark color, which can only be corrected by vermilion, which gives it a reddish color, somewhat similar to that of the gums. Vermilion, however, being a compound of mercury, seriously affects the health of some persons, whose peculiar constitution renders them very sensitive to the influences of this pernicious metal.

In drying, collodion contracts considerably, and the only additional trouble, in making objects of dry collodion, is to make the molds larger, by repeated castings and re-castings in plaster; the plaster expanding every time a little, the last mold obtained may be sufficiently enlarged to compensate for the shrinkage of the material. Sets of teeth made on collodion are much lighter and stronger than on any other material thus far employed for that purpose, and, no doubt, will soon come into general use in the United States, as the dentists of this country are among the most progressive in the world.—*Druggists' Circular.*

Tie-Spotting Machine.

This device is thus described by the *Chicago Railway Review*: "Our readers are aware that rails are generally laid level upon the ties, with the result of bringing the whole weight of the car upon the inside of the rail and the inclined rolling surface of the wheel. Mr. Jauriet conceived the idea of laying the rail so as to incline inwards on the same level as the surface of the wheel. The old hand process of doing this, with adze, is slow and unequal and costs more than it comes to. The tie-spotter, attached to a car and transported from place to place on the line, may be generally described as consisting of two vertical shafts, with knives attached, to which the ties are brought by means of a chain feed. The knives are adjustable so as to 'spot' at an angle, or in the ordinary manner. The machine is operated by the engine attached, and requires, besides the engineer, six men to operate it, who do the work of from fifteen to twenty. A recent experiment resulted in the spotting of seventy-six ties in fifteen minutes."

Telegrams from various points seem to indicate that at least a majority of the astronomers have been in luck in witnessing the eclipse. The weather was generally fine.

THE GREAT SOLAR ECLIPSE.

The morning of the 7th dawned clear but with some floating clouds at this point. Thousands of people were prepared with smoked glass, opera glasses, etc., etc., to observe the remarkable event, although at New York the eclipse was to be only partial, a fact which the press had made generally understood previously.

The scientific were anxious in regard to the news telegraphed from Chicago to the effect that the weather was not propitious, as although the eclipse would not be total at that point it was in sufficiently close proximity to the belt of totality to give fears that the clouds might extend to some of the most important points where observations were to be attempted. Up to the present writing, we have not the news from the different points of observation, and are therefore unable to state how much success has been achieved by different expeditions, but will give a summary of the results in our next.

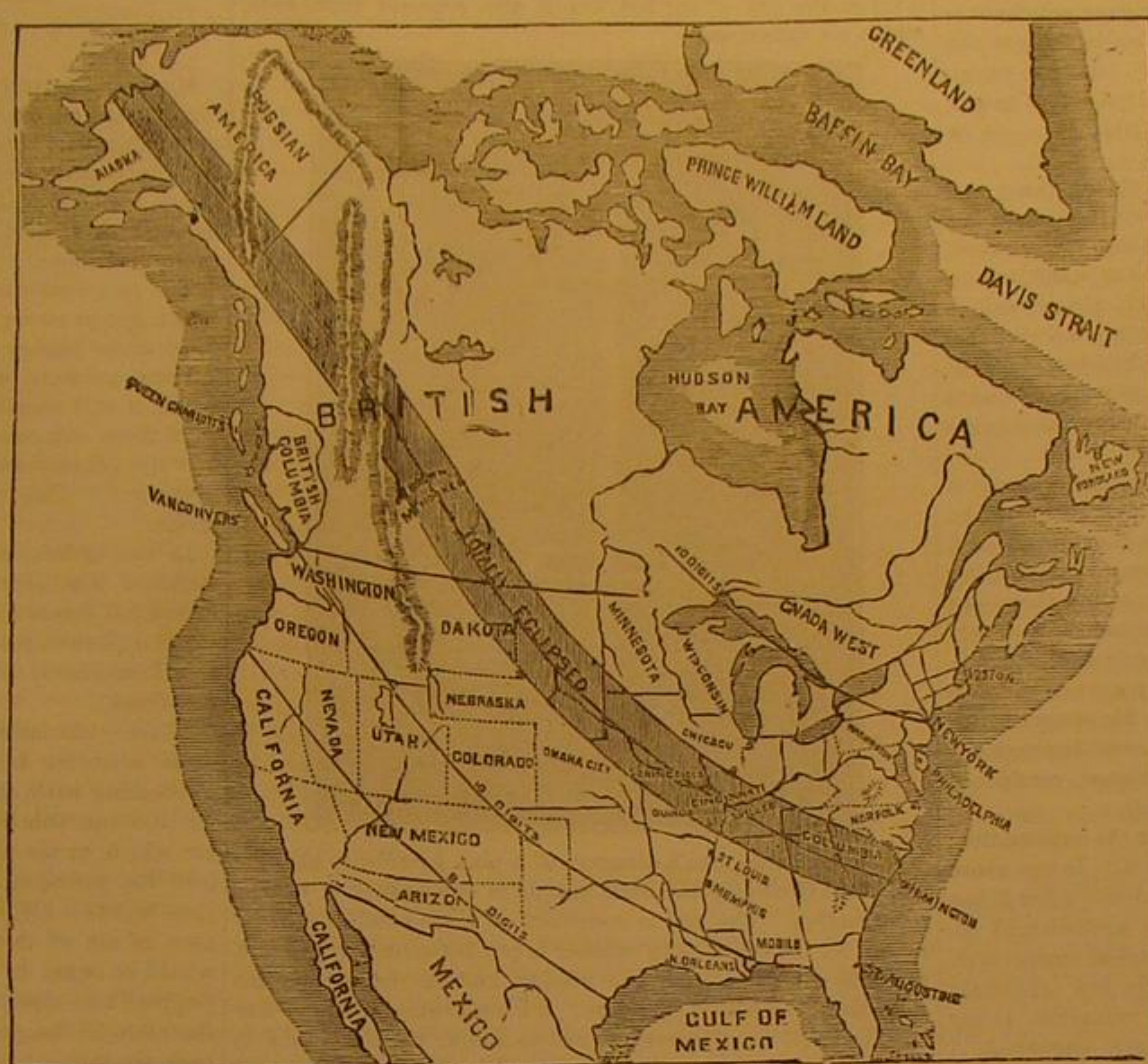
In all probability there will have been some disappointments. To those who were not in position to observe this eclipse the following facts, with the accompanying illustrations, will serve to give a pretty good conception of the features of the phenomenon, and its importance. The times of the beginning and ending of the eclipse at prominent points in the belt of totality have been already given in our issue of July 31st. We herewith give a map showing the belt of totality in the United States. This belt was 140 miles in width. The eclipse was also visible, but partially, far outside this belt.

The nearest lines drawn parallel to the belt show the limits between which ten digits of the sun's disk were covered, and the next the limits between which eight digits would be obscured. A digit is one twelfth of the sun's diameter.

In the diagram of the middle of the eclipse as it appeared in New York, the greatest obscuration, 10·6 digits,is shown.

The obscuration of the sun's disk began in the lower righthand quarter, and the shadow passed off at the upper lefthand.

We also give a diagram of the corona and the protuberances observable in the belt of totality, which will give our readers an approximate idea of these most remarkable appearances.



PATH OF THE ECLIPSE.

THE CORONA.

The following descriptions of the corona and protuberances are copied from an article published in the New York *Tribune* of the 6th inst.:

"In 1706, at Montpelier, the French astronomers saw the moon, when the sun was entirely hid, surrounded by a very white light, which formed a sort of corona or crown around its disk about three minutes of an arc in breadth, or one tenth the moon's apparent diameter. Within these limits the light preserved a uniform intensity, and beyond it, to the extent of about four degrees all around the moon, the light was seen gradually diminishing, till it was finally lost in the obscurity of the firmament.

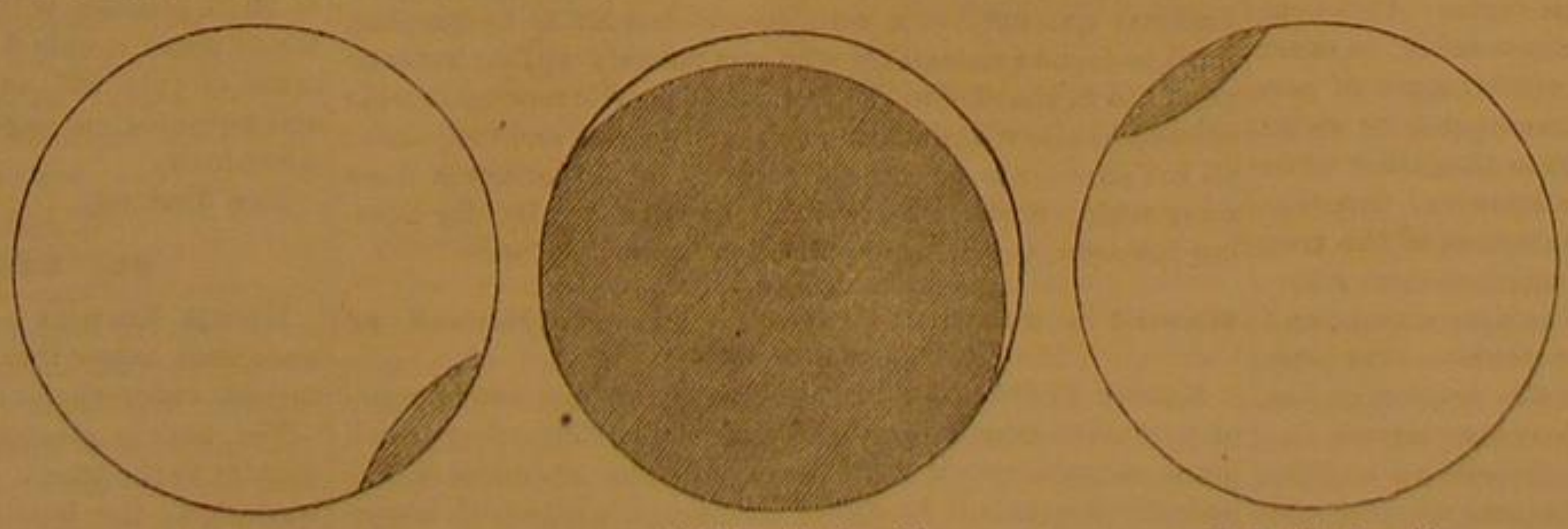
"During the total eclipse of 1715 at London, some seconds before the sun was completely hid, Halley saw a luminous ring around the moon, the breadth of which was one twelfth, or perhaps a tenth, of her diameter. To a French astronomer, who went to London for the purpose of observing this eclipse, the corona or ring around the moon appeared of a silver color. It was more luminous near the borders of the moon, and diminished gradually in intensity up to its exterior circumference. This circumference, although faint, was very well defined. The corona did not appear of equal intensity on every line radiating from its center. Dark spaces or interruptions were observed in it, which gave it still more the appearance of the glory around the heads of saints. This observer also saw at the innermost edge of the corona, a brilliant circle of red, which is probably the earliest notice of what we now call the red protuberances or projections. In 1724, Maraldi observed for the first time that the luminous corona was not concentric with the moon. These observations proved the corona to be concentric with the sun instead of with the moon, and that it is a phenomenon closely connected with the sun's physical constitution.

"THE ROSE-COLORED PROTUBERANCES."

"The red protuberances were first seen by Vassenius at Gottenburg, May 3, 1733, and they have been observed at every total solar eclipse since that time. These rose-colored prominences are of irregular form, sometimes rising nearly as high as the corona itself. These phenomena were variously seen and described in the eclipses of 1778 and 1806, and in 1842 Arago saw the corona both with his telescope and the naked eye. In the Sandwich Islands in 1850, and on the coasts of Sweden and Norway in 1851, these curious appearances were still the objects of study. It was not until the eclipse of 1860 that it was satisfactorily demonstrated that they belonged to the sun, and that the interposition of the moon merely enabled us to see them by cutting off the direct rays of the sun."

The Government parties, sent out to different stations along the line of the total eclipse, were provided with the means of taking, in large telescopes, photographic impressions of the phenomena at their various stages. These photographs can be studied at leisure, and, in connection with the impressions left on the memory of the observers, will serve to determine very important questions as to the constitution of the sun. Besides these usual means of observation, comparatively new instruments for detecting polarized light, and for determining the chemical composition of the sun, and of the corona and red protuberances, will be employed. The spectroscope is the important instrument for making this curious chemical analysis of a distant object.

Our readers having read the accounts of observations of the eclipse of 1868, as observed principally by European astronomers, will appreciate the zest with which American scientists seized this opportunity to add to the important discoveries of last year. Whatever valuable results have been obtained, will be duly referred to as they come to hand.



Beginning 5h. 12m. 30s. P. M. Middle, 6h. 8m. 39s. End, 7h. 0m. 46s.

THE ECLIPSE IN NEW YORK.

[The *left hand* diagram represents the sun five minutes after the commencement of the eclipse, when the moon has begun to make its appearance on the right. The middle diagram represents the sun midway between the beginning and end of the eclipse, when the obscuration is the greatest; and the right hand diagram represents the sun five minutes before the termination of the eclipse.]

NO GREAT achievement is possible without hard work.

The Use of Glycerin in Wine.

We translate from "Wagner's Iahresbericht" the following, which will be of interest to wine growers:

Glycerin has been used for some time for the improvement of wines. This process has been called Scheeleizing (from Scheele the discoverer of glycerin).

According to the investigations of Pasteur, Nessler, and Pohl, glycerin is a component part of wine. As is well known, glycerin differs from the sugar, inasmuch as it does not ferment nor take any part in the process of fermentation, actively or passively. These valuable properties have only recently been recognized and appreciated, and have given to glycerin, in addition to many other applications, a firm hold in the rational improvement of wine.

It is not our intention to undervalue the important part which grape sugar takes in pure wine, nor to supplant by glycerin this article, which cannot be dispensed with during the state of fermentation. As soon, however, as the wine has passed the fermentation, the valuable functions of glycerin commence; for only by its aid is it possible to impart to the wine any degree of sweetness that may be required without incurring the risk of spoiling the wine or producing future changes thereon. Nothing like that. Even the greatest addition of glycerin is unable to endang r the wine in any way, and a valuable remedy has thus been discovered to improve even wines that are ready for bottling, which, to this date, has been considered entirely impossible. An erroneous impression having gained ground that the glycerin could not be used for young or new wines, we can add that there is no reason why it should not be applied, with the same advantages stated above, to any wine as soon as it has become clear, and when it is necessary that it should not again ferment by an addition of sugar.

The sweetness and smoothness which glycerin imparts to wine will ever be apparent. Regarding the manner of using the glycerin, we can only say that it is so simple that it hardly requires a detailed description.

The first and greatest consideration is, to procure a quantity of glycerin that is chemically pure, which is especially essential when it enters into consumption, and here we would say that there is scarcely another article in the market which is liable to contain so many impurities, owing to an imperfect or incorrect manner of manufacturing, or intentional adulteration to produce a cheap article.

Under these circumstances it is best to buy only of parties who will guarantee the article to be pure.

According to experiments thus far made, the addition of glycerin to wine, according to the quality of the latter, should be from one to three per cent, or for one hundred gallons of wine from one to three gallons of glycerin.

It will be necessary to apportion the maximum quantity of glycerin to be used to the quantity of wine in process of preparation; add to the quantity of glycerin thus obtained the same measure of wine, and then impart enough of such mixture to the wine to give it the required taste. The barrel of wine thus improved by glycerin will at once be ready for bottling, provided the wine was clear before.

We repeat: an addition of glycerin will not effect on wine any other changes than such as the latter is predisposed to by virtue of its inherent properties.

SOME recent experiments made at the Woolwich Arsenal, near London, encourage the hope that gun-cotton can be successfully used as a most destructive agent. A palisade was built of oak timbers a foot thick, firmly fixed in the ground, and supported in the rear by strong trusses. Disks of gun-cotton were placed along the face of the palisade about a foot above the ground, and were fired by a battery in the usual way. The effect may be described as wonderful. The palisade was literally blown away amid a deafening report, as if the massive timbers offered no more resistance on one side of the gun-cotton than the atmosphere on the other. The disks require no fixing; merely laying them on is sufficient. Solid blocks of iron and stone can be shivered into fragments by firing a disk laid on the top. In future sieges, if some desperate fellow can but get to the gate or a thin part of the walls, and hang on a few disks of gun-cotton, a breach can be made by firing with a galvanic current from a long distance.

THE most insignificant of human transactions can only be performed in the best manner by those possessed of all the knowledge bearing upon them. Ignorance is always a dead weight, embarrassing him who carries it; on the contrary, "knowledge is power."

Correspondence.

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

Printers' Ink in the Sale of Patented Articles—An Important Suggestion.

Messrs. Editors:—I want to make some complaint about the manner in which patented articles are introduced to the public, and to point out a remedy.

In the first place, nine tenths of all "the people" are totally incapable of understanding the principle of a machine, more complicated than a crow bar. That we cannot help. Our only remedy lies in presenting an article with a full explanation, and explicit directions for using, applying, etc. Retail hardware merchants sell a great many patented articles intended for domestic use. Now a hardware merchant is liable to be a natural mechanic and to be able to explain the uses of his goods, but he is a good deal more likely to be utterly wanting in these qualities and is usually content to sell a machine with as little comment and instruction as he would a nail rod.

He tells the purchaser "'They say' it's a tip-top thing and works nice. I don't exactly understand how it works, but I guess you'll have no trouble; any way if it don't work well, you can bring it back." So the customer takes it,and just for the want of a little printers' ink (which should always accompany an article of this kind, in the form of explicit directions) he fails to make it work, concludes it is a humbug, tells all his neighbors so, and takes it back to the merchant (who is selling on commission), and the fate of that invention is decided—in that community at least.

It has been my good fortune to save from disgrace many a really good article by explaining to its possessor its principle.

I was visiting a friend in the country a short time ago. He had just brought home a patent arrangement for holding the sickles of reapers and mowers while grinding them—an arrangement with four distinct motions to adjust the two bevels to the stone. We tried to apply it properly to the grindstone frame. We worked at it without the least real success for a long time and then searched through a file of agricultural papers to find the advertisement and get some instructions from that. Now I will tell you in the strictest confidence what I found, and you can imagine how I felt.

In plain type and good English, this was the explanation: "It is so simple that a child can understand it." In one sense that was true, but there should have been added—"after it has been explained to him." I also found in the agricultural paper one of those abominations by courtesy styled engravings. It represented the grindstone, complacently but evidently grinding off the point of the "section." I remarked to my friend "If this was a Scientific American engraving I could set your "grinder" without a word of explanation. He thought we had better let it go, and he would carry it back; but I was spunky and saw some good points about it. The result was that we conquered it,and he was delighted with its working.

Now I could tell anyone in a few words how to set that kind of a grinder; but better than that I could write it, and any printer could print it, and then if a copy was furnished with each grinder everyone would know how to use it. Wouldn't that be better than to send the machine out as a sort of Chinese puzzle? Wouldn't the inventor or manufacturer make more money, and wouldn't the public be benefited?

Of course we who read the Scientific American, know that an inventor cannot make half as good use of his money as to have his invention engraved and explained in your paper simply on account of the wide-spread advertisement which it gives his invention; but when we consider that he can have the engraving electrotyped, and can copy your explanation into his circulars, the benefits become immense, and I do not doubt but it would in thousands of instances quadruple the profits, to say nothing of the benefit which would accrue to users and consumers by thus having a good article presented in a good manner. M. S. Baxter.

Aurora, Ill.

Variations of Chronometers.

Messrs. Editors:—Traders on the west coast of Africa, and perhaps on the east coast, sometimes experience inconvenience, and sometimes loss, from the "loss of rate" of their chronometers in the tropics of that region. Occasionally good instruments that are perfectly reliable on other voyages, on approaching these tropics exhibit signs of perturbation, very marked, and hitherto unaccounted for so far as the writer knows. These variations cease altogether when that locality is left behind, and cases are known of variation of rate on that coast, with a precise resumption of the true one on approaching our own. Marine chronometers sometimes, and perhaps generally, have steel balance wheels, and the presence of these may account for the trouble—of at least some of the employés of the writer—in the temporary loss and often resumption of the "rate" of their instruments.

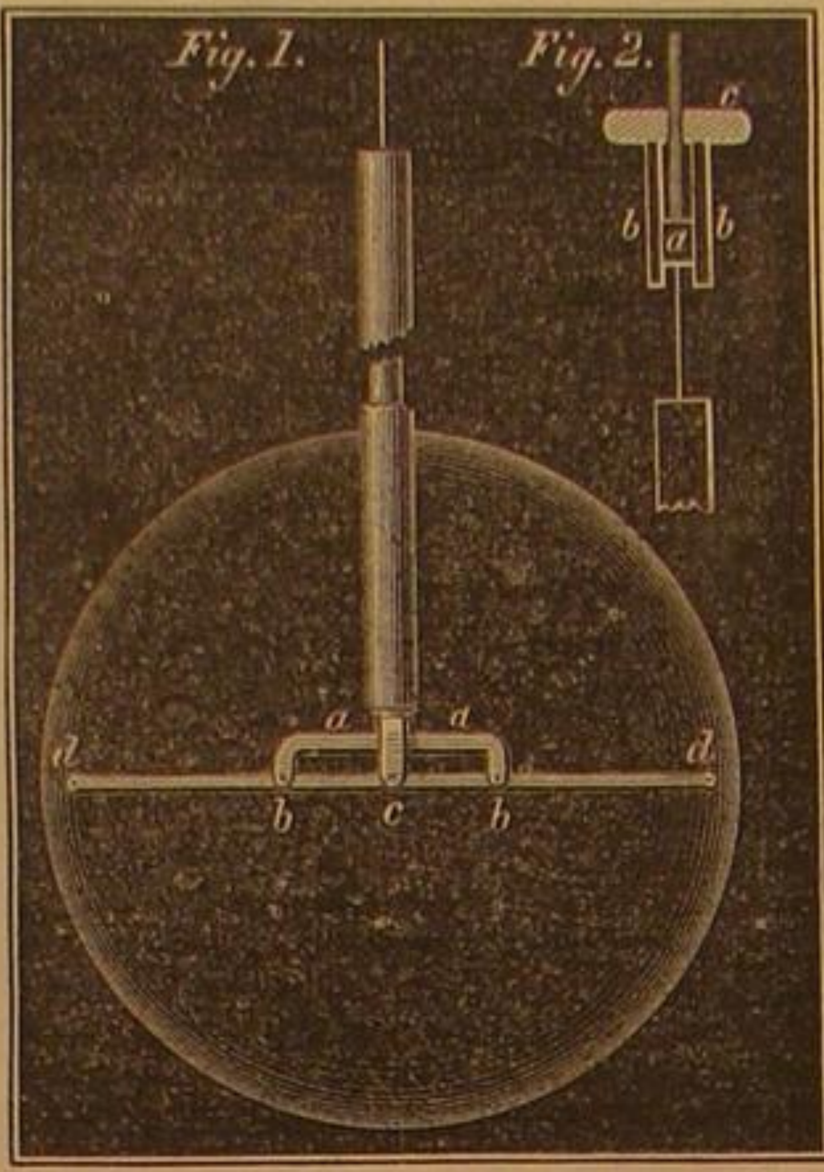
The magnetic *status* of central Africa is believed to differ from ours, and a magnetic power in the balance wheel would at once produce there a marked variation of "rate," and account for the occasional embarrassments hinted at. The proofs that this is so—assuming only a difference in magnetic conditions of the two coasts—are not wanting.

A fine old English watch with a steel balance recently discovered to be magnetic (a magnet) is in possession of the writer of this article, to the beats of which a delicate needle responds, when properly placed, with certainty and precision, swinging around half the circle and returning with the movement of the wheel.

A chronometer circumstanced like this watch would probably lose its "rate"—however good it might otherwise be—on any other magnetic meridian than that of its rating, and perhaps would do so in simply a change of position. The variation, however, would doubtless be influenced by the length and rapidity of the swing. It will be seen that if the north pole of this "swinging magnet" should be placed north, the vibrations would be shortened, and the instrument would gain time; if south, they would be prolonged, and time would be lost. Thus no true rating could exist. A.

A Simple Pendulum.

Messrs. Editors:—The compensation pendulum rod you give in your issue of August 7th, is not new. I have had different arrangements of the lever to accomplish the end; one of which you give. I have an arrangement of a single lever at the top of the rod, but it also requires three rods, which are unnecessary



Inclosed I send you a diagram of a plan I prefer to all others. It is decidedly the most simple in appearance, if not in construction. The rod is composed of a steel rod in a brass tube. At the top a thin washer is put between the rod and the tube; the steel rod, the washer, and the brass tube are then firmly soldered together. *a a* are continuations of the steel rod; *c b d* are levers pivoted to *a* at *b*; the brass tube is pivoted to levers at *c*. The length of levers from *b* to *d*, and from *b* to *c*, are as the expansion of brass to steel. The bob rests on points, *d*. Fig. 2 shows a plan by which a clock can be regulated in the face and without stopping. *a* is a screw with a square head to which the rod is attached, and slides between the sides, *b*. At *c* is a nut resting on *b*, which projects a trifle through the dial to allow turning.

Philadelphia, Pa. David Shive.

Treatment of Corns.

Messrs. Editors:—The treatment you indorse for corns, perhaps, is well enough if you decide to retain them and nurse them. I cultivated them some twenty-five years, but came to the conclusion that they were neither profitable nor comfortable, and resolved to abandon them.

The way I did was to have a pair of lasts made which were the shape of my feet; thus instead of fitting my feet to the boots or shoes, the boots or shoes were made to fit my feet, thereby saving the misery of "breaking-in" a new pair.

The result has been, that for the last three years I have not found the least inconvenience from corns; in fact they have abandoned me with apparent disgust. No traces of them are left. F. W. B.

[Our correspondent is perfectly right. If people would begin sensibly, and wear only such shoes as fitted their feet, they would never be troubled with corns. Neglecting to do this, the disease penetrates so deeply that the slightest pressure brings on irritation and pain.

The writer of this has suffered very much from corns, and has patronized all sorts of remedies, even resorting to the professional quackery of a corn doctor—but all to no purpose, until he found a shoemaker who was not only willing but competent to fit the shoe to the foot. The shoe is now made wide enough to allow abundant room for the toes and toe joints; all the annoyance of corns, quackery, and specifics is done away with. Such is the writer's experience. But for nursing purposes, the lemon application is good.—Eds.

Wanted a Substitute for the Present Method of Branding Cattle.

Messrs. Editors:—I will venture to ask that you or some of your able contributors, through the medium of your columns, recommend (if there be such) some chemical agent (safe and convenient for use by all classes) with which horses or cattle may be permanently and legibly "lettered," "numbered," or "branded," and whereby the barbarous style of burning the legal marks of ownership on or into them with red hot irons may be superseded.

Our grazing grounds extending from the Sabine to the Rio Grande, and from the Gulf of Mexico to Elpasso, are in common.—"The cattle of a thousand hills," roam without restraint. Hence the application of some indelible mark of recognition by which the property of different individuals may be distinguished is indispensable.

Yet it is a matter of great doubt whether the geographical munificence of our range or the "abundance" of our flocks, or herds warrants the maintenance of a system at once prodigal and inhuman.

The suffering of animals directly induced by this process of fire branding is often but a tithe of its future results. For the sore left by the burning iron serves both as an irritation and an initial point of operations for the murderous "screw horn"—the peculiar pest of our latitude—from the ravages of which thousands of stock of all classes die here annually.

In the hope that some means may be devised, or suggested, whereby the severities of the merciless necessity for branding can be mitigated, and its purposes as well otherwise subserved, I have written. N. L. Norton.

Clinton, Texas.

On the Flow of Elastic Fluids through Orifices or Pipes.

Messrs. Editors:—In the article under this head appearing on page 50, current volume, and taken from the London paper *Engineer*, appears a serious mistake in the reasonings and conclusions, and consequently in the result of the calculation, which it will be necessary to correct, as those investigating this subject may be led astray by the erroneous rule prescribed there.

The rule I refer to is, that in order to find the velocity with which gas or steam will flow from a vessel in which it is confined under higher pressure, into a vessel in which there is a lower pressure, we must calculate just the velocity with which it will escape from each vessel into a vacuum, subtract these velocities, and the difference between them will be "the velocity with which steam will flow into the lower pressure." This rule is entirely wrong, as I will demonstrate.

In the article referred to, is the following pneumatical standard law, nearly correctly stated, in italics: *Gases and vapors will flow into a vacuum with the same velocity that a body would acquire in freely falling through a space equal to the hight of a homogeneous volume of gas or vapor of the given pressure and density.*

When calculating this hight it is found that it is the same, whatever be the pressure and density of the gas we are dealing with, if only the temperature be the same. Let me illustrate this by an example: Suppose we have common air, which, at the pressure of $14\frac{1}{2}$ lbs. per square in. weighs 0·08 lbs. per cubic foot, its pressure on a square foot must then be $14\frac{1}{2} \times 144$, or 2,088 lbs.; the hight of a uniform volume of air of this weight and of one square foot section would be equal to 2,088 lbs., divided by 0·08, or 26,100 feet. Suppose now again we have air at four times this pressure, therefore 58 lbs. per square in., which, at the same temperature, according to Mariotte's law, will weigh $4 \times 0{\cdot}08$, or 0·32 lbs.; its pressure on a square foot will be 58×144, or 8,352 lbs.; and to find the hight of the uniform volume of air of this weight we have this time to divide the 8,352 lbs. by 0·32, which also gives 26,100 feet. The hights being the same, bodies falling from these hights will acquire equal velocities, and we see then that it is a necessary consequence of the standard rule and of Mariotte's law, that the same gas will flow into a vacuum with the same velocity whatever be the pressure and density under which it is confined, other circumstances being equal. The simple cause being, that the increase in pressure is compensated by the exactly corresponding increase in density, which practically retards the flow. It is therefore clear that a substraction of the two velocities, first calculated separately, cannot be the correct rule, as it would lead to the absurd conclusion that there being in the above case no difference in the velocities it would not flow at all from a vessel in which it was confined under four atmospheres pressure (or any other pressure which we may suppose) into the atmosphere.

The true way of calculating is *to substract first the two pressures* before calculating anything else, and then *find the hight of a volume of homogeneous vapor or gas, exerting by its weight the same pressure on its base.* Applying this rule to the case referred to (page 50) of a steam cylinder with a pressure of 20 lbs. and a condenser of 5 lbs., we find the difference 15 lbs., and a homogeneous volume of steam of this pressure would be equal to very near 43,264 feet, and a body falling from this hight would acquire a final velocity of nearly 1,679 feet per second; therefore the true velocity with which steam of 20-lb. pressure will flow from a cylinder into a condenser where there is only 5 lb. pressure, is 1,679 feet per second in place of only 367 as calculated by the London *Engineer*, and reprinted on page 50 of this volume of the Scientific American. P. H. Vander Weyde, M. D.

New York city.

The Lowell Water-Wheel Test.

Messrs. Editors:—Inclosed you will find a sample of the numerous letters that I daily receive in regard to the test of turbine water-wheels at this place.

The test is creating much interest from one end of the country to the other. I can not give the information required, because, at the beginning of the test, it was agreed not to publish or make public the results until all had been tested, as it might deter some from testing their wheels if the first gave good results. Only the Swain wheel has been tested, the others had to prepare after that was tested, as that was the opening of the test, and the conditions were not settled until that time. When the others commence all will probably be ready to take their turn. The Bodine Jonval will probably be the first and very soon.

When the test is completed a full report will be made up for the Scientific American, and published free to all, so far as I am concerned.

I have no knowledge that the report will be published in pamphlet form. I require no money for information that I can give; correspondents will govern themselves accordingly.

JAMES EMERSON.

Lowell, Mass.

When Doctors Disagree Who Shall Decide?

MESSRS. EDITORS:—I have read your article headed "When Doctors Disagree Who shall Decide?" in the issue of August 14th, respecting Prof. Horsford's method of manufacturing acid phosphates so as to render them useful in the making of bread.

At the close of this article you say: "The celebrated Liebig has stated that the nutritive value of ordinary flour is increased ten per cent by the use of Prof. Horsford's phosphatic bread preparations."

We can truly say "when doctor's disagree who shall decide," for Prof. A. J. Bellows, late Professor of Chemistry at Harvard, in his book recently published in this city, entitled "How not to be Sick," and in the "Philosophy of Living," distinctly asserts that this same preparation of Prof. Horsford's is "poison!" that it is simply phosphorus disorganized, made from calcined bones, and, as such, as dangerous to use as any other poison, and should, of course, never be used. On the contrary, phosphorus as organized in our food as it grows (wheat unbolted, etc.), is the only form in which it can be taken with safety. "Who shall decide?"

B. H. J.

Boston, Mass.

Another Invention Wanted.

MESSRS. EDITORS:—Often during dry hot summers we have to witness the destruction of our corn by drought on the banks of streams, with water flowing by in waste, sufficient to make corn in abundance. We need machinery to raise the water out of the streams and apply it on the adjacent fields of corn. There are generally no falls in the streams to raise water by dams for irrigation. Here is a fine field for inventors to benefit a large farming interest and themselves also. The machinery must be light and of easy transportation, adapted to horse power for small farmers, and not too costly, as it may not be necessary to use it every year. On many of our rivers the lands are highest at the banks, with a gentle slope across the bottoms to the foot of the highlands, and water raised to the top of the banks would flow across the fields.

We hope inventors will take this subject into consideration and help us.

MANY FARMERS.

Indian Springs, Ga.

Importance of Smooth Edges on Cutting Tools.

MESSRS. EDITORS:—Allow me to say a few words more in regard to serrated, or rough-edged instruments, intended as cutting instruments. I am fully aware that some hold the idea that an absolutely smooth edge cannot be attained. It was not the intent of my former article, neither is it now my intent to discuss imaginary, or theoretical cutting edges; but will state that if an edge cannot be attained smooth enough so that a saw edge will not appear, even under the most powerful microscope, then the theory that an absolute smooth edge cannot be attained is established. It is also established that the first series of notches has notches also, and so on infinitely.

The object of my former article was to do away with something that has become a public nuisance. The teeth of a saw are the same as the sections of a sickle; not as the serrated teeth of the sickle edge. I never heard any one argue that the edge of saw teeth ought to be serrated. The teeth of saws are a series of cutting edges, not the whole saw one continuous cutting edge.

Now I wish to state one uncontrovertible fact; all cutting edges should be made just as smooth as they can be, and have them practically profitable.

A. K. SMITH.

Nebraska, Ohio.

The Oxyhydrogen Light.

The oxyhydrogen light scheme has now taken a definite shape in Paris. A company has been formed, the capital necessary has been raised, and application has been made for permission to lay down pipes to carry oxygen and hydrogen over about a fourth of the city. It is not very likely the permission will be granted, and the promoters will have to confine themselves to supplying individuals with compressed gases, as was originally proposed. We have published the patented processes by which M. Tessié du Motay obtains the oxygen and hydrogen which he proposes to distribute over Paris, at a cost so low that the oxyhydrogen light is promised much cheaper than common gaslight; but ingenious and relatively cheap as they undoubtedly are, it is impossible to believe that the service can be made so inexpensive as to supersede coal gas. The prospectus of the company enlarges upon the cheapness and purity of the light, the complete combustion, and the absence of all deleterious matters in the products of combustion; but is quite silent as to the danger of introducing into a house two gases not possessing any smell, and which, consequently, may escape without observation, and the mixture of which forms an explosive compound of far greater power than any mixture of coal gas and air. To any danger of this kind, continental engineers appear to shut their eyes. We saw, a short time ago, a patent taken out in Belgium for making a mixture of coal gas and air, storing it in gasholders, and distributing it over the city of Brussels for heating purposes. The engineering details given showed a complete knowledge of the manufacture and distribution of gas, but there seemed to be no recognition of the risk, imminent enough, of blowing up the whole concern. A consideration of this kind, some years ago, stood in the way of a scheme of the kind projected for Birmingham, and will, no doubt, now prevent the Oxyhydrogen Light Company from getting permission to lay down their pipes over Paris.—*Mechanics' Magazine.*

THE THEORY OF BOILING—TOMLINSON'S EXPERIMENTS AND CONCLUSIONS.

We conclude our review of these interesting experiments from our last issue.

Mr. Tomlinson asserts that there is a kind of matter which when used for nuclei in boiling is not liable to the defects enumerated in our previous article, and which he has not been able to make inactive, either by the action of the strongest acids or caustic alkalies, or by repeated boiling in water, ether, alcohol, naphtha, etc. These bodies are such as charcoal, coke, pumice-stone, meerschaum, and a few other bodies. They act by means of the powerful force of capillarity. The same force which, according to Saussure, enables one volume of boxwood charcoal to absorb 90 volumes of ammoniacal gas, 85 of hydrochloric acid gas, 65 of sulphurous acid gas, and so on, enables these porous bodies to absorb vapor from boiling liquids, and, under the continued action of the heat, to give it out in never-ceasing jets, thus relieving the vessel of all tendency to bumping, making the boiling soft, gentle, and regular, and increasing the quantity of the distillate.

Charcoal, or some other porous body, is then the proper nucleus in the case of boiling liquids. It is quite remarkable to see how efficiently a lump of coke acts in a vessel of boiling water in giving off vapor, promoting tranquil boiling, and preventing the jumping of the vessel. Not the least important service of these porous nuclei is the fixity they confer on the boiling point. When a liquid is boiling in a clean vessel, and in the absence of nuclei, it may go on dissolving steam until the liquid becomes more and more highly saturated with it, and during this period the phenomena of boiling cease, and the temperature rises some degrees above the boiling point.

The formation of a steam in liquid is indicated by a rise, the bursting of a bubble by a fall. The most considerable rise and fall is when the boiling ceases and steam accumulates, and there is a sudden burst accompanied by a kicking of the vessel. This uneasy kind of action, so manifest on a small scale, must be a mighty force in a steam boiler, or a large still or retort.

The following series of experiments show clearly the value and superiority of porous nuclei:

1. A glass flask with a wide neck was filled about one third with distilled water; it was boiled over a gas burner, weighed rapidly, and replaced over the burner. After boiling 20 minutes it was weighed again. The flask was once more filled to the original quantity, and some bits of coke were added; it was boiled and weighed as before, the gas flame remaining unaltered all the time.

RESULTS.—Water boiled away in the first trial (water only) 995 grains; in the second trial (with coke) 1,130 grains.

Ratio of products, 100 : 113·6.

2. Water was made to distil freely from a still, and the quantity collected in 15 minutes was weighed. A few pieces of coke were then added to the water in the still, and the distillate collected again during 15 minutes.

RESULTS.—Distillate from water only 293 grains; from water with coke 310 grains.

Ratio of products as 100 : 105·8.

3. A similar trial was made with common wood charcoal, but the vessel having been made much cleaner by the action of the first boiling, the water boiled irregularly, with bumping. The addition of the charcoal made the boiling tranquil and regular.

RESULTS.—Distillate from water only, 262 grains; from water with charcoal, 334 grains.

Ratio of results as 100 : 127·4.

The following results are from my own experiments:

Methylated spirit was distilled in a glass retort at a fixed boiling point of 171° Fah. The distillate collected in 5 minutes was weighed, and found to amount to 244 grains. Three or four fragments of charcoal, partly from boxwood and partly from cocoa-nut sheel, weighing altogether 20 grains, were now added to the retort, and when the spirit was again fairly boiling, the distillate during 5 minutes was again collected and weighed. It was found to amount to 325 grains. The ratio of the results is as 100 : 132·2.

Instead of charcoal, 20 grains of fine ground pumice-stone in four fragments were used in the retort, when the ratio of results was as 100 : 121·7.

With 20 grains of meerschaum, as 100 : 112.

With 20 grains of coke, as 100 : 107·46.

These numerical results are, however, very much understated if compared with those obtained in a retort that is structurally free from nuclei, which was by no means the case with the retort actually employed.

Charcoal, coke, pumice, and other porous bodies are especially valuable in distilling those liquids that are of such a nature as to exert a powerful action in cleaning the inner surface of the retort or of the still. Such liquids as alcohol or spirits of wine, ether, naphtha, benzole, sulphuric acid, etc., act in this way, and the sides of the vessel no longer performing the useful functions of a nucleus, the adhesion of the liquid to the sides of the vessel is so strong that the vapor accumulates in it, and only escapes in explosive bursts, separated by almost quiet intervals. These porous nuclei render the boiling and the liberation of vapor quite easy. Even in thick sirup of sugar, boiling at 240° Fah., they are still active, and Mr. Tomlinson asserts that with their assistance he has, in the course of a few minutes, driven off so much water from a sirup boiling at 218°, that it soon reached 240°, and cooled down into a clear, semi-solid mass in a flask, into which a plug of cotton wool was inserted when the lamp was removed.

Charcoal from cocoa-nut shell is a good nucleus. It is very dense, and will occupy the bottom of the vessel that contains liquids somewhat denser than water. It is at the bottom, or near the bottom of the vessel, that the nucleus is most efficient, and for dense liquids the porous nucleus may be loaded with some heavy metal that the liquid does not act on. Coke, though a less powerful nucleus than charcoal, is convenient from its being always at hand, and presenting itself in lumps of any size. Mr. Tomlinson has no doubt it will be found of use in steam boilers, and may be used instead of the radicles of barley, the soap, the butter, and the paraffine, etc., noticed in our last.

He has already said that these porous nuclei act by the force of capillarity, and so powerful is this force alone that it can be applied in a variety of ways. Even a short bundle of fine capillary fibers, united like a faggot by a thread in the middle, is an active nucleus in liberating vapor. Such a bundle, weighing only ten grains, put into a retort from which methylated spirit was being distilled, raised the amount of distillate in the ratio of 100 : 110.

Where circumstances admit of it, we may apparently increase the nucleus power even of charcoal by first boiling it in a liquid of higher boiling point than that of the liquid to which it is to be transferred. Thus a piece of charcoal that has been used in boiling turpentine seemed to be more active than pure charcoal in liberating vapor from boiling water. The charcoal is not only porous, but unclean, and hence its activity.

What Mr. Tomlinson claims to have discovered is the action of nuclei in liberating gas, or salt, or vapor from solution, and the behavior and proper application of nuclei in various processes in the useful arts. Bodies have long been used for promoting vaporization, crystallization, etc., but how they acted and why they often suddenly ceased to act was not known. We have many theories about the "mysterious action of air," "catalytic action," "molecular change," etc., which have borne no fruit; whereas, according to this view, supported as it is by hundreds of experiments, all the varied phenomena of nuclei may be explained by the varying force of adhesion and capillary action.

Signaling on Board the Cable Fleet.

The London *Gazette* gives the following interesting description of the manner of signaling through the cable on board the Great Eastern:

The method of signaling used between the ship and the land is that now universally adopted in working all long submarine lines—the reflecting galvanometer. The principle of this most delicate instrument was discovered a few years since by a German electrician, named Weber. It was then, however, a large machine, and the condensation of all its powers into the smallest and lightest form is due to the scientific research and skill of Sir William Thompson.

This instrument consists of a small mirror with a magnet on its back. That the two are very small indeed may be judged by the fact that both together weigh less than three eighths of a grain. This infinitesimally small reflector, which is intensely bright, is suspended by a silk thread as fine as a hair in the midst of a small circular coil of insulated copper wires. Directly a current is sent through this circular coil, no matter how slight, it induces another electric current within its circle, which acts in an opposite direction, and this causes the magnet at the back of the mirror to turn to the right or left, and, of course, to turn the little mirror with its reflecting ray of light with it. By a very simple arrangement, this fine ray of light is thrown upon a horizontal graduated scale, about three feet long and three feet distant from the mirror.

Thus when a current is sent through the little circular coil around the mirror, the magnet is acted upon, and turns the mirror with its ray of light, say on the left of the scale in front of it. When the current is reversed, and that is instantly done by pressing a little key in the speaking instrument, the current in the circular coil is reversed and sent in the opposite direction, and this in turn sends the ray of light from the mirror on to the opposite side of the scale to the right. When the ray of light rests stationary on any part of the scale, it means a dot; when it moves rapidly to the right or left, it means so many dashes, according to the distance it goes. This reflecting galvanometer tells with unerring certainty whether or not the Great Eastern is steady.

The vessel now at the end of the cable is, with its coils of insulated wire and iron hull, a mere electro-magnet so to speak. The course of the Great Eastern is east and west, and therefore at right angles with the course of the magnetic current, which is north and south. Thus every time the ship rolls, either to port or starboard, a slight current, but still a current, is induced in her vast coils, and then transmitted through the cable to the shore end at Minou, where it acts upon the reflecting galvanometer, and turns its ray of light a little to the right or left of the center of the scale, and thus shows in a fraction of a second of time the precise degree and rapidity at which the vessel is rolling.

WE recently noticed the fact that a flying machine was soon to start from San Francisco on its aerial voyage to New York. It now turns out that we are to be disappointed, the thing being only a partial success. It will navigate the air in a calm, but the slightest breeze disconcerts its movements. The *Chronicle* thinks that if the inventor should ever start for New York, he would be quite as likely to bring up at Cape Horn or the North Pole.

Gin Saw Gummer.

The inventor of this instrument claims that whatever injury cotton sustains in its separation from the seed, is caused by the action of the saws in concert with the ribs of the cotton gin. While this will be generally admitted, there is a diversity of opinion in regard to the character of the teeth as to form and surface.

It has been the theory and practice of gin makers to make the gin saw teeth as round and smooth as possible, in order that they may go into the cotton and not cut the fiber, as they assert would be the case with a square tooth.

The inventor of the gin saw gummer shown in the engraving, who has had a long experience in the working of gins, affirms that neither round nor square teeth cut the cotton fiber, but both break it, and he affirms that square rough teeth will, on a fifty saw gin, pick a bale a day more than the round smooth teeth. He claims that the notion that a gin which picks rapidly must, of necessity, injure the fiber, is totally erroneous.

The gin saw gummer is an instrument devised for the purpose of giving each tooth of a gin saw the proper roughness and form. We say proper roughness, because if the principles above stated are correct, it does not follow that any kind of roughness will answer the purpose.

It is claimed that the circular file of the form, and used in the manner shown, in the engraving, is the only tool that will secure the right kind of roughness in the tooth, or make a perfect gin saw tooth.

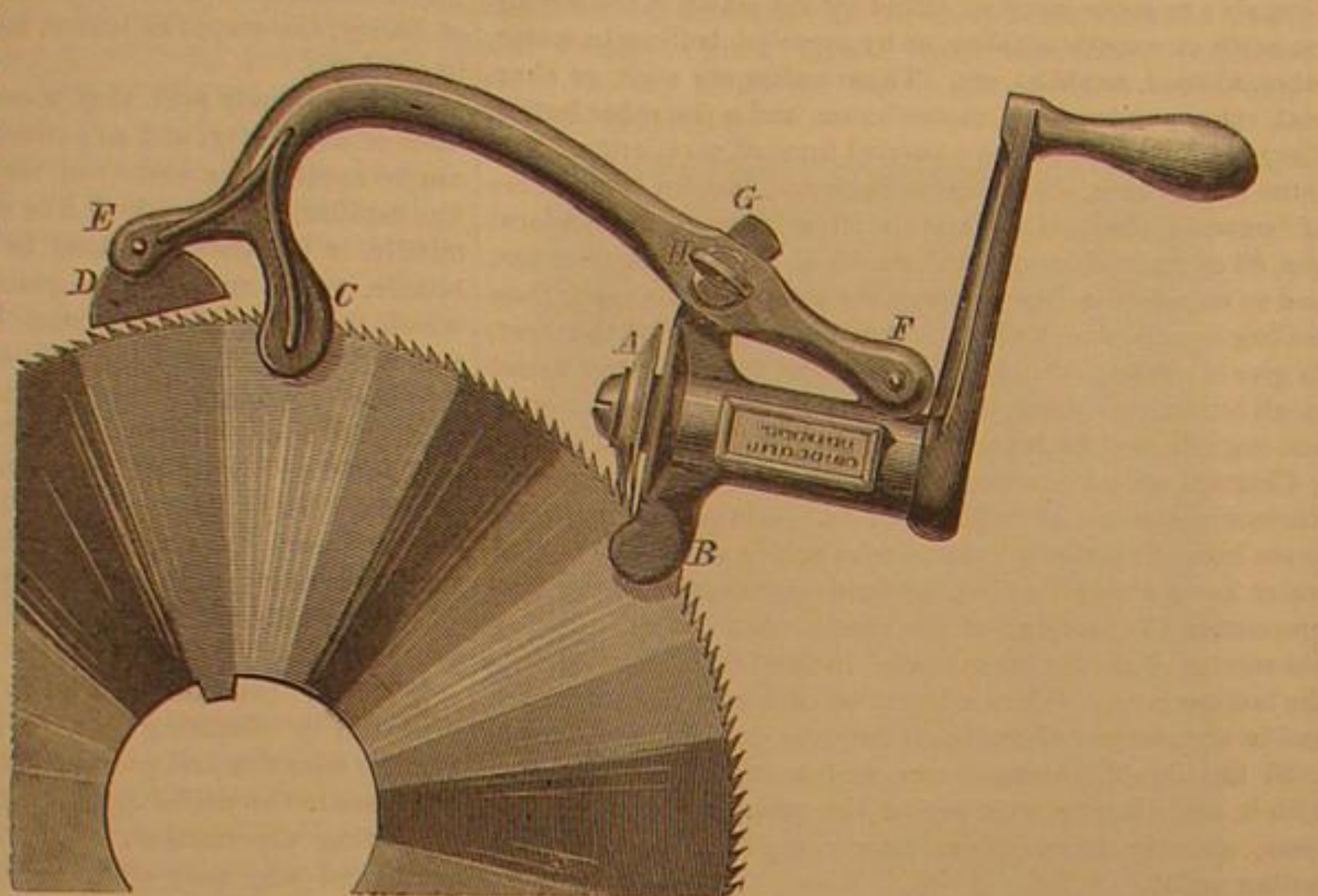
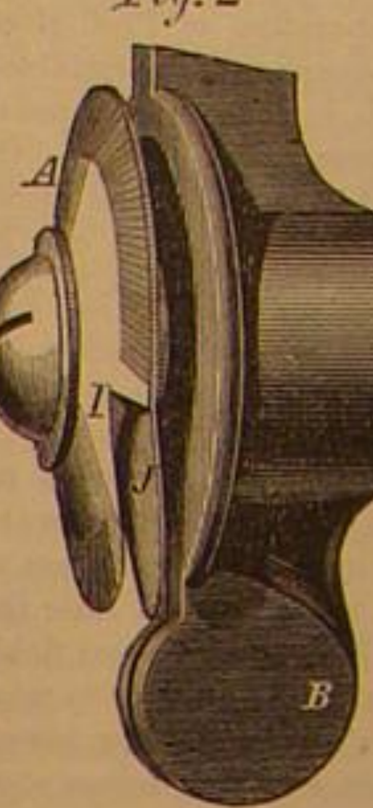


Fig. 2



BURDINE'S PATENT GIN SAW GUMMER.

The device consists of a circular file, A, of the form shown, attached to an arbor revolved by means of a crank. The arbor, file, and crank, are supported in a cast-iron frame, the portion carrying the arbor being pivoted to the other portion at F. An upright arc, G, passes through the top part of the frame, and is held at the proper angle by a set screw, H. At B and C are slits sawed in the frame, of the right size to admit the saw when the instrument is in use, and which prevents lateral motion in the frame. The file has upon the back a spiral adjustable tongue, J, shown in the detail at the right of the engraving. The file also is cut away at I, to admit a tooth of the saw at each turn of the file. The adjustable tongue, J, thus acts like a screw to force the saw along one tooth at each turn of the file. The shape of the file is such that the teeth are constantly kept at the same length, a vital point in the proper working of a cotton gin.

A semi-circular block of cast iron, D, is pivoted to the frame at E, which serves as a gage in securing the proper position of the frame.

In operation the frame is grasped in the middle of the bow by the left hand, and the crank is turned by the right hand.

The inventor claims that this is the only way to give a correct finish to gin saw teeth, and to restore worn or shortened teeth to their original length and perfection of surface.

Patented, Sept. 14, 1868, by A. H. Burdine, Taylor's Depot, Miss. Further information may be obtained by addressing Israel F. Brown, New London, Conn., or the patentee, as above.

Improvement in Keyhole Guards.

This is one of those small inventions alluded to in our editorial of Aug. 7th, that can scarcely fail to prove remunerative unless through bad business management on the part of the inventor. Nothing could be more simple and subserve fully the purpose for which it is intended.

It is a well-known and common practice for burglars to thrust in a pair of strong and slender nippers from the outside, and, grasping the end of the key which protrudes through the lock, to turn it and throw back the bolt. With such ease and certainty can they do this on ordinary door locks, that it is even less trouble than to pick the lock were the key left out. With ordinary locks neither leaving the key in the lock nor taking it out, affords any security from pick locks. The inventor of this improvement justly believes that the place for a key, when people are locked up in a house, is in the lock, so that ready escape can be made in case of fire, and he has set himself to work to enable this to be done and at the same time to effectually foil the burglars.

The engraving well illustrates how this is done. Fig. 1 represents the lock with the key inserted on the inside, and Fig. 2 an opposite view of the same. The lock is provided with a front and also a back guard, or escutcheon, attached to a common pivot, and placed at angles with each other, so that when the inside escutcheon is pushed aside, the outside one covers the keyhole on that side, and *vice versa*. The inside one, A, is pushed aside by hand in the usual manner, the outside one, C, Fig. 2, then covering the hole so that a person outside the door cannot thrust in a key further than the guard, and cannot by any means move the bolt of the lock. Neither can he by any means push aside the guard when the key is left in the lock on the inside, as both the inside guard, A, Figs. 1 and 2, and the outside one, C, are countersunk to admit the end of the key, which thus prevents all lateral motion. The guard, A, has a curved edge at B, which fits into a groove turned in the shank of the key, so that the latter cannot be withdrawn from the inside without pushing aside the guard, nor be jarred out by opening and shutting the door.

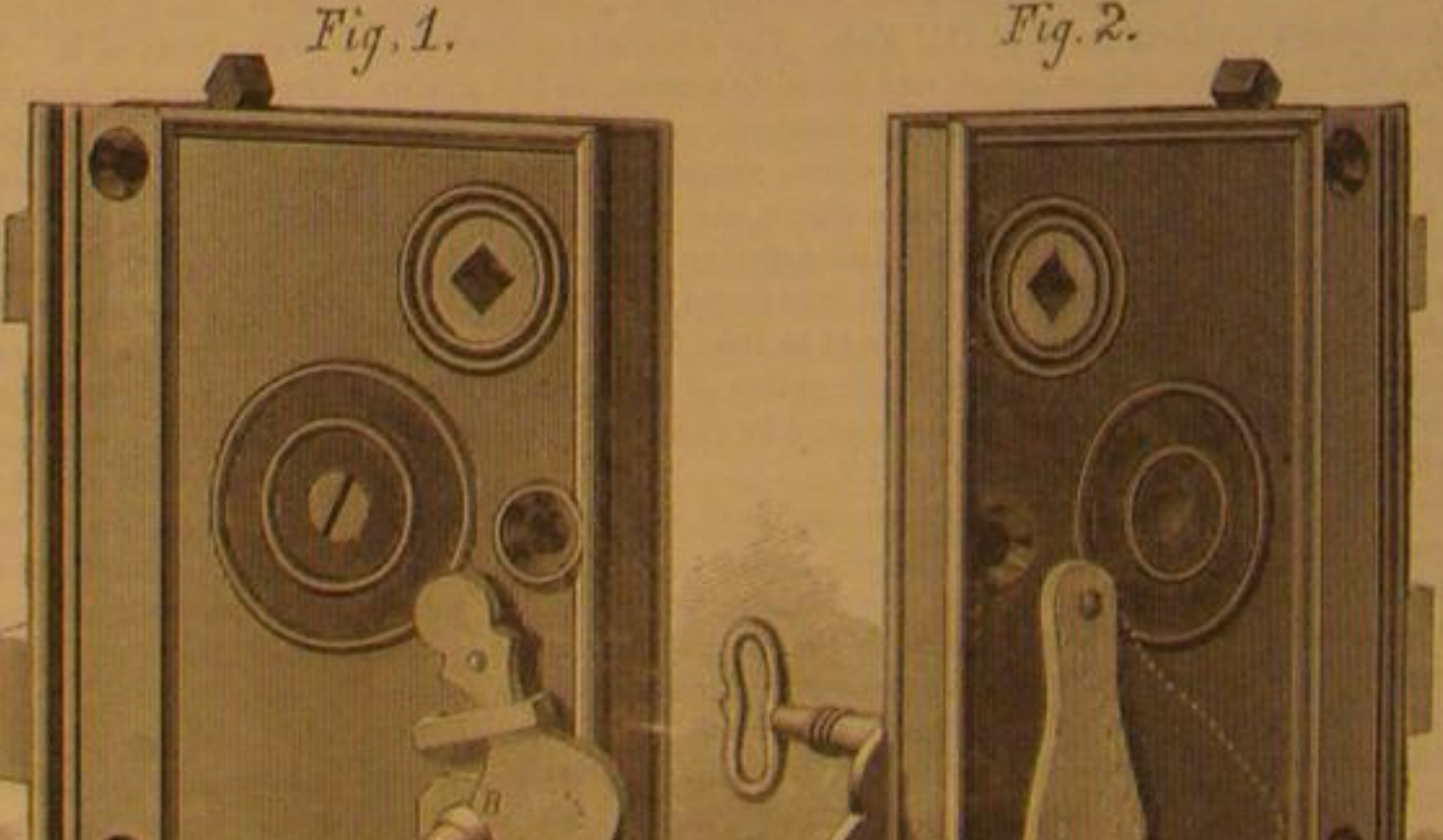
A coiled spring is fixed upon the common pivot of the two guards, or escutcheons, which, when the key is taken out from the inside of the door, forces the guard, A, to cover the keyhole on the inside, at the same time throwing aside the guard, C, into the position shown by the dotted outline in Fig. 2, so that whenever the key is withdrawn from the inside it can be readily inserted from the outside.

The guard, A, is protected from being broken away through carelessness of servants, or other cause, by means of a staple riveted to the inside plate of the lock, as shown in Fig. 1, under which it can move laterally as far as required.

The features of the invention are, then, the attaching the opposite guards at angles with each other to a common pivot actuated by a spring, so that when the keyhole is uncovered on one side it is covered on the other; the device by which the key is prevented from falling, or being pulled out of the lock; the countersinking the under side of the guards to admit the end of the key; and the supporting the inner guard by the staple, as described.

Patented Aug. 11, 1868, by Alfred Huffnagle, No. 8, South Fifth street, Philadelphia, who may be addressed for a portion or the entire right for the United States.

Fig. 1. Fig. 2.



HUFFNAGLE'S KEYHOLE GUARD.

Iron Manufacture in the West.

We are glad to learn that the manufacture of iron is making progress in the West. The North Chicago, the Wyandotte, and the Milwaukee rolling companies are three distinct enterprises, which, the Chicago *Tribune* remarks, owe their existence and prosperity to the far-sightedness and energy of Captain E. B. Ward, who, when he first moved in the matter, was everywhere assured that he could not successfully contend against Eastern manufacturers, and found himself unable to get one dollar of the stock taken in Chicago or among the railroad companies of the West who were to be directly benefited by it. Recently, moneyed men of Boston, New Bedford, and other Eastern cities, such as Forbes, Brooks, Bartlett, and Thayer, have united in largely increasing the capital stock of these three companies, and a purchase has been made by them jointly of the Swedes iron mines, lying forty miles northwest of Milwaukee, where ore of peculiar richness and good qualities can be mined at a low cost.

One million and a half of dollars have been subscribed, of which eight hundred thousand are in the name of the North Chicago Mills, a company which already represented one million of dollars. As enlarged, this important corporation will employ one thousand six hundred men, including with their families a population of eight thousand persons. The three companies together will give work to three thousand operatives, supporting an aggregate population of fifteen thousand souls. The whole annual product of the three companies will be three and a half millions of dollars.

The Chicago *Tribune* says of these mills, before their recent enlargement, that of one hundred and fifty thousand tuns of iron rails which they had turned out since they began operations, not a single rail has proved defective and no accident has ever resulted from their use. Hereafter it is confidently expected that they will be equal to the manufacture annually of thirty-five thousand tuns of new rails, and fifty five thousand tuns of re-rolled iron.

The Swedes iron mines are geologically peculiar in the admixture of a large amount of fossil remains in the ore, superseding the employment of lime in fluxing. Few other deposits of this character are known to exist, and those only in Sweden. The ore is also mixed with manganese, which is said to impart to the iron manufactured from it a steel-like toughness of fiber admirably fitting it for rail heads, or the upper half of the longitudinal rail. The companies propose to use the Swedes iron chiefly for the rail heads, in the proportion of three fourths Swedes to one fourth Lake Superior iron, which they say will give a surface equal in hardness to the Bessemer steel; making the lower half or base of the rail of three fourths Lake Superior to one fourth Swedes, thus securing a rail that may be bent double without breaking. The advantage these iron rails will have over those of the Bessemer steel is, it is asserted, that when so worn as to be unfit for further use, they can be re-rolled, whereas the Bessemer steel rails when disintegrated or broken are worthless.

The *Evening Post*, in publishing the above facts, calls Capt. Ward "a fanatical protectionist." That is very possible, but of one thing we feel tolerably certain, viz., that Capt. Ward would not have risked his own capital in these great enterprises had he felt assured of the prevalence of the free trade notions of the *Evening Post*. The industry of the West is likely to be considerably benefited in consequence of the "fanatical" views of Capt. Ward.

Magnetism.

The French Academy of Sciences has received a paper from M. J. Jamin, in which he shows that magnetism may be condensed, just like electricity. Having, for some special purposes, had a large horse-shoe magnet made, consisting of ten laminæ of perfectly homogeneous steel, each weighing 10 kilogrammes, he suspended it to a hook attached to a strong beam, and, having wound copper wire around each of the legs, which were turned downwards, he put the latter into communication with a battery of 50 of Bunsen's elements, by which means the horse-shoe might be magnetized either positively or negatively, at pleasure. The variations were indicated by a small horizontal needle, situated in the plane of the poles. There was, further, a series of iron plates, which could be separately applied to each of the laminæ. Before attaching any of the latter, the electric current was driven through the apparatus for a few minutes, and then interrupted, whereby the magnet acquired its first degree of saturation, marked by a certain deviation of the needle. One of the iron plates (usually called "contacts") was then put on, and it supported a weight of 140 kilogrammes. A second trial was now made; and the current having passed through again for a few seconds, it was found that the horse-shoe would support 300 kilogrammes, instead of 140. The number of contacts being now increased to five, which together, in the natural state, supported 120 kilogrammes, it was found, after the passage of the current, that they could support the enormous weight of 680 kilogrammes, which they did for the space of a full week. No sooner, however, were the contacts taken off than the horse-shoe returned to its usual permanent strength of 140 kilogrammes. This leads to show that magnetism may be condensed like electricity for a short period.

The commission of engineers on the East River Bridge, consisting of Allen, Latrobe, Serrell, McAlpine, Kirkwood, Adams, and Steele, met in this city on the 4th inst., and after a thorough examination of all the details of Mr. Roebling's plans, have approved them. The chairman recommended, as the successor of Mr. Roebling, his son, W. A. Roebling. He was accordingly elected

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Contents:

(Illustrated articles are marked with an asterisk.)

EFFECT OF FORM UPON FRICTION.

The mechanic is often prone to regard friction only as the deadly enemy of mechanism; the monster that gnaws away at axles and bearings, consuming both machinery and power. It is true that friction produces the ill effects he attributes to it, but it is none the less true that its benefits are much greater than the evils which attend its action.

Of course we do not mean by this that reduction of friction is not an advantage on most kinds of machinery, or that if it could be reduced to nothing in special cases, a great gain would not be made. What we assert is that the general and total abolishment of the law of friction, would be just as disastrous, and fatal to man's existence as the destruction of the law of gravity.

Friction wears out clothes and shoes, but that is better than being unable to walk. We have all received practical illustrations of the uses of friction, when we have had our feet slip from under us on an icy sidewalk, and found ourselves seated without ceremony and with greater force than was agreeable. But there are many machines that would be totally useless without friction. Without it we should be unable to use belts and pulleys, screws, or friction pulleys. Without it the modern locomotive could never have existed. Without it the wedge, one of the most useful and simple of mechanical appliances, would be worthless.

Unlike gravity or cohesion it is, however, to a certain extent controllable by means the most of which are familiar to mechanics, and it is not our purpose to say anything in this article of the substances employed to reduce friction between bearing surfaces.

It is a well-established fact that friction is proportioned to pressure, and is independent of velocity and extent of surface. To illustrate the proposition by an example: A weight of ten pounds resting upon a surface of two square inches and moving one hundred feet in a minute, would have no greater friction than the same weight resting upon one square inch of surface and moving one hundred feet in two minutes.

There are some circumstances which slightly influence the exactness of the proposition but it is generally correct, and may be relied upon for all practical purposes.

It follows that so far as form diminishes the element of pressure it may be made to diminish friction. A simple illustration of this may be obtained by laying a flat weight upon an inclined plane—a piece of board or a book will answer for the inclined plane. The greater the inclination the less will be the pressure between the surfaces of the weight and plane, so that the weight becomes more influenced by gravity, and descends with greater rapidity, the nearer the perpendicular is approached. A screw is nothing but an inclined plane wound around a cylinder, and all who are accustomed to making large and powerful jacks, know that it will not do to give them too abrupt a pitch, as otherwise they will not support their weights without turning.

Here we have an illustration of the way in which form may influence pressure and through it friction. In a subsequent article we shall consider this truth in its relation to the construction of gearing.

MECHANICAL FAIRS AND EXHIBITIONS.

The season is approaching when it is customary to hold fairs and exhibitions. Such exhibitions are of great and diversified utility. They bring the minds of inventors in contact, post them in regard to the advance of improvement, and almost invariably suggest new and valuable ideas.

They also afford a means of displaying to the public at large the construction of new and old devices, and of widely and thoroughly advertising valuable improvements. They are generally attended with interest by large numbers of people, and are among the most influential of means employed to educate the people at large.

They have, moreover, the great advantage of being, when properly managed, self-supporting, and, in many cases, profitable enterprises. For ourselves, we never visit one of these exhibitions with impaired interest, and never come away without profit.

Let any critical observer attend one of them and he cannot fail to be impressed with the versatility of Yankee genius, and the wonderful march of intellect which characterizes the age. From the steam engine to the sewing machine he will find a heterogeneous collection of all sorts of queer contrivances, all of which are intended to assist man in ridding himself of the primal curse, or, rather, to transform the curse into a blessing.

It is curious enough to listen to the *impromptu* lectures delivered by exhibitors upon their respective inventions; to watch their faces, now lit up with enthusiasm, and anon flashing scorn at the puerile criticisms of some garrulous ignoramus; or to watch the countenances of bystanders, standing agape at the automatic performance of some triumph of constructive genius. In short, for both amusement and instruction, commend us to a well-arranged and conducted Mechanics' Fair, above all other places.

We have already noticed the announcement of the twenty-second annual exhibition of the Maryland Institute, to be opened October 13, 1869, and continue till the 10th of November, and of the exhibition of the American Institute, to held in this city during the coming autumn.

We are now in receipt of a circular of an exhibition to be held under the management of the Mechanics' Institute of Buffalo, to be called the International Industrial Exhibition, which will commence on Wednesday, the 6th of October. The circular sets forth the design and scope of the proposed exhibition in full, and pamphlets will be sent on application to the Acting Secretary of the International Exhibition, Buffalo, N. Y.

We shall be happy to receive and briefly notice all announcements of similar Mechanics' Exhibitions throughout the country, believing that they ought to be encouraged and sustained, and that our readers will be interested in the information imparted.

In conclusion, we urge upon inventors and manufacturers at large, the importance of availing themselves of the opportunities afforded by these fairs, especially in the introduction and display of new inventions and processes.

PORTLAND CEMENT.

The composition of Portland cement is argillo-calcareous; that is, it is formed of clay and limestone, generally containing some silica, the properties of which may vary without injury to the cement. The proportion of clay may also vary from 19 to 25 per cent without detriment.

It is found native at Boulogne, France, in the inferior cretaceous formation. The only necessary condition for the formation of a good artificial Portland cement, is an intimate and homogeneous mixture of carbonate of lime and clay, the proportion of clay being as above stated.

The materials are raised to a white heat in kilns of the proper form, so that they are almost vitrified. After the calcination all pulverulent and scorified portions are carefully picked out and thrown away. The remainder is then finely ground and becomes ready for use.

The amount of water which enters into combination with it in mixing is about 0·366 by weight. It sets slowly, from 12 to 18 hours being required.

Ordinary hydraulic or water cements set very quickly, some of them setting in three or four minutes under water at 65° Fah. The time of setting varies from this to four hours, according to the characters of the cements. They contain larger amounts of silica and alumina than any of the other limes, and also contain magnesia, which Portland cement does not. They will not slake after burning, nor shrink in hardening, like the fat limes, and may be used without sand, the latter being only used for economy.

The slow setting of Portland cement renders its use very convenient for many purposes, as a much larger quantity can be mixed at once than can be done with hydraulic cements. When properly made, and this can always be determined by proper tests, it is undoubtedly a durable and strong cement. It has been successfully applied to concrete building, road making, lining of iron pipes and cisterns, marine architecture, etc., etc.

It seems to be growing in favor, and its manufacture is on the increase. In England large quantities are made, chalk being the formation from which the carbonate of lime is obtained. It has been largely used in the construction of foundations for bridges, some of which have stood from 16 to 18 years, showing no symptom of failure. Extensive sea walls have been built with this material in the Mediterranean.

Mr. Hawkshaw, a well-known engineer of note, says he has used Portland cement in a tide-way and has met with no difficulty. Neither has he found any difficulty in using concrete blocks in similar situations. Many others testify to its good qualities, and there is no doubt in our minds that its use may be greatly extended with advantage.

BUSINESS MISTAKES OF INVENTORS.

Having completed an invention, and found it to answer all the anticipations entertained previous to its completion, inventors next turn their attention to securing a patent. If their application is allowed, they are in a position to realize solid returns for time and money expended.

In doing this they find that perfecting an invention, and making money out of it afterwards, are two very different things. However great may be their inventive talent, it avails nothing in the business management, which must be conducted wisely or financial success will not follow.

At this stage of their operations they are apt to suppose that they must in some way secure the aid of outside capital, and many are led to sacrifice a large share of a valuable monopoly, to secure a small sum of money, and the help of what they suppose to be an expert in business. Ten to one they fall into the hands of some shark, who devours the profits of their invention, secures final control of it, and leaves them out in the cold.

Few inventions are made that cannot be disposed of by the inventor as well as any one he can employ or take into partnership with him. If of a small and cheap kind, and the best way to make money is decided to be by manufacturing and selling the article rather than rights to make it, let the inventor be content to begin small, gradually increasing his business from his profits, until it by natural and healthy growth arrives at the point where large returns may be expected.

There are, however, some inventions that can only be worked profitably with large capital, and an inventor may be so placed that his only means of obtaining the necessary aid is to put in his patent against capital as stock in a joint-stock company. In making an arrangement of this kind, the inventor should act only under the counsel of a competent legal adviser. The money expended in obtaining such counsel will never be better expended. A joint stock company has ins and outs in its organization which are difficult for the uninitiated to comprehend; and many an inventor has been inveigled into an arrangement whereby he has been shorn of his rights, and has found out too late that he has been fleeced.

Were inventors to dispose of their property in improvements as carefully as they deal in real estate, and proceed as cautiously in the transaction of their business as they should, we should hear less about capitalists reaping where they have not sown, while the simple-minded man who has put the power to make money in their hands is neglected and unrewarded.

In the sale of rights an inventor will generally succeed better than any agent he can employ. He understands his invention, and what a man understands well, he can, as a rule, talk well. But in the sale of rights there is generally more or less barter, a Yankee way of dealing, which gives considerable scope for sharp practice, and an inventor who is not on the alert, is often sold himself while he thinks he is making a good bargain.

In this, a good judge of the value of all kinds of property has an advantage. Inventors, therefore, who propose to sell rights, should first post themselves in regard to the value of most kinds of property likely to be offered in exchange for rights, and where it can be most readily put into market and turned into money. All the time he spends in obtaining such knowledge, will largely repay him when he comes to apply his knowledge in selling his patent.

He should insist upon all agreements being made in legal form, and omit no technicality likely to secure him from trouble in the future. In short, he should be thorough and exact in all his transactions, and if he has really got a valuable improvement, he can scarcely fail to make money.

ARTIFICIAL BLUSHES—HOW THEY ARE PRODUCED.

In the provinces of Oaxaca, and Guaxaca, and other parts of Mexico, grows in greater profusion than anywhere else, the species of cactus called the *Cactus opuntia* or *nopal*, otherwise the *Opuntia cochinillifera*, one of the most important plants grown in that country. This plant is the home and pasture of a species of shield louse, an insect the properties of which have been known since the earlier part of the 16th century. It exists wild in the woods, or upon cultivated tracks of the *Cactus opuntia*, grown to afford a support for an insect the scientific name of which is *Coccus*, and the commercial name of which is cochineal. This insect furnishes a coloring matter of great importance in the arts, not excluding the fine art of painting in oils or water colors on canvas, drawing paper, or the cheeks of haggard belles, whose natural color has suffered damage from late hours, hot drinks, and pickle diet.

The little parasite, whose favorite home we have mentioned, furnishes the chief staple for these artificial blushes, or perhaps we should say blush, as it is, like the American Union, and unlike the beautiful tint which nature provides the young who do not defy her laws—"one and inseparable."

The cultivated insect furnishes the finest cochineal, but the wild, is less expensive to procure, and is therefore largely used. The insect as found in his native home, is shaped very much like a miniature turtle, its back being of an oval, shield-like form, and its belly flat. It has on its back a rather deep furrow running longitudinally, and cross furrows, which unite with the main central furrow. Only the female insect affords the coloring principle for which these insects are sought. The male has wings of which the female is destitute.

We remember seeing in a geography book, in our youth, a picture of people gathering cochineal, which, although we have since seen it repeated, gives a wholly erroneous idea of the operation. In this mendacious illustration the people were represented as shaking and pounding with poles a tree, very much resembling an old fashioned red-cherry tree, having sheets of cloth spread upon the ground to catch the cloud of insects which were represented as falling to the ground in great numbers; a good way to gather beechnuts, but one that would hardly avail to gather the cochineal.

The males are very much fewer than the females, only one of the former being found to one or two hundred of the latter. At the proper season for collecting them, the iemales attach themselves to the leaves and grow so fat and corpulent, that their snouts—of which they have at first an ample allowance—their antennæ, and legs almost totally disappear, and the insects look more like excrescences than anything having life.

They are now gathered by means of a blunt knife, a quill, or its equivalent, and killed, either by inclosing them in a bag and immersing them in boiling water, or by heating them in a stove. If boiling water is used they are subsequently dried in the sun. The wild variety yield, it is said, six crops, and the cultivated variety three crops annually. The insects after drying, are sifted, and the dust forms an inferior article of commerce called granillo.

The coloring matter which renders this insect valuable is very soluble in water, in cold alcohol, and still more in boiling alcohol, but insoluble in ether. It has been called by the chemists *cochinilin*, and more recently carminic acid, on account of its acid properties. According to De la Rue, it consists of carbon, hydrogen, and oxygen, in the proportions expressed by the formula $C_{28}H_{14}O_{16}$, or 168 parts of carbon, 14 parts, of hydrogen, and 128 parts of oxygen by weight.

It may be obtained by digesting the insects in ether to remove the fat, disolving the residue in water and adding acetate of lead, when a lead carmine lake will be precipitated. This is washed, dissolved, and decomposed by hydrosulphuric acid, which precipitates the lead as a sulphide leaving the carminic acid in solution, which is separated by evaporation. Carminic acid is a purple-brown friable mass, soluble in all proportions in alcohol and water, and unchangeable by the action of strong sulphuric or hydrochloric acid. It forms purple lakes with salts of copper zinc and silver; and with tin, a bright crimson. Very fine lakes are also prepared by its combination with fine gelatinous alumina.

When pure it is harmless but it is often shamefully adulterated with lead salts and vermilion, which are poisonous.

Cochineal is used largely in dying, in fine painting, in coloring confections, and in the perfumer's art, where it forms the basis of a number of the finest preparations called rouges. The following is one of the best recipes for the manufacture of this sort of pigment, and it can be easily prepared by any one. It is perfectly harmless to the skin.

Recipe.—Extract the coloring matter from cochineal (obtainable at any good druggist shop) by digestion with alcohol; filter the tincture, add a little solution of gum-arabic, and boil down to a thick liquor. The boiling should be done in an earthern vessel set in a pan of boiling water. When the liquid has become sufficiently thick it may be spread evenly over the inside of a saucer. Thus ladies may have it in their power to make themselves blush to any desirable extent, without the aid of the perfumer, and without fear of deleterious effects upon the skin from poisonous adulterations.

THE PROPERTIES OF RESINOUS TIMBER.

The fact that resinous timber will withstand the action of heat and moisture, where other kinds will soon decay, seems already to have been known by the ancients, for Pliny says, the more odoriferous wood is, the more durable it is. Indeed, the longer a tree has been used for pitch, the less enduring is the timber that it yields; and it may be asserted, that the wood of the Coniferæ, which is so useful for all kinds of carpenters' work, owes its usefulness greatly to the quantities of resin secreted in its tissues, they rendering it impermeable to water and making it thus capable to withstand its effects. The resin becomes concrete after death by the evaporation of the essential oils which held it in solution. Schacht, in his splendid work, "Der Baum" (the tree), relates several instances of the wonderful durability of resinous timber. This author examined the ruins of the castle Ehrenstein, near Remda, in Thuringia, one of the oldest extant in Germany, and found the wood (yellow pine), perfectly sound, and but little turned brown. The old wood of the Canarian pine is also nearly imperishable on account of the resin diffused in its tissue. Schacht relates that the pillars of the dwellings on Teneriffa and Gran Canaria are still as well preserved as if recently cut. They were driven into the ground at the time of the Conquista, in 1402.

William W. Bates, of Chicago, Ill., in a report on American ship timber, relates, also, numerous instances of the great durability of resinous timber, among which the following may find a place here. "The red and white pines of Oregon are largely used on the Pacific coast in the construction of the various parts of vessels. They are considered so well fitted for this purpose that vessels have been constructed entirely of the denser sorts of pine timber, both in Oregon and California The yellow, or long-leaved pine of Virginia and North Carolina is extensively used by Atlantic ship builders for planking, ceiling, stringers, beams, waterways, rails, keelsons, etc. It is very durable, and when a lighter, yet solid wood is required, it is preferred to oak of whatever kind." The white or northern pine, according to Bates, is found at the head of the list of the softer woods used in building vessels of every description. For the construction of river steamboats, it is invaluable, and is sometimes used in almost every part of the boat, except the frame, above light water mark. No wood is said to be better adapted to withstand the sun and weather, for, with proper seasoning and reasonable protection, after the work is finished, it retains its properties as long as the best kind of oak. The wood of the hackmatack or tamarack (the American larch), which is known for its density as well as for its gummy nature, is used for vessels in every part. The sap-wood should, of course, be excluded in this, as well as in all other instances, but the heart-wood requires no seasoning before use, the shrinkage in weight being less than two pounds per cubic foot. For lightness, strength, tenacity, and durability, it is unequaled. The red, or Norway pine, when deprived of its sap-wood, is found to be a first-class material for top timbers, beams, deck planks, bulwarks, and ceiling; it affords excellent timber for masts, when large enough, and for all kinds of small spars. The roots make very good knees and breast hooks.

Another proof of the unchangeability of resinous matter, is the amber, which, formerly, was considered as being of mineral origin, but is now decided upon to have been secreted, in a fluid state, from the Coniferæ of the upper tertiary and secondary strata. From the ordinary resins it differs in yielding a peculiar acid, the succinic acid, upon being treated with alkaline lyes. Goeppert succeeded in producing it artificially from Venetian turpentine, in digesting the same with twigs of the larch, for twelve months, in water of from 140° to 175° Fah.

THE MICROSCOPE IN SILKWORM CULTIVATION.

Our readers may not generally be aware that for several years the microscope has been employed in Europe for the purpose of scanning the eggs of the silk moth, with a view to separating the bad ones from the good. The result of this has been a decided improvement of the stock wherever the the method has been employed. A paper, from the pen of M. Comalia, published in the *Monthly Microscopical Journal*, contains the following extracts, which gives an account of a further extension of the use of the microscope to examination of the moths, thereby enabling the grower to withdraw such as are diseased from the general stock, a process which he claims to be more expeditious and efficient than the assorting of the eggs after they are deposited.

M. Comalia asserts that with a microscopic examination limited to the eggs, we make only a half experiment. The method is imperfect, and the success resulting from its employment may be attributed (excepting certain bad processes of culture) to examination for corpuscles in the eggs only, for every healthy egg does not necessarily produce a healthy moth. He says:

"These facts are evidenced by the fact that eggs attacked in the proportion of 4 per cent if proceeding from one of our families of moths, or 8 or 9 per cent if from one of the Japanese races, give very mediocre results. In fact, the corpuscles, which I have often insisted on, are the appreciable characters of the disease; but the eggs may be attacked by the original disease without having these microscopic features. In examing the eggs of a corpuscular female, in which they were disposed in chaplets in the ovaries, all the eggs were not found charged with corpuscles.

"In order, then, to make a definitive experiment to guarantee the healthiness of the eggs, there is nothing like examining the moths before or after they have deposited their ova, in order that we may reject all those eggs proceeding from tainted parents. This mode, the most rational, although the most difficult ot execution, which M. Pasteur has suggested, and which I believe to be alone capable of regenerating our races of worms, was attempted last year at Milan with complete success.

"In the month of June, 1868, I received from Zara, a package of cocoons of the ancient Italian race, cultivated on the Dalmatian coast, not far from the shores of the Adriatic. These cocoons, about one kilogramme, contained three chrysalides alive. Some of these chrysalides, which I soon examined, and which were not yet perfect, exhibited no trace of the corpuscles. It was then that the idea occurred to me of applying M. Pasteur's method to the eggs obtained from healthy moths grown with every care.

"My friends, the Marquis Crivelli and M. Bellotti, undertook this experiment. The moths, when hatched out, had a most deceptive appearance, and, when examined by these gentlemen, were found to be free from corpuscles; here there was a perfectly healthy egg, the product of healthy parents, which gave promise, not only of a large produce in cocoons, but even of a healthy crop of moths and of eggs for the culture of the year 1869

"M. Crivelli selected Inverigo, in Brianza, to 'bring up' these eggs, in order to surround them with all the necessary care. He divided the eggs into three portions; one of these parcels was given to a peasant in the village, another was reared in his own garden, and the third was sent to a distant locality.

"It is necessary to state that the mode of 'education' adopted by the Marquis was an extremely careful one; general hygienic conditions being carefully attended to, and the locality, which had some time ago been used as a hospital for cholera patients, having been fumigated with chloride of lime. Within a radius of 500 meters no other silkworms were cultivated. Moreover, the locality abounded in mulberry trees—this fact being of importance—for had the leaves been imported from other localities they might have been tainted with corpuscles of diseased caterpillars.

"The cultivation of the three batches proceeded excellently, as on the estate of Inverigo, where the Marquis raised 210 ounces of eggs, of which no more than two per cent were diseased. From these 210 ounces he obtained 10,176 kilos. of cocooons, a mean of 48 kilos. to the ounce. The three batches of eggs from Zara did still better, for they produced a maximum of cocoons equal to 62 kilos. per ounce.

"As may be imagined, the Marquis set apart for the next year the eggs from the last mentioned quality, and he set to work with ardor, and with great hopes of excellent results, but all his exertions were not followed by equal success.

"The examination of the chrysalides responded exactly to what might have been predicted; that is to say, that all three batches were equally healthy. The microscopic examination of the moths, however, gave quite a different result. Those which had been reared in the village and those in the Marquis' garden were diseased; but those which had been sent to a distance and which were brought up in the isolated house were perfectly healthy. Not one of these last presented any corpuscles, neither in leaving the cocoon nor in depositing ova, nor in decay, nor after death.

"Here there is a decisive result; for the eggs were the same and the education of the three batches was alike, save in certain circumstances, on which it is important to insist. The peculiar circumstances relate only to the conditions of contagion—to the transport ot corpuscles. In fact, the healthy moths were those which had been reared under circumstances of isolation, in places previously disinfected, and where the worms had been fed with leaves equally isolated.

"Here there is what is essential to obtain certain results. To the ordinary precautions of 'education,' conducted with all possible attention as to temperature, aeration, and abundance of food, it is necessary to add isolation of the chambers by a cordon of at least 500 meters radius, and healthy eggs, deposited by healthy moths, cultivated with particular care in isolated localities, disinfected with chlorine, and having a certain 'precocity,' in order to obtain isolation.

From the foregoing remarks and general experience, M. Comalia draws the following conclusions:

"1. An egg, apparently healthy as to its microscopic features, may proceed from very unhealthy parents.

"2. An egg, healthy as to its characters under a microscope, may and does give ordinarily a long produce in cocoons, but it may be incapable of giving healthy eggs.

"3. The absolute health of an egg proceeding from healthy moths (which present only about 4 or 5 per cent of diseased specimens) is an excellent indication of the capacity of an egg to produce healthy moths, which in their turn shall be capable of producing healthy eggs.

"4. To assure this result, it is necessary to maintain all those hygienic and other conditions before mentioned."

COAL—HOW IT MAY AND MUST BE CHEAPENED.

All agree that coal is absurdly, extortionately, cruelly high; but all do not agree as to the cause of present high prices, or as to how it may be cheapened.

The free traders say the high price is dependent on the present tariff, while some protectionists say it is owing to extortionate freights and high prices demanded by miners. We say it is a combination of all the causes assigned.

While we have been and still are protectionists within what we consider the legitimate meaning of that term, we say remove the tariff on coal, at least until such time as it may become apparent that it needs some protection. At present it is perfectly plain "the shoe is on the other foot." But when this is done only a small part is done. We need additional and competing lines of transit trom the great beds of coal to the principal centers ot trade, and we need more labor; the want of a proper labor supply being, in our opinion, one of the chief causes of trouble.

This labor can be found in abundance in Asia. It only waits to be properly invited. It is just the kind of labor wanted for the purpose, and the coal strikers may rest assured that if it be once called into request, public opinion will sustain it against all intrigue, and threatened or attempted outrage.

Cheap coal we may have, and *must* have, and all parties implicated in the present stringency had better take heed lest they carry things just beyond the limit of the proverbially elastic American patience.

We say to these people so long as you protect the public we go in heart and hand to protect your industry, but not one fraction of a moment longer. And we say the same to all other industries the people have been willing to aid by tariff on foreign importations. We are sorry to say it, but the present high prices of coal are doing more to build up the doctrines of free trade than all the writings of its advocates, or speeches of clergymen, college professors, and demagogues, upon the much misunderstood and abused subject of protection.

If only the coal trade would be likely to suffer by the reaction which the present state of things will cause, we should not grieve, but we fear that the prosperity of other important industries will be also imperiled. Many will be so illogical as to reason that if a tariff is not needed on coal it is not needed on anything. Now the only way to make such a conclusion tenable is to cheapen labor. Let people take their choice, but remember that labor cheapened by a supply adequate to the demand will not be likely to soon recover its present power.

Testing Opium.

Professor Schneider has proposed, in the sixth revised edition of the *Pharmacopœia Austriaca*, the following method for testing the goodness of opium: Ten grammes of previously dried and powered opium are treated with a mixture of 150 grammes of distilled water, to which 20 grammes of pure hydrochloric acid, sp. gr. 1·12, are added; the residue, after extraction, should not exceed 4·5 grammes weight; to the acid fluid 20 grammes of common salt are added, and the precipitate thereby caused is collected, after 24 hours, on a filter, and the latter washed with a solution of common salt; to the filtrate ammonia is added, and the fluid left standing again for 24 hours; the crystals which have separated are collected, redissolved in acetic acid, and precipitated with ammonia; the precipitate so obtained is washed, dried, and weighed; its weight should not be less than 1 gramme.

INVENTION.

From the New York Tribune.

The number of patented articles in our country is so great that no one man can have a knowledge of them all. When one invention comes into general use, a demand grows out of it for another which shall operate with what it produces, or in combination with what others produce; and we may say that the first invention of the human mind is comparable to the seed of fruit, since it contains within itself the nucleus of innumerable leaves and branches, and other fruit and seed which in the progress of outgrowth take on innumerable variations and developments. When a tree is planted the growth for a few seasons is slow, and it is a law that the more valuable and enduring the sort the more tardy is its progress; and when men first planted, no little energy was required, for the natural mind, being without a standard, could not look forward except by a dim light to the season of depending and fruitful branches. Casualties of the passing time—insects, winter with its snow, its cold, fierce winds, and frost, searching for the heart and the mainspring of life—seemed so direful in their effects that when spring showers and gentle sunshine came it was almost miraculous to behold the bare twigs become adorned with tender leaves, and the delicate bloom foreshadow the fruit that was to be. As ages passed, each gave a little to the preceding of culture and care, and finally minds, grown into harmony with familiar trees, dissociated themselves from the mass of men, and the pursuit of horticulture issued out of ages of poverty, plague, and pain.

Not dissimilar has been the progress of invention, and in like manner has the mind of man struggled with the adversities everywhere rushing in to avert, to overwhelm, and to destroy. It is almost miraculous to see how ideas have been preserved and matured amidst the darkness; and now those ideas spread out manifold, and triumph with foliage and fruit. We can see how the mind rises step by step—how, in gathering to itself comforts and riches, it uses the power which these give to grasp for still more, and changes arise, and what seemed established conditions pass away. Inventions must be introduced by degrees, and only as strength is acquired. If the inventions of the last thirty years could at once have been given to man in the age of Queen Elizabeth, they would have been useless, because society and mental development were not in condition to admit of their application. There can be no doubt that in ages past many things were invented, or at least conceived, which could neither be understood nor adopted, for they were before their time, and they floated back into the great, and, to us, unknown infinity of intelligence and mechanism.

We have, in our day, what would seem a singular condition regarding applied inventions. Notwithstanding the vast amount of labor which they save, and of wealth which they create, we are still as much in need of new inventions as were the people of any former age, and this evidently because the mind has enlarged, and new wants have been created. Perhaps the need for new inventions is felt nowhere so much as in the household, and a grievous burden rests upon at least one half of the race, which is more sensibly felt because in other industries and in the arts human ingenuity has brought automatic labor into successful operation, and it is demanded that the household shall enjoy corresponding results. In this we are not speaking of the higher, or of the wealthy, but of the great middle class. Upon investigating the claims of the household, it will be seen that the deficiency arises from a want of motive power to perform the labor now supplied by muscles unequal to the task. The work for inventors is the discovery of some power which shall be cheap, so compact that it will not be ungainly, and which can be used in all places. We need a philosophic and analytic history of inventions. It would show, we think, that progress commenced in the obvious, and that it has been gradually approaching to the abstract. The higher class of inventions demand deep research in every department of human study, that each may contribute something. The inventive and the creative powers are akin, and the more we investigate their relations the more will this part of the nature of man appear to partake of those attributes which called the world itself into existence. However much is to be expected from an individual during the extension of his existence, we ought not to look for one age to accomplish much. To the coming children, work and endeavor and great cares must be allotted, that they, too, may spread out branches, and that at no remote period of time they may, by superior powers, bring out of the invisible, despite unwilling nature, such things as elude our weaker grasp.

Testing Petroleum Oil.

There seems to be various opinions in regard to the true method of testing refined oil in this country, owing to the fact that refiners and inspectors do not confine themselves to a uniform standard and method of operation, and are inclined to advance each his own mode as the true and only one, and inspect his oil to the best advantage, so long as it suits individual interest. Hence the great difference in comparative fire test of inspection through the country, and the evil tends to furnish a basis for difference of opinion and contention, and, in many cases, throw discredit alike upon the dealer and inspector.

The true method of testing refined oil is by fractional distillation, to determine the proportions of benzine or gasoline and naphtha which they contain. As this is not generally understood by inspectors or refiners, and would occupy too much time for practical mercantile business, the next best method is of great importance.

The State law authorized the use of G. Talinbur's instrument, which is an inclosed vapor test, delicate and accurate, when understood. Another method in use is the open water bath, with a small flame suspended above the oil; and still another, an open water bath and testing by passing a light over the surface. The objection to the first is that any fluid or gas heavier than the atmosphere will rise by capillary attraction through a wick, or tube to the flame, and indicate a lower fire test; and the uncertainty of equal distance of the flame in the latter is an objection.

We are inclined to believe that so long as fractional distillation is not known by the masses that the true commercial mode is that similar to Professors Roscoe, Penny, and Attfield, in use by the British board, and described in the British petroleum act.

A porcelain vessel is used—extra protection of an extra glass tube around the stem of the thermometer, which is placed one and one half inches below the surface of the oil. Great accuracy in filling the water in bath to an exact hight, and fresh water used for every test—great accuracy in filling oil to a certain prescribed hight—a small wire or guard is placed one quarter of an inch above the rim of the vessel, which is flat, with a raised edge, one quarter of an inch in hight—a screen is placed two thirds around the apparatus to protect it from uneven draft, and a few inches above the level of the vessel. Great care is used in not too rapidly heating, otherwise the test is unsatisfactory. When the thermometer indicates the desired heat, say 90 degrees Fahrenheit, a small flame is quickly passed across the wire over the surface of the oil. If no pale blue flicker or flash is produced, the test will be applied at every three degrees in thermometer above this, when flash point has been reached and noted. The test is repeated with a fresh sample of the oil and fresh water as before, withdrawing the source of heat from the outer vessel, when the temperature approaching that noted in the first experiment is reached.—*F. S. Pease's Oil Circular.*

Manufacture of Oil-Cloth.

The manner of making oil-cloth, or, as the vulgar sometimes term it, *oil-skin*, was at one period a mystery. The process is now well understood, and is equally simple and useful.

Dissolve some good resin or gum-lac over the fire in drying linseed oil, till the resin is dissolved, and the oil brought to the thickness of a balsam. If this be spread upon canvas, or any other linen cloth, so as fully to drench and entirely to glaze it over, the cloth, if then suffered to dry thoroughly, will be quite impenetrable to wet of every description.*

This varnish may either be worked by itself or with some color added to it: as verdigris for a green; umber for a hair color; white lead and lamp-black for a gray; indigo and white for a light blue, etc. To give the color, you have only to grind it with the last coat of varnish you lay on. You must be as careful as possible to lay on the varnish equally in all parts.

A better method, however, of preparing oil-cloth is first to cover the cloth or canvas with a liquid paste, made with drying oil in the following manner: Take Spanish white or tobacco-pipe clay which has been completely cleaned, by washing and sifting it from all impurities, and mix it up with boiled oil, to which a drying quality has been given by adding a dose of litharge one fourth the weight of the oil. This mixture, being brought to the consistence of thin paste, is spread over the cloth or canvas by means of an iron spatula equal in length to the breadth of the cloth. When the first coating is dry, a second is applied. The unevennesses occasioned by the coarseness of the cloth or the unequal application of the paste, are smoothed down with pumice stone reduced to powder, and rubbed over the cloth with a bit of soft serge or cork dipped in water. When the last coating is dry, the cloth must be well washed in water to clean it; and, after it is dried, a varnish composed of gum-lac dissolved in linseed oil boiled with turpentine, is applied to it, and the process is complete. The color of the varnished cloth thus produced is yellow; but different tints can be given to it in the manner already pointed out.

An improved description of this article, intended for figured and printed varnished cloths, is obtained by using a finer paste, and cloth of a more delicate texture.—*The Painter, Gilder, and Varnisher's Companion.*

*This preparation will likewise be found both useful and economical in securing timber from the effects of wet.

An Oxygen Explosion.

The oxyhydrogen, or lime light, is now in use, with great success, in the theaters of this city, and is regarded as indispensable in the making up of all effective scenes. The best light is produced by the ignition of two jets—one of hydrogen and one of oxygen, which impinge against a piece of lime. In some cases the common street gas, which contains hydrogen, is substituted for hydrogen; but the light is better when the pure article is employed.

The oxygen is supplied to the theaters in portable cylinders of rolled iron, of convenient size for lifting by one man. The gas is condensed into the cylinders, under a pressure of from 100 to 150 lbs. per square inch, by steam power.

During a recent performance at Niblo's Garden Theater, in this city, one of these oxygen gas holders suddenly exploded, with a report equal to a cannon, causing the utmost consternation among the audience, and doing some damage to the theater. No cause is assigned for the explosion; but the cylinder probably was too weak to stand the pressure.

Japanese Matches.

Mr. R. Trevor Clarke has stated in the *Chemical News* that the Japanese matches are identical with the spur-fire of the Chinese. He gives the following form for making this beautiful little firework: Lampblack, 5; sulphur, 11; gunpowder from 26 to 30 parts, this last proportion varying with the quality of the powder. Grind very fine, and make the material into a paste with alcohol; form it into dice, with a knife or spatula, about a quarter of an inch square; let them dry rather gradually on a warm mantelpiece, not too near a fire. When dry, fix one of the little squares in a small cleft made at the end of a lavender stalk, or, what is better, the solid straw-like material of which housemaids' carpet-brooms are made (panicular stems of *Arundo Donax*). Light the material at a candle, hold the stem downward, and await the result. After the first blazing off, a ball of molten lava will form, from which the curious coruscations will soon appear.

Power of the Wind.

The Vicksburg *Times*, says that recently a young lad at Lake Station, Mississippi, had a very large and beautiful kite presented to him, about six feet by four in size, which he attempted to raise, just as the wind was increasing and a storm was threatening. The wind drew the kite so heavily as to drag the boy along also. To prevent losing the favorite, he wound the cord around his body. At last the gust bore kite and boy along in the rapid air currents. The boy seemed to be about 100 feet above the earth, and the kite five times that distance. At last the young kite-flyer caught in the top of a tree, and was suspended 75 feet above the ground. A flood of rain came on, slackening the line, abating the wind, and allowing the little sufferer to be rescued. He was found to be unconscious, and so bruised and marred as to be scarcely recognized, but was restored the same evening, and is now doing well.

Editorial Summary.

MAGNETIC VARIATION.—The *Duluth Minnesotian*, says: The magnetic compass, on the north shore of Lake Superior and particularly in surveying around Duluth, is a very zig-zag kind of guide. The Assistant Surveyor in charge of the transit on our Town Site Survey during the past week experienced some of its wildest eccentricities of variation. In running and cutting out a transit line between sections on the mountain side, at a certain spot he noticed in a distance of fifty feet a change from 11 deg. east, to 17 deg. east; then in a hundred feet further, back to 12 deg. east; while five hundred feet further on from 12 degs. 30 min. east it whirled around to 30 degs. west (!) and kept at that for three hundred feet and then got back again to 11 degs. east. The Surveyor picked up a piece of rock of the granitic species, which seemed to prevail in the locality, and applied it near his compass, when the needle followed it around the same as it would a true loadstone. The general Government may well require the use of the solar compass in surveying lands in this region. The needle is but a blind guide.

WE are reminded, says the *American Builder*, that, during the past month, a letter came to us from a distant city in which the writer suggests a novel style of a dwelling, and asks us whether we think the plan patentable. Most assuredly we do, and we hail this request as an encouraging sign of the times. Why no patents are applied for on improvements in dwellings, has, to us, long been a mystery. We want something new. What are our inventors about? Millions of money expended annually in the construction of dwelling houses and no patent house. Start in, inventors. You will produce a sensation among the dry bones in the architects offices, that will be eminently amusing. We beg of you not to consult any books on architecture; but go at it in a muscular style and give us an original plan for a house. If the dead centuries, surfeited with architectural lore, see fit to laugh at you, do not be disturbed. An age that lays cables across an ocean, and railroads across a continent, can afford to be laughed at. Send on your plans.

THE Gateshead (Eng.) *Observer* says that the offering of prizes to pit lads in that district to induce them to search for fossil remains has been attended with unexpected results. Not only had the lads picked up from the refuse shale heaps large numbers of fish remains, and some remains of large reptiles, but what is really extraordinary, and will astonish palæontologists, one of the lads has found the lower jaw of a true mammal. The effect of this discovery will be to reduce the comparative ages of all hitherto known mammalia, and carry backward the mammalian life of the world to a much earlier period than that at present assigned to it.

TO INVENTORS.—We desire to call the attention of inventors to an article entitled "Invention," published in another column, and copied from the New York *Tribune*. This able article forcibly confirms the views we have always maintained in our paper, that there is no natural limit to invention any more than to the desires of individuals for new and improved articles, machines, and processes. We also advise all who have or expect to have patents or patented articles for sale to read attentively an able communication entitled, "Printers' Ink in the Sale of Patented Articles." It contains most valuable suggestions.

WM. M. HAYNIE, of Sacramento, who has a large number of silkworms, lost 500,000 in one night. He attempted to hatch them by artificial heat, and to economize the heat by running steam pipes through the building.

THE GUNPOWDER HAMMER, for driving piles, illustrated in our last issue was patented by Thomas Shaw, of Philadelphia. It is a very useful and ingenious machine, and the inventor's name should be associated with its introduction.

Nitro-Glycerin Explosion.

The Titusville (Pa.) *Herald* records a singular accident:

"One of the most extraordinary accidents it has been our province to chronicle, occurred at the 'Salt Well,' Scrubgrass, on Friday afternoon, July 30th, and resulted in the death of George W. Fetterman, and the seriously wounding of two other persons.

"The unfortunate man procured on Monday last, for the purpose of oiling engines, a quantity of thick fluid which, from the color, he supposed to be lard oil, but which, as the sequel proved, was really that dangerous explosive, nitro-glycerin. He used it as a lubricator on the engine at the 'Salt Well,' and also on another engine, from Monday until Friday afternoon. Strange as it may appear, the nature of the fluid was not suspected during all the time, although it was remarked by some one who was curious enough to taste it, that it was singularly sweet for lard oil. However, about 3 o'clock on Friday afternoon, as the man was oiling the gudgeon of the sand-pump pulley, which was revolving with great rapidity, a terrific explosion occurred. Fetterman was blown some distance and instantly killed. He was mutilated almost beyond recognition. The flesh was literally torn from his limbs, and one half of his head was blown off. His brother James and a man named D. McNally, who were standing near by, were thrown violently to the earth. They were both much bruised. The former was wounded in the chest, thigh, and groin by pieces of the can, in which the glycerin had been kept, and other splinters, and the latter was struck in the face by a piece of tin. Their injuries are not considered dangerous.

"The force of the explosion drove pieces of the can and splinters in all directions, and also blew three or four boards off the engine-house. One piece of tin was driven entirely through a four-inch post. At the time of the explosion there was very little glycerin in the can, probably not more than an ounce or two."

MANUFACTURING, MINING, AND RAILROAD ITEMS.

M. de Lesseps, the Suez Canal engineer, having sent some surveyors to examine the desert of Sahara, has, it is said, become convinced that the desert is at its nearest limit 27 meters below the level of the Red Sea, and that the depression continues increasing toward the interior. He therefore thinks that he can make the desert the bed of a large inland sea, by a canal of 75 miles in length, bringing the water from the Red sea. Besides climatic changes an easy method of intercourse with Central Africa would be effected if this project could be accomplished.

A correspondent of the New York *Times* writing from Helena, Montana, says: "The daily receipts of bullion and dust at the Helena Bank are over $50,000 per day. A seven pound nugget was taken out of 'Bilk Gulch' a few days ago, by G. W. Moore. The lucky miner had better rechristen that gulch. A nice little silver 'button,' weighing $2,800, was sent in from the Stapleton Silver Mines a few days ago, and last week the banking house of Bohm & Aub shipped the 'heftiest' gold brick yet made in Montana, although by no means the last. The value of this little auriferous pocket piece was $40,000."

The jury on the inquest in the case of a woman whose death was caused by an explosion of a kerosene lamp at 408 West Twenty-sixth street, this city, on the 29th ult., added to the verdict that deceased came to her death by burns inflicted by an oil proved to be highly explosive, a recommendation to the Board of Health, Fire Commissioners, or any authority having power to do so, to enact an ordinance making it a punishable offense to manufacture and offer for sale an oil that shall evaporate at less than 100 degrees Fah., and burn at less than 110 degrees.

The Monson, Mass., quarrymen have split out a granite slab 350 feet long, 11 wide, and 4 thick, containing 15,400 cubic feet, and weighing twelve hundred and eighty-three and one third tuns. To cut it from the rocks 1,104 holes were drilled on a line parallel with the front edge. This ponderous piece of granite will be cut up and sent to Albany to be used in the construction of the new capitol.

On the 19th July the Thames Tunnel was finally closed as a public footway. The tunnel was commenced by Brunel in 1824, and was finished in March, 1843. The total cost of the tunnel was about $3,500,000, but the East London Railway Company recently purchased it for a little over a third of that sum. The company will run their trains through the tunnel, their line bringing the inhabitants of Wrapping, Shadwell, etc., within easy distance of Southwark Park.

Nameless County, Nebraska, has voted to donate $250,000 to the St. Louis Trunk, and the Brownsville, Fort Kearney, and Pacific Railroads. Both roads will be built through the county next year. The latter is an extension of the Quincy and Brownsville Railroad. The work is progressing on both lines.

A convention was concluded on the 16th day of April, and proclaimed on the 6th of July last, between the United States and the Emperor of the French, to secure in their respective territories a guarantee of property in trade marks. A similar arrangement has been made with Russia.

At a workingmen's convention held at Virginia City, Nevada, resolutions were passed declaring that "the importation of Asiatics and their employment in the mines, or other fields of labor, must be discontinued, or it will bring on an 'irrepressible conflict' likely to end in bloodshed and ruin."

The British Board of Trade return of the number and nature of railroad accidents during the year 1868 has been published. In England 150 persons were killed and 528 injured. In Scotland the numbers were respectively 47 and 39, and in Ireland 15 and 33. Of the 150 persons killed in England by train accidents 31 perished at Abergele.

The statistics of immigration at New York for the month of July show the total number of arrivals to have been 25,017, against 26,111 last year, a falling off of 1,094. The greatest number came from England and Ireland, 11,694, Germany being represensed by 8,149, and the Scandinavian countries by 3,401.

A ship canal is to be constructed through Schleswig-Holstein to connect the Baltic and the North Seas. The preliminary surveys have been completed. It is thought the Prussian Government will undertake the work of building.

The Exhibition Commissioners at London, England, have decided to hold a series of annual international exhibitions of select works of fine and industrial art and scientific inventions at Kensington. The first exhibition s fixed for 1871.

The International Exhibition of Art and Industry just opened at Munich is said to surpass in attractiveness the similar exhibition of 1858. The pictures number over two thousand.

A telegram from Ketch announces that the Black Sea cable belonging to he Indo-European Company has been successfully submerged.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

2,067.—Reaping and Mowing Machine.—James Thayer, New York city. July 8, 1869.

2,068.—Shaving Mug.—F. M. Keeler, Boston, Mass. July 8, 1869.

2,087.—Producing Marquetry and other Divers Colored Wood-Work. Joseph Dill, Grand Rapids, Mich. July 10, 1869.

2,088.—Machine for Manufacturing Horseshoes.—O. A. Howe, Jersey City, N. J. July 10, 1869.

2,090.—Wood-Working Machine.—Joseph Dill, Grand Rapids, Mich. July 10, 1869.

2,102.—Manufacture of White Lead.—Geo. T. Lewis, Philadelphia, Pa. July 12, 1869.

2,112.—Mowing and Reaping Machine.—James Green, Boston, Mass. July 13, 1869.

2,118.—Pianoforte Hammer.—C. W. Brewster, Racine, Wis. July 14, 1869.

2,119.—Pianoforte Bridge.—C. W. Brewer, Racine, Wis. July 14, 1869.

2,179.—Blotter.—C. C. Moore, New York city. July 19, 1869.

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.

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.*

H. A., of N. J.—If an upright cylindrical vessel be filled with water, the pressure against each point of the walls varies from nothing at the top to a quantity proportional to its depth at the bottom. It will be upon each square inch of area equal to a column of water of a hight found by measuring from the center of the area to the surface of the water, and having for its base one square inch. If now the top be closed and pressure be applied through a tube or other means, this pressure will be transmitted equally in all directions. That is, suppose the pressure at the top to be nothing previous to applying pressure, and at the bottom to be ten pounds per square inch, then if ten pounds additional pressure to the square inch were applied, the pressure on the top would become ten pounds to each square inch and at the bottom twenty pounds. And if the pressure were sufficiently increased the cylinder being of uniform thickness and strength throughout would burst first at the bottom. In a vertical boiler 17 feet high the difference in pressure against the walls at the top and at the bottom would be equal to about seven and one half pounds per square inch.

B. D. M., of N. Y.—All kinds of bricks are more or less conductors of heat, and though you should cover your boiler with a mountain of masonry you cannot avoid some loss. Nevertheless there is great economy in such a covering. The man who will first discover a means whereby the heat of boilers, steam pipes, and cylinders, can be wholly confined, will immortalize his name, and secure the means of obtaining the largest fortune ever yet made, but we don't think he is born yet.

S. T., of Mass.—It has been claimed by some engineers that the heat expanded in producing a proper draft by means of a chimney will produce a still better draft by means of a blower. A practical test of this statement would be of value.

R. H., of N. H.—The oscillations of the common pendulum only take place in equal times within a certain amplitude of arc. This amplitude ought not to exceed five degrees. The varying density of the atmosphere making unequal resistances to the oscillations of the pendulum, is a constant source of irregularity, as well as the variation in the length of the pendulum rod.

C. P., of Ala.—No more heat can be theoretically obtained by the conversion of mass motion into heat, than the heat required to produce the mass motion. Practically not so much. Could more be obtained the problem of a perpetual motion would be solved.

S. W. G., of——The length of a telescope is adjusted to the focal distance of the lenses. The magnifying power depends entirely upon the latter, and the relation between the power of telescope and its length is only an indirect one. The power of a telescope depends upon the focal distances of the lenses and the illuminating power of the object glass. The latter increases with the size of the object glass.

H. R. S., of Vt.—A great many machines for cutting stone for architectural work have been tried. We do not think any of them have been found adapted to general use, or have attained much success. We do not know that the carbon tool point has been specially applied to this purpose.

N. O., of Ky.—All springs lose their power by overtaxing them. The load should always be less than that required to produce a permanent set. You will also find that brass wire will vary very much in elasticity throughout a coil. The only safe way is to keep within the inferior limit.

R. C., of La.—The action of an air-pump will cease to extract air from a receiver as soon as the expansive force of the residual air or gas becomes too weak to raise the valves. The best pumps leave about one thousandth of the air unexhausted.

L. M. V., of N. Y.—You can fasten rubber hose to a coupling so as to be water-tight by winding it with annealed brass wire. You will find no trouble in accomplishing it.

L. C., of Kansas.—The substance of which you make inquiry is mostly gum dextrine. You will find a process of making this gum in Dr. Ure's "Dictionary of Arts and Manufactures," or you can purchase it ready made, of dealers. It dissolves readily in water, and is very adhesive.

G. O., of——In your case capillary attraction is as you suppose, overcome by centrifugal force. The oiler you employ is in our opinion not adapted to a fast running pulley.

APPLICATIONS FOR EXTENSION OF PATENTS.

Loom.—James O. Leach, of Ballston Spa, N. Y., has applied for an extension of the above patent. Day of hearing October 11, 1869.

Sugar Filterer.—C. E. Bertrand, of New York city, has petitioned for an extension of the above patent. Day of hearing, October 11, 1869.

Sewing Machine.—L. W. Langdon, of Northampton, Mass., has petitioned for the extension of the above patent. Day of hearing, October 11, 1869.

Sewing Machines.—(Numbered 13,768).—Isaac M. Singer, New York city, has petitioned for an extension of the above patent. Day of hearing, Oct 18, 1869.

Process for Making Zinc White.—Samuel Wetherill, of Baltimore, Md. has petitioned for the extension of the above patent. Day of hearing, Oct. 25, 1869.

Mills for Grinding Coffee, etc.—Cornelius W. Van Vliet, of Fishkill Landing, N. Y., has applied for an extension of the above patent. Day of hearing, Nov. 1, 1869.

Knitting Machine.—Timothy Bailey, of Ballston Spa, N. Y., has applied for an extension of the above patent. Day of hearing Nov. 1, 1869.

Making Gum Elastic Cloth.—Henry G. Tyer, of Andover, Mass., and John Helm, of New Brunswick, N. J., have applied for an extension of the above patent. Day of hearing December 20, 1869.

Recent American and Foreign Patents.

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

Sheave Pulley.—J. B. Valnan, and N. P. Cramer, Carbondale, Pa.—This invention relates to improvements in casting grooved sheave pulleys, the object of which is to provide sheave pulleys with a chilled portion of the surface of the groove.

Construction of Buildings.—Joseph Potts, Harrisburg, Pa.—This invention relates to improvements in the construction of buildings intended to provide a combined arrangement of brick and wood walls, and framing calculated to so strengthen the brick portion thereby, so as to produce walls of the desired strength, with fewer bricks than as now constructed.

Steam Generator.—H. B. Smith, and J. V. Stevens, Pomeroy, Ohio.—The object of this invention is to provide an improved arrangement of steam-generating apparatus, calculated to simplify the construction and to facilitate the generation of steam economically, also to admit of changing the position of the tubes from time to time, placing the bottom sides upward so that the scale previously formed will be thrown off.

Combined Wagon and Sleigh—John S. Drake, New York city.—The invention consists in so attaching a pair of "bob" runners to each axle, that, by a simple movement of a hand lever, they may be turned down to the ground and the wheels drawn therefrom, or by the reverse movement where the wagon is being backed up, the said runners may be raised up in front of the wheels out of action, where they may be secured.

Throtle Valve Gear.—Samuel Moore, Providence, R. I.—This invention consists in the application of affixed toothed or friction segment to the valve stem and a friction pinion on the lever, so arranged that the movement of the lever causes the pinion to revolve, which being controlled by a friction clamp, will resist any tendency of the lever to move, and thereby hold it as set by the attendant. A pivoted handle for the friction clamp is provided and so arranged as to be grasped and the friction released, when the lever is grasped for moving it.

Tinners' Bending Machine.—Isaac Grim, Polo, Ill.—This invention relates to improvements in machines for bending the edges of square sheet metal pans for wiring them, and the object is to provide a simple and cheap machine adapted for pans of various sizes.

Lamp.—John Phelps, Owego, N. Y.—The object of this invention is to provide a simple and efficient arrangement whereby the filling orifices through the necks of kerosene, and other lamps, may be readily opened for filling and immediately closed on the withdrawal of the nozzle of the can by a self-closing device, which will keep the passage closed sufficiently tight to prevent danger, and which will not work loose or get out of order.

Fence.—Wm. F. Auxier, Mason City, Ill.—This invention relates to improvements in fences for river bottoms liable to be overflowed in times of high water, the object of which is to provide a fence which may be readily turned down so as to make less resistance to the water, and which will be so secured to the ground as not to float away. The foundation is such that the posts cannot be undermined by gullies formed around their base by the water.

Fanning Mill Attachment.—Pardon Austin, Medina, Wis.—The object of this invention is to provide an improved arrangement of elevating apparatus for fanning mills for receiving the grain from the discharge apron of the mill and delivering it into bags or other receptacles. The invention consists in the arrangement of the attaching and operating apparatus to adapt the elevators for attachment to any mill.

Washing Machine.—J. M. Starr, Jr., Fond du Lac, Wis.—This invention consists in a wash tub, of rectangular form at the top, with a bottom curved in the direction of its length, and provided with curved ribs in the same direction, and the combination therewith of a series of horizontal notched beaters or agitators suspended upon levers pivoted at the center from which the curvature of the bottom is struck, and projecting upward to receive oscillatory motion from a crank shaft.

Manufacture of Plows.—Henry Barnes, Franklin, Iowa.—This invention consists in the construction of the blanks for the moldboards and share plates, by first rolling the plates from which they are to be cut into such form that the blanks may be puched therefrom without material waste of metal, and the "shins," or parts thereof subjected to the greatest amount of wear, may be formed with the increased thickness required to withstand the wear.

Corn Planter.—Peter Shellenberger, Millerstown, Pa.—This invention has for its object to furnish an improved corn planter, which shall be so constructed and arranged as to plant the corn at a uniform depth.

Apparatus for Emptying the Cooling Tubes of Filtering Furnaces.—Eugen Langen, Cologne, Prussia.—This invention has for its object to remove the re-burnt animal charcoal from the vertical cooling tubes of filtering furnaces, used in the production of sugar, in an automatic and uniform manner.

Churn.—Robert Wilson, Rees Corners, Md.—This invention has for its object to furnish an improved churn, simple in construction, convenient, efficient, durable, and not liable to get out of order, and which may be manufactured at comparatively small cost.

Pipe Tongs.—R. Crain, Shaffer Farm (Dennison P. O.), Pa.—This invention has for its object to furnish a simple, convenient, and effective pipe tongs, which will securely clasp and firmly hold pipes, tubes, or other cylindrical bodies, and at the same time will not injure the articles grasped.

Horse Bonnet.—J. L. McIntosh, Brooklyn, N. Y.—This invention has for ts object to furnish an improved bonnet for protecting the horse from sun-stroke, by keeping his head cool and protecting it from the heat of the sun.

Combined Plow and Cultivator.—Samuel Huber, Danville, Pa.—This invention has for its object an improved plow, which shall be so constructed and arranged that it may be easily adjusted for use as a furrowing plow coverer, cultivator, or potato digger, and which shall at the same time be simple in construction, easily adjusted, and effective in operation in whatever way it may be used.

Lock Nut.—Almon Roff, Southport, Conn.—This invention relates to a new device for preventing nuts on bolts from working loose, and consists in the application of a left-hand screw, fitted into the end of the bolt, so that its head will partly cover the end of the nut, to prevent the same from being unscrewed.

Alarm Bell.—L. F. Bruce, Bridgeport, Conn.—This invention relates to a new attachment to doors and windows, by means of which, should an attempt be made to open such doors and windows, a loud and continuous alarm will be given.

Apparatus for Opening Packing Cases.—C. M. O'Hara, New York city.—The object of this invention is to provide a simple and effective apparatus for opening packing cases, whereby the cover of the case may be readily separated from the body of the same, without splitting the cover or marring the edges of the case.

Organ.—Wm. Robjohn, New York city.—This invention relates to certain improvements on the organ, improvements for which letters patent No. 54,603 were granted to the same inventor on the eighth day of May, 1866. The present invention has for its object to simplify the devices on the composition board, referred to in the aforesaid letters patent, as well as the pneumatic lever, and to provide a reliable and practicable tremulated pneumatic lever and a reversible coupler for the keyboards.

Globe Lantern.—William Porter, Sr., and William Porter, Jr., New York city.—This invention relates to a new manner of constructing lanterns with a view of making the globe removable from the top.

Combined Lamp and Candlestick.—F. C. Richer, Gilmer, Texas.—This invention has for its object to provide a new and useful device, by means of which a lamp can be converted into a candlestick, and *vice versa*, while on the other hand the lamp burner may be used on any kind of oil reservoir.

Milling and Reaming Tool.—Albert J. Lutz and H. Reiss, New York city.—This invention relates to a new manner of arranging the cutting edges of milling tools and reamers with the object of preventing their becoming blocked with shavings.

Head Block for Carriages.—J. C. Bates, Warrensburgh, Mo.—This invention relates to certain improvements in the head blocks of carriages and buggies, and the devices with which they are directly or indirectly connected.

Coffee Roaster.—F. W. Zochert, Watertown, Wis.—This invention relates to a new coffee roaster, or rather to a new case for containing the same, and consists in the use of a cap which covers the roasting cylinder, and which is provided with double folding doors through which the cylinder may be removed to be filled and emptied. When the doors are closed, the heat is all confined in the cap, and is brought above as well as below the cylinder to equalize the roasting process.

Flooring Clamp.—David Nevin, Boulder City, Colorado Territory.—This invention relates to improvements in clamps to be used for clamping the boards of flooring tightly together, previously to nailing, when laying the floors of buildings.

Railroad Chair.—D. B. Skelly, Lockport, N. Y.—This invention consists in a peculiar arrangement in recesses in the outer sides of cast metal chairs upon elastic beds of blocks to secure the rails and receive the wheels and support them while passing the joints at the ends of the rails.

Safety Watch Pocket.—William O. Sumner, Brooklyn, E. D., N. Y.—The nature of this invention relates to improvements in pocket watch safes, which are designed for the protection of watches, against the efforts of pickpockets to abstract them from the pocket. It consists in the manner of arranging the parts of a pocket safe, designed for being secured to the interior of the pocket, whereby they may be readily opened to receive or deliver the watch, and be secured together while holding the same.

Subsoil Plow.—J. W. Murfee, Havana, Ala.—This invention consists in an arrangement of a horizontal wedge-shaped share, for plowing and pulverizing the earth. This wedge is driven horizontally through the ground by being attached to an inclined and wedge-edged cutting coulter, which coulter is attached to the beam of the plow. The coulter is set as acutely with the horizon as practicable, so as to approach the line of the axis of the plow or hoe as near as may be, and the power is applied thereby as nearly in the direction of the axis of the wedge as possible. The standard of the frame is a continuation of the line of the coulter shank, and the angle which the handles make with the horizon, or base of the plow point, should be a mean of the angles which the top of the point and front edge of the coulter shank make with the horizon, so that any power employed in the direction of the handles by the plowman will have the greatest effect on the point and shank.

Fence.—Isaac J. Morrow, Everton, Ind.—The object of this invention is to provide a fence for farm, and other purposes, which can be easily and cheaply made, with portable panels and of a durable character.

Steam Engine.—W. H. Hull, Warren, Ohio.—This invention relates to a new and useful improvement in steam chests and valves for steam engines.

Extension Hame.—F. M. Schaeffer, Blooming Grove, Kansas.—This invention relates to a new and useful improvement in hames for horses' harness, and consists in so constructing them that they may be extended and thereby made to fit different-sized horses, and also so as to change the place of draft or strain.

Convertible Ladder.—Henry B. Malbone, Geneva, N. Y.—This invention relates to a new and useful improvement in ladders, whereby they are made convertible to various purposes.

Milk Can Stopper.—John M. Burghardt, Great Barrington, Mass.—This invention relates to a new and useful improvement in stoppers to milk cans, whereby all motion in the milk is prevented.

Gas Burner.—Isaac R. Fisher, Reading, Pa.—This invention relates to a new and useful improvement in gas burners, having special reference to horizontal burners, and consists in a device for protecting the flame of the lighted gas from lateral currents of air.

Printers' Galley Rest.—John M. Murphy, Olympia, Washington Ter.—This invention relates to a new and useful improvement in the method of holding or supporting the proof-correcting galley in printing offices.

Water Filter.—J. D. Parrot, Morristown, N. J.—This invention relates to a useful improvement in apparatus for filtering water.

Harrow.—John Jay and Joel Coppock, Jonesboro', Ind.—This invention relates to a new and useful improvement in harrows, whereby they are made much more useful than harrows of ordinary construction, and it consists in the means applied for raising the harrow teeth from the ground, either in whole or in part.

Tilting Barrels.—John C. Curran, Philadelphia, Pa.—This invention relates to an improvement in the mode of adjusting barrels.

Sewing Machine Attachment.—J. W. Gillam, Newton, N. J.—This invention relates to a new and useful improvement, whereby the sewing machine is rendered more useful and efficient than it has hitherto been.

Machine for Twisting Cord.—George T. Wright, New Preston, Conn.—This invention relates to new and important improvements in machines for twisting or "laying" cord and twine, having more particular reference to hard twisted cord, twine, or rope.

Churning Butter.—William Kegg, Lassellsville, N. Y.—This invention relates to new and useful improvements in churning butter, and consists in the peculiar form and construction of the dasher, in the method of aerating or supplying atmospheric air to the cream and regulating the temperature thereof.

Blasting Wedge.—G. Werlich, Watertown, Wis.—The object of this invention is to provide a blasting wedge or packing device, for confining the blasting charges in the drill holes, so shaped that when the explosion takes place, the force will be delivered wholly, or nearly so, upon the walls of the holes, in the manner best calculated to separate the rocks.

Electro-Magnetic Lock.—John C. Smith, Brooklyn, N. Y.—This invention relates to a new and important improvement in locks, designed more especially for outside doors of dwellings, public buildings, banks, vaults, and safes, but applicable to locks for all ordinary purposes, and consists in controlling the movement of the bolt of the lock by means of electro-magnetism.

Plow.—J. W. Gilliam, Elkton, Ky.—The object of this invention is to provide an adjustable double plow, capable of turning two furrows either right or left simultaneously, or in opposite directions or towards each other, whereby the said plow may be adapted for various kinds of work.

Compound for Cutting and Polishing.—James P. Hall, New York city.—The present invention relates to a new and useful compound, combining both cutting and polishing qualities. The object of this compound is to offer a good and cheap article, which will act as a substitute for emery, rotten stone, and such other articles which cut and do not polish, or which polish without cutting.

Mode of Preserving and Conserving Fruit, Produce, etc.—R. d'Heureuse, New York city.—This invention relates to improvements in means for preserving fruits, vegetable products, and other organic substances containing nitrogen, from putrefaction, mold, and decay, when stored in confined spaces either in bulk or in packages.

Wringing Machine.—Edward L. Perry and Charles Manheim, New York city.—This invention relates to improvements in clothes-wringing machines, whereby it is designed to provide a more simple and effective machine than any now in use. It consists of an improved arrangement of the adjusting supports of the adjustable roller. Also, of improvements in the arrangement of the supporting brackets for connection with the roller supports.

Beehive.—Richmond Pearson, Appleton, Wis.—This invention consists in forming a skeleton frame of wire, shaped like an egg, and suspended from the under surface of a honey board, and covered with paper in a peculiar way, the honey board being provided with transverse strips for the attachment of the bee comb, and with passages through it for the bees to have access to boxes above for the honey.

Farm Locomotive.—Daniel F. Leach, Forsyth, Ill.—The object of this invention is to improve the construction and arrangement of the device which supports and guides the forward wheels, and to improve the construction of the traction wheels of locomotives employed for farm work.

Circulating Boiler.—John Wells, Baltimore, Md.—The object of this invention is to construct the boiler in such a manner that it will effectually separate the dry steam from the wet, condensing the latter and returning the water of condensation to the water space, while, at the same time, the the water is caused to circulate more freely, than heretofore, among the heating pipes, whereby the heat is thoroughly utilized.

Sulky Plow.—Benjamin Slusser, Sidney, Ohio.—This invention relates to that class of plows denominated sulky plows, (plows supported upon wheels and provided with a seat for the driver); and it consists in a new and improved mode of attaching the plow to the carriage, an improved mode of adjusting the draft of the plow, and an improvement in the means for raising and lowering the plow for any purpose.

Tobacco and Grain Curer and Artificial Season Producer.—Henry R. Robbins, Baltimore, Md.—The object of this invention is to construct an apparatus by which tobacco or grain can be artificially cured in an exceedingly short time, not only without impairing its good qualities, but in such a manner as to produce, with certainty and uniformity, an article of cured tobacco superior in appearance, fragrance, and taste, to that cured from the same material by any other known process.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING AUG. 3, 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.

93,156.—Flyer for Spinning.—S. A. B. Abbott, Boston, Mass. and E. F. Fields, Lewiston, Me.

93,157.—Electro Deposition of Nickel.—Isaac Adams, Jr., Boston, Mass.

93,158.—Hydrostatic Scale for Tunnage of Vessels.—Ira R. Amsden, Buffalo, N. Y.

93,159.—Velocipede.—J. A. Aspinwall and C. M. Perry, New Utrecht, N. Y.

93,160.—Fanning-mill Attachment.—Pardon Austin, Medina, Wis.

93,161.—Flood Fence.—W. F. Auxier, Mason City, Ill.

93,162.—Plate for Making Blanks for Moldboards and Shares for Plows.—Henry Barnes, Franklin township, Iowa.

93,163.—Head Block for Carriages.—J. C. Bates, Warrensburg, Mo.

93,164.—Washing Machine.—Barzillai B. Beckwith, Rockville, Conn.

93,165.—Grain Binder.—Jacob Behel, Rockford, Ill.

93,166.—Railway Car Brake.—Norborne Berkeley, Aldie, Va.

93,167.—Screw Press.—H. C. Bowen, New York city.

93,168.—Alarm Bell.—L. F. Bruce, Bridgeport, Conn.

93,169.—Whiffletree.—Henry Buck, Chardon, Ohio.

93,170.—Apparatus for Making Pig Blooms in the Manufacture of Iron.—J. A. Burden, Troy, N. Y.

93,171.—Milk-can Stopper.—J. M. Burghardt, Great Barrington, Mass.

93,172.—Combined Corn Planter and Cultivator.—John Campbell, London, Ohio.

93,173.—Washing Machine.—Heman Carter, Greene, N. Y.

93,174.—Churn.—W. C. Chamberlain, Dubuque, Iowa.

93,175.—Turbine Water Wheel.—John Chase, Paterson, N. J.

93,176.—Steam Generator.—Robert A. Chesebrough, New York city.

93,177.—Safety Switch for Railways.—Anthony Conarro and Zak. Gemmill, Warren, Pa.

93,178.—Method of Producing Calcium Light.—Chas. L. Coombs, Washington, D. C., and J. A. Bassett, Salem, Mass., assignors to J. J. Coombs, Washington, D. C.

93,179.—Pipe Tongs.—R. Crain, Shaffer Farm, Dennison Post office, Pa.

93,180.—Device for Tilting Barrels.—J. C. Curran, Philadelphia, Pa.

93,181.—Machine for Curving and Shaping Sheet Metal.—Daniel Cushing, Lowell, Mass., assignor to himself, G. W. Smith, and Franklin Smith.

93,182.—Mode of Preserving Liquid and other Substances.—R. D'Heureuse, New York city.

93,183.—Preserving Meats, Poultry, Fish, etc.—J. E. Dotch, Washington, D. C. Antedated Feb. 3, 1869.

93,184.—Carriage and Sleigh Combined.—J. S. Drake (assignor tor himself and W. H. Burton), New York city.

93,185.—Animal Trap.—Melvin W. Drake, Owasso, Mich.

93,186.—Bedstead Fastening.—William H. Elliott, New York city.

93,187.—Harrow and Cultivator.—W. A. Estes, China, assignor to R. M. Mansur, Augusta, Me.

93,188.—Clothes Wringer.—Peter Falardo, Danbury, Conn.

93,189.—Gas Burner.—I. R. Fisher, Reading, Pa.

93,190.—Sled Brake.—W. F. Foley, Albany, N. Y.

93,191.—White Lead and Packing Cans.—Charles J. Fortin and D. H. Drake, Cincinnati, Ohio, assignors to Eagle White Lead Co.

93,192.—Stump Extractor.—D. C. Frazeur and Peter Ginter, Siddonsburg, Pa.

93,193.—Braid Guide for Sewing Machine.—J. W. Gillam, Newton, N. J.

93,194.—Tinners' Bending Machine.—Isaac Grim (assignor to himself and William Gregory), Polo, Ill.

93,195.—Life-preserving Mattress.—David E. Hall, Detroit, Mich.

93,196.—Blacking-box Holder.—Heman B. Hammon, Bristolville, Ohio.

93,197.—Steam Blower.—J. T. Hancock, Jamaica Plain, Mass. Antedated July 22, 1869.

93,198.—Fence.—Thomas Harrison, La Fayette, Wis.

93,199.—Steam Engine.—Andrew Hartupee, Pittsburgh, Pa.

93,200.—Stiffening Cord for Skirts.—Henry Hayward, New York city.

93,201.—Trace Support and Buckle.—J. H. Hill and H. C Hill, Clinton, Ill.

93,202.—Binding Guide for Sewing Machines.—W. S. Hotchkiss, Bridgeport, Conn., assignor to Howe Machine Company.

93,203.—Combined Plow and Cultivator.—Samuel Huber, Danville, Pa.

93,204.—Steam Valve Device.—W. H. Hull, Warren, Ohio.

93,205.—Wagon.—Reuben Hurd, Morrison, Ill.

93,206.—Hog Cholera Remedy.—A. M. Johnston and H. H. Avrit, Clarksville, Tenn.

93,207.—Churn Dasher.—William Kegg, Lassellsville, N.Y

93,208.—Apparatus for Emptying the Cooling Tubes of Boneblack Furnaces.—Eugen Langen, Cologne, Prussia.

93,209.—Medical Compound or "Bitters."—Joseph Llado, New Orleans, La.

93,210.—Implement for Taming and Marking Hogs.—Samuel Long, Ogle county, Ill.

93,211.—Yoke for Standards for Stove Shelf.—Luther Longley, Leominster, Mass.

93,212.—Milling Tool.—Albert J. Lutz and H. Reiss, New York city.

93,213.—Machine for Making Chain.—Wesley Malick, Erie, Pa.

93,214.—Mechanism for Driving Sewing Machines.—G W. Manson (assignor to himself, John A. Knoeller, and Michael Bowe), Jersey City, N. J.

93,215.—Die Holder for Screw Presses.—J. McWilliams, Providence, R. I.

93,216.—Printers' Galley Rest.—J. M. Murphy, Olympia, Washington Territory.

93,217.—Flooring Clamp.—David Nevin, Boulder City, Colorado Territory.

93,218.—Transportation Case.—Edwin Norton, Toledo Ohio, assignor to himself, O. W. Norton, and A. H. Fancher.

93,219.—Churn.—T. S. Nutter, Harrisburgh, Ohio.

93,220.—Fishing-Line Sinker.—R. T. Osgood, Orland, Me.

93,221.—Steam Valve Devices.—Joseph E. Outridge, Newport, England. Patented in England, Aug. 1, 1868.

93,222.—Faucet.—S. W. Palmer and J. F. Palmer, Auburn

N. Y., assignors to "The Metropolitan Washing Machine Co.," Middlefield, Conn.

93,223.—Wringing Machine.—E. L. Perry and C. Manheim, New York city.

93,224.—Lamp.—John Phelps (assignor to himself and C. W. Merchant), Owego, N. Y.

93,225.—Dovetailing Machine.—John Phillips, Jr., Chicago, Ill.

93,226.—Lantern.—Wm. Porter, Sr., and Wm. Porter, Jr., New York city.

93,227.—Buildings.—Joseph Potts, Harrisburgh, Pa.

93,228.—Lamp.—F. C. Richer, Gilmer, Texas.

93,229.—Lock Nut.—Almon Roff, Southport, Conn.

93,230.—Lock Nut.—Henry Rosamyer, Rochester, Pa.

93,231.—Grain Measure.—J. A. Rosbeck, Herman, N. Y.

93,232.—Steam Generator.—Silas C. Salisbury, New York city.

93,233.—Extension Hame.—F. M. Schaeffer, Blooming Grove, Kansas.

93,234.—Feeding Door for Animal Pens.—B. C. Scott, Paxton, Ill.

93,235.—Straw Cutter.—L. Sears, Perrysville, Ohio.

93,236.—Hay Elevator.—S. B. Secrist and Isaac Seyster, Ogle county, Ill.

93,237.—Corn Planter.—Peter Shellenberger, Millerstown, Pa.

93,238.—Rotary Spade.—B. E. Siversten, Pittsburgh, Pa.

93,239.—Railway Chair.—D. B. Skelly, Lockport, N. Y.

93,240.—Steam Generator.—H. B. Smith and J. V. Stevens, Pomeroy, Ohio.

93,241.—Clamp for Planking Ships.—P. Staples, Stockton, Me.

93,242.—Washing Machine.—J. M. Starr, Jr. (assignor to himself and G. D. Trombly), Fond du Lac, Wis.

93,243.—Balancing the Keys of Pianos, etc.—Frank J. Steinhauser, Lancaster, Pa.

93,244.—Water Heating Device.—E. R. Stilwell, Dayton, Ohio.

93,245.—Composition for Roofing.—L. S. Stimson (assignor to himself and N. F. Libby), Lowell, Mass.

93,246.—Safety Watch-Pocket.—W. O. Sumner, Brooklyn, E. D., N. Y.

93,247.—Grapple.—J. F. Thomas, Ilion, N. Y.

93,248.—Base Burner.—W. B. Treadwell, Albany, N. Y.

93,249.—Toy Ball.—Henry Trebe, Indianapolis, Ind., assignor to himself and Frederick Klare.

93,250.—Hedge Planter.—J. J. Tucker, Albia, Iowa.

93,251.—Hat.—P. W. Vail, Newark, N. J.

93,252.—Sheave Pulley.—J. B. Vannan and N. P. Cramer, Carbondale, Pa.

93,253.—Machine for Cutting and Slicing Vegetables.—C. H. Van Orstrand, New York city.

93,254.—Machine for Spooling Thread.—Asel M. Wade, Lawrence, Mass.

93,255.—Washing Machine.—C. F. Walker, Benford's Store Post Office, Pa.

93,256.—Straightening Machine.—J. C. Warr, Wareham, Mass.

93,257.—Casting Hollow Metal Rollers with Shafts.—Zadock Washburn, Hopedale, Mass.

93,258.—Grease Trap.—Edward Whiteley, Cambridge, Mass.

93,259.—Carriage Hub.—J. M. Whiting, Providence, R. I.

93,260.—Harvester Rake.—Julius Wilcke, Chicago, Ill. Antedated July 23, 1869.

93,261.—Fifth Wheel for Carriages.—Darius Wilcox, Birmingham, assignor to himself and Warren Wilcox, Ansonia, Conn.

93,262.—Horse Collar and Hames.—Ezra Wilder, South Hingham, Mass.

93,263.—Washing Machine.—Robert Wilson, Burdett, N.Y.

93,264.—Churn.—Robert Wilson, Rees Corners, Md.

93,265.—Cord-Making Machine.—G. T. Wright (assignor to himself and Walter Burnham), New Preston, Conn.

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93,268.—Apparatus for Carbureting Air.—J. F. Barker, Springfield, Mass., and C. N. Gilbert, New York city.

93,269.—Hop-Pole Sharpener.—S. V. Barns, Triangle, N.Y.

93,270.—Receivers or Carboys for the Manufacture of Muriatic and other Acids.—Alfred Baumgarten (assignor to himself and C. W. Walter), New York city. Antedated Aug. 2, 1869.

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93,272.—Mode of Constructing Billiard and other Game Tables.—W. E. Bond, Cleveland, Ohio.

93,273.—Piston Spring.—W. R. Brown, Bath, N. Y.

93,274.—Sash Fastener.—Daniel Bull, Amboy, Ill.

93,275.—Self-Recording Pressure Gage.—G. P. Clarke, M. B. Edson, and J. B. Edson (assignors to the Recording Steam Gage Co.), New York city.

93,276.—Steam Generator.—L. H. Colborne, Albion, N. Y.

93,277.—Garden Plow.—G. W. Cole, Farmington, Ill.

93,278.—Railway Switch.—J. B. Cox, James O'Conner, and Michael Cahalan, Columbus, Ga.

93,279.—Photographic Head Rest.—Gustav Cramer and Julius Gross, St. Louis, Mo.

93,280.—Composition Pavement.—H. L. Cranford, Brooklyn, N. Y.

93,281.—Earth Scraper.—J. H. Dalbey, Springfield, Ohio.

93,282.—Street-Car Starter.—A. B. Davis, Catahoula parish, La.

93,283.—Car Starter.—A. B. Davis, Catahoula parish, La.

93,284.—Plow.—A. B. Davis, Catahoula parish, La.

93,285.—Churn.—A. B. Dean, Louisville, Ky.

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93,288.—Gas Carbureter.—G. B. Dyer, New York city.

93,289.—Carriage Jack.—D. Elliot and E. Seely, New York city, assignors to themselves, and John A. Holmes.

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93,298.—Railway-Switch.—Chas. Greenman, Scott township, Pa.

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93,302.—Water Cooler and Refrigerator.—Jos. Hindemyer and Chas. C. Savery, Philadelphia, Pa.

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93,310.—Gas Burner.—Wesley L. Jukes (assignor to himself Frederick McLewee, P. H. Putnam, and Johnson Murray), New York city.

93,311.—Corn Harvester and Shocker.—Wm. H. Karicofe, Harrisonburg, Va.

93,312.—Slaw Cutter.—Michael Keefer, Washington county, Md.

93,313.—Hay Spreader.—W. G. Kenyon, Wakefield, R. I.

93,314.—Knitted Fabric.—Martin Landenberger, Jr., Philadelphia, Pa. assignor to Martin Landenberger & Co.

93,315.—Wagon Brake.—Jay Lathrop, Lapeer, N. Y.

93,316.—Farm Locomotive.—D. F. Leach, Forsyth, Ill.

93,317.—Coffee-Pot.—J. E. Lewis, Kittery, Me.

93,318.—Gang Plow.—J. J. Lindly, Lebanon, Ill.

93,319.—Harvester Cutter.—H. A. Link, Columbus, Ohio.

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93,327.—Seed Drill.—Solomon Mickley, Dover township, and Samuel Leathery, Warrington township, Pa.

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93,329.—Fly Trap.—A. C. Mills, Oaktown, Ind.

93,330.—Breech-Loading Firearm.—Wm. Morgenstern, New York city, assignor to himself and Herman Funke.

93,331.—Printers' Rule.—C. N. Morris, Cincinnati, Ohio. Antedated July 20, 1869.

93,332.—Fence.—I. J. Morrow, Everton, Ind.

93,333.—Roofing Composition.—F. Neidhardt, East Saginaw, Mich.

93,334.—Lunch Box.—Addison Norman, Rochester, N. Y.

93,335.—Apparatus for Opening Boxes.—C. M. O'Hara, New York city. Antedated July 30, 1869.

93,336.—Coal Scoop.—H. A. Palmer, Rochester, N. Y.

93,337.—Propelling Apparatus.—Joseph Paradis, Brooklyn, N. Y.

93,338.—Fruit Picker.—G. H. Parham, Harrodsburg, Ind.

93,339.—Filter.—J. D. Parrot (assignor to himself and Henry McCauley), Morristown, N. J. Antedated July 30, 1869.

93,340.—Beehive.—Richmond Pearson, Appleton, Wis.

93,341.—Switch Holder.—A. C. Penny and Minor Spicer, Unadilla Forks, N. Y.

93,342.—Electrical Railroad Signal.—George M. Phelps, Brooklyn, N. Y., and Robert Stewart, Bordentown, N. J.

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93,353.—Eyeleting Machine.—J. F. Sargent, Melrose, assignor to Elmer Townsend, Boston, Mass.

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93,355.—Wire Ear for Metal Buckets.—Joseph M. Shank, Dayton Ohio.

93,356.—Apparatus for Chalking Billiard Cues.—D. P. Shaw, Elkhart, Ind.

93,357.—Carriage Wheel.—Samuel S. Sherman and Silas D. Piper, West Eau Claire, Wis.

93,358.—Sulky Plow.—Benjamin Slusser, Sidney, Ohio.

93,359.—Door Spring.—Patrick Smith, Newport, Ky.

93,360.—Vapor Burner.—Willard H. Smith, New York city.

93,361.—Street Railway.—Wm. M. Smith, Augusta, Ga.

93,362.—Plow Gage.—Hugh B. Spedden (assignor to himself Wm. H. Baltzel, and G. A. Moore) Baltimore, Md.

93,363.—Soda Fountain.—B. E. Sperry, Aurora, Ill.

93,364.—Driving Belt and Band of Rubber and Metal.—Louis Sterne, London, England. Patented in England, June 2, 1868.

93,365.—Seam-puttying Machine.—Alfred Stevens, Georgetown, assignor to Josiah Starling, Manheigan, Me.

93,366.—Hot Blast Pressure Gage.—John Storer, New York city.

93,367.—Railway Rail Chair.—John H. Teahl, Eberly's Mill, Pa.

93,368.—Machine for Distributing Fertilizers.—John H. Thomas and Phineas P. Mast, Springfield, Ohio.

93,369.—Grain Drill.—John H. Thomas, Phineas P. Mast, and Charles O. Gardiner, Springfield, Ohio, assignors to John H. Thomas and Phineas P. Mast.

93,370.—Grain Drill.—John H. Thomas, Phineas P. Mast, and Charles O. Gardiner, Springfield, Ohio, assignors to John H. Thomas and Phineas P. Mast.

93,371.—Seal Lock.—James E. Thompson and James Tillinghast, Buffalo, N. Y.

93,372.—Beehive.—Ruggles S. Torrey, Bangor, Me.

93,373.—Water Elevator.—Pieter van Dyk, The Hague, Holland.

93,374.—Cultivator.—Henry Wadsworth, Duxbury, Mass.

93,375.—Railway Car Coupling.—William V. Wallace, New York city.

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93,377.—Steam Generator.—John Wells, Baltimore, Md.

93,378.—Railway Car Coupling.—Richard Wells, Bloomington, Ill.

93,379.—Blasting Charge.—Gustavus Werlich, Watertown, Wis.

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93,383.—Steam Engine.—James D. Willoughby, Shippensburg, Pa.

93,384.—Propelling Apparatus.—Charles Wolff, Washington, D. C.

93,385.—Low Grade Steel for Axles, Tires, etc.—Henry Brook Woodcock, Low Moor, England.

93,386.—Railroad Car Wheel.—George W. N. Yost, Corry, Pa.

93,387.—Pessary.—David D. Young, Dayton, Ohio.

93,388.—Ash Hopper.—Peter Zimmerman, Sylvan, Pa.

93,389.—Coffee Roaster.—F. W. Zochert, Watertown, Wis.

93,390.—Ladies Chemise.—R. L. Jones, Sacramento City, Cal.

93,391.—Revenue Stamp for Barrels.—Edward A. Locke, Boston, Mass.

93,392.—Tide Water Wheel.—P. W. Yarrell, Littleton, N. C.

REISSUES.

82,475.—Steam Pumping Engine.—Dated September 29, 1868; re-issue 3,573.—Robert Allison, Port Carbon, Pa.

22,379.—Boring Machine.—Dated December 21, 1858; reissue 3,574.—Emory L. Bates (assignee of George F. Rice) Fiskedale, Mass.

39,616.—Soldering Sheet-metal Cans.—Dated August 18, 1863; reissue 3,575.—Devoe Manufacturing Company, Long Island City, N. Y., assignees, by mesne assignments, of Herman Miller.

41,887.—Composition of Matter.—Dated March 8, 1864; reissue 1,772, dated September 24, 1864; reissue 1,886, dated February 28, 1865; reissue 3,576.—Lewis Francis and Cyrus H. Loutrel, New York city, assignees of Lewis Francis.

30,400.—Socket Coupling.—Dated October 16, 1860; reissue 3,577.—Elliott P. Gleason, Providence, R. I.

64,571.—Reversible Knob Latch.—Dated May 7, 1867; reissue 3,578.—M. Greenwood and Company, Cincinnati, Ohio, assignees of Henry M. Ritter.

54,554.—Manufacture of Elastic Packing.—Dated May 8, 1866; reissue 3,579.—Nathaniel Jenkins, Boston, Mass.

17,798.—Harvester.—Dated July 14, 1857; reissue 3,580.—Division A.—John P. Manny, Rockford, Ill.

17,798.—Harvester.—Dated July 14, 1857; reissue 3,581.—Division B.—John P. Manny, Rockford, Ill.

66,038.—Gymnastic Swing.—Dated June 25, 1867; reissue 3,582.—Alonzo P. Payson, San Francisco, Cal.

45,198.—Manufacture of Sheep Shears.—Dated November 22, 1864; reissue 3,583.—Henry Seymour, New York city, assignee of Herman Wendt and Henry Seymour.

76,365.—Railway Frog.—Dated April 7, 1868; reissue 3,584.—George Westinghouse, Jr., Pittsburgh, Pa.

DESIGNS.

3,593.—Trade Mark.—Henry Ashbury (assignor to Enterprise Manufacturing Company), Philadelphia, Pa.

3,594.—Arm End of a Settee.—Jacob Beesley, Philadelphia, Pa., assignor to Thomas J. Close.

3,595.—Trade Mark.—James L. Brickey, Hannibal, Mo.

3,596.—Trunk Clasp Caster.—J. H. Burnett, Williamstown, N. Y.

3,597.—Furniture Leg.—G. L. Chapman, Maumee, Ohio.

3,598.—Cook Range.—John I. Hess, Philadelphia, Pa.

3,599.—Trade Mark.—Henry Roundy (assignor to California Marine Metallic Paint Company), San Francisco, Cal.

3,600.—Cook Range.—John Clifford Shoch, Philadelphia, Pa.

3,601.—Boot Leg Top.—J. H. Walker, Worcester, Mass.

3,602.—Show Case.—Gerhard Winter, New York city.

3,603.—Grinding Machine.—Thomas H. Worrall (assignor to the American Twist Drill Company, East Blackstone, Mass.

EXTENSIONS.

Bridle Rein.—Kingston Goddard, Richmond county, N. Y.—Letters Patent No. 13,306, dated July 24, 1855.

Candle-mold Apparatus.—Wellis Humiston, Troy, N. Y.—Letters Patent No. 13,334, dated July 24, 1855; reissue No. 1,131, dated January 22, 1861; reissue No. 2,108, dated November 14, 1865.

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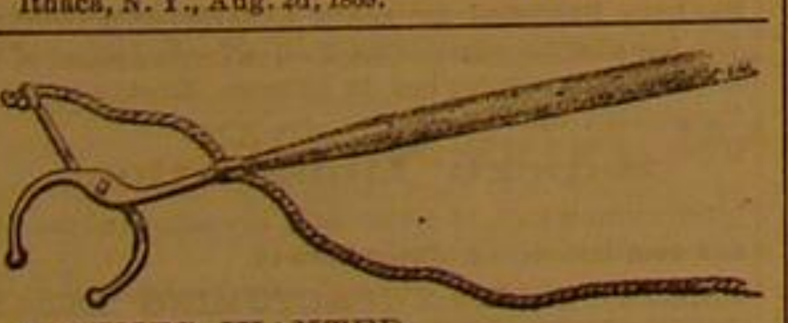

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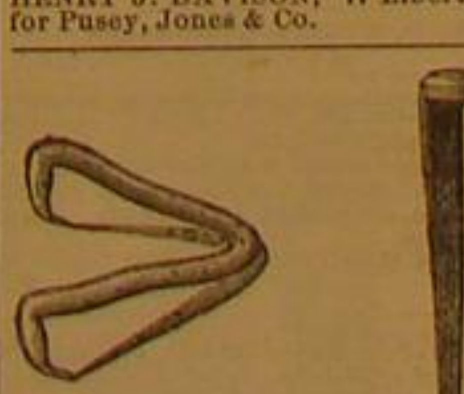

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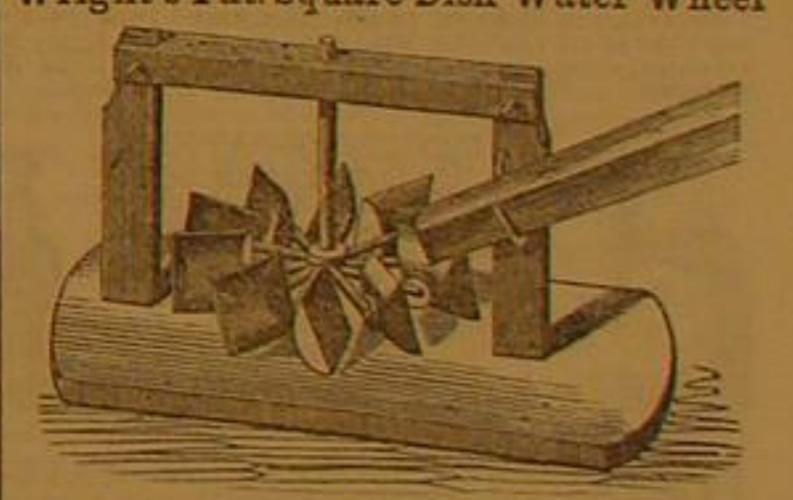

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