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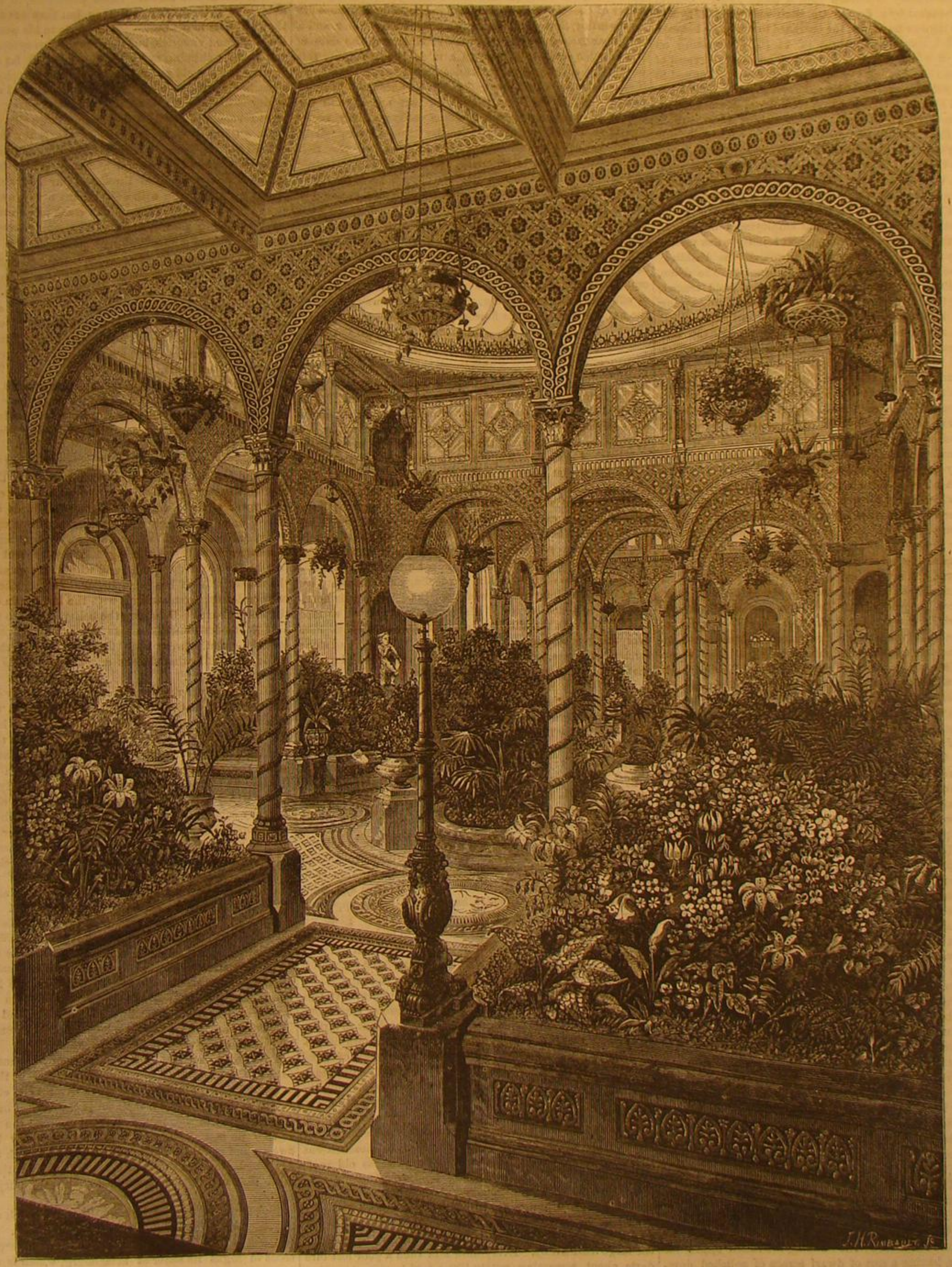
SCIENTIFIC AMERICAN

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MR. BESSEMER'S CONSERVATORY.

But few iron structures have been hitherto attempted in which the architectural effect has not been more or less marred by the prominence given to large bolted flanges, tie rods, cross braces, or other like devices, which, however necessary in a structural point of view, certainly do not add to the beauty of the building, unless it be of the plainest or most utilitarian description. In the design we now lay before our readers, however, there are no signs visible by means of which the whole is put together; not one flange, tie, or bolt of any description being shown in the whole of the building, externally or internally. The castings have all been executed with a degree of care and beauty of finish rarely seen in any large work, and Messrs. Andrew Handyside, of Derby and London, have most fully sustained their high character as founders, in the execution of the work intrusted to them. The original plan, we understand, was made by Mr. Bessemer, and the details worked out under the able superintendence of Messrs. Banks and Barry. Many of the perforated castings employed in this structure, are of extreme beauty



BESSEMER'S CONSERVATORY. ENGLAND.

and delicacy of finish. Among the heaviest are some from three to four tuns in weight each, while there are thousands of others not exceeding four or eight ounces.

The conservatory has two floors or crypts, extending entirely beneath it. The lower one receives a supply of fresh air through a perforated stone screen facing the grounds, and forms the cold air chamber. Above this is a second space of equal area, divided from the lower one by a stone floor. The upper space contains a coil of ten pipes of 4 in. diameter, the coil being about 100 ft. in circumference, and giving over 1000 square feet of heating surface. The ceiling of this upper or hot-air chamber is covered by 5 in. York flags, laid on rolled iron beams. On the upper surface of these flags the tesselated floor of the conservatory is laid. Ten large slide valves (all connected by a rack and pinion) admit cold air from the chamber below at equidistant parts to the surface of the hot water pipes. After passing over and among these pipes, the air enters the conservatory through numerous perforated brass panels, in such quantities as may be desired. Massive brick piers pass through these floors, and support the sixteen columns on which the upper part of the structure rests.

The conservatory is formed with a large square central area surmounted by a dome. On each side of the square there are bays or transepts, the entrance to which is beneath three arches, rising to a height of 14 ft., and resting on columns, of which there are sixteen. The dome is formed of rolled iron ribs, meeting together in the center and united to a large pendant perforated boss; the ribs (40 in number) are separated by extremely light iron ornamental casting, forming a framework which is glazed with stained glass, which encircles the dome in three distinct bands; exterior to this stained glass is a plate-glass covering, each plate being curved to the true shape of the dome; the plates are each 7 ft. long, the joints so arranged as to be rendered invisible behind the stained glass panels; the glass is ground on both sides, and embossed in a bold trellis pattern, giving to the whole a most beautiful effect. The employment of ground glass for the dome gives it an apparent solidity when viewed externally from the terrace that surrounds the building, which much increases its architectural beauty. The dome, which is 40 ft. in hight, rests on a series of bold trusses, springing from the sills of the upper windows, and forming a division between them; these trusses are perforated on all sides, and are highly ornamented. The ceiling of the central part surrounding the dome is formed into deep soffits, each filled with elaborately designed perforated gilt panels, with an azure background formed by the flat iron roof above them. In the upper part of the central space there are six windows on each side, each one composed of a single sheet of ground plate glass, engraved and painted in pale tints. These windows all open by an ingenious contrivance worked by an attendant from the cold-air chamber below, which is sufficiently lofty to admit of ready access.

The iron columns have a spiral groove running around them, in which small spheres are fitted, by stringing them on a copper wire, giving an effect which simple casting could never accomplish; these spheres are all gilt, and give to the fresh gray tint of the columns a great relief; the capitals are all built up with separate acanthus leaves of very light and elegant form, and are also gilt. The arches, which rest on these columns, are all double castings, placed back to back, and are most exquisitely molded in a perforated pattern, through which the light falls in ever varying clusters of rays as one walks about the conservatory. There are thousands of rosettes on these perforated screens, all cast separately, and screwed in place, so as to get a bold relief, well undercut, an effect which founding in mass could not have.

The external walls are pierced with large circular-headed windows, glazed with a single sheet of plate glass, with a small Greek border etched around the edge, and narrow margins of colored ground glass of a soft gray tint etched in patterns. The walls are entirely incased with polished marble in pieces so large as to show no joints. A richly-molded architrave of red Devonshire marble surrounds each window and door, and relieves by its warm color the spaces between the windows, which are of dark Bardillo marble, against which are placed three-quarter columns of white veined Sicilian marble. The shafts of all twenty-four columns and the angle pilasters are 10 ft. in length, each in a single piece, and surmounted by capitals carved in white Carrara marble. Above these is a rich entablature of veined Sicilian marble running over the Bardillo, which is ornamented over each window and door, with a rich incised pattern of arabesque scroll work gilt in all the sunk part. The whole of the marble work was executed by Mr. Hartley, of Pimlico. One bay or transept forms the end of the adjoining drawing room, having two glass doors and a window between looking into it. It is from this window that the view was photographed which we have engraved. The right-hand bay abuts on a billiard room, having a central door and two large windows looking into it; and opposite to this are two similar windows, and a central door leading on to a raised terrace, 90 ft. in length, paved with squares of black and white marble, and extending all along the garden front of the house. The fourth bay is also divided by three equal arches, in each of which there are mirrors of 14 ft. high by 7 ft. wide, passing down below the floor line, and thus continuing the pattern of the pavement. These mirrors are silvered by a deposit of pure silver, and are not easily injured like those coated with tin-foil and mercury. They are kept warm at the back by a hot-air chamber, which prevents any deposition of moisture on them; they thus, at all times, reflect clearly the whole interior of the building, giving it apparently double its real size. Around the sides of the building are raised spaces for the flowers, having a sort of dwarf screen of polished dove-colored marble, in which are numerous gilt brass panels for the supply of warm air from the chamber below. In the central space beneath the dome is a large basin, richly molded in beautiful veined Bardillo marble, with four pedestals of the same material at the angles, which serve to support vases of white marble, containing some beautiful specimen plants. The basin is filled with rare exotic ferns, and has a fan palm in the center. Eight similar marble pedestals are also formed in the dove marble screen before named, on which are some choice specimens of Majolica vases by Minton, and two from Sèvres, and containing rare plants. Pendant from the ceiling are six Majolica flower baskets containing choice ferns and other drooping foliage. There are also eight suspended Roman lamps in bronze, with lotus leaves forming clusters of flowers in gas jets, and also four other suspended Roman lamps of classical design, giving in all eighty gas burners, by means of which the whole building may at night be brilliantly illuminated; there are also near the drawing room door a pair of exquisitely chased bronzed candelabra, which on ordinary occasions give sufficient light for walking in the evening. The floor is composed of encaustic tiles and tessera tastefully arranged in panels of quiet colors (so as not to interfere with the brilliant colors of the flowers). In this design are embodied mosaics representing Spring, Autumn, Summer, and Winter, and a fifth near the entrance represents Old Time with the date of the erection of the building on a table beneath him; this beautiful floor was erected from designs prepared by Messrs. Simpson, the London agents for Maw's encaustic tiles; at each of the four angles of the central part are life-size figures of boys executed in biscuit china at Sèvres, they represent Love, Pleasure, Folly, and Repose; they are exquisitely modeled, and of a pure white, standing against the rich crimson background of the niche, and supported by pedestals of Devonshire marble.

At six different parts there are semicircular spaces left above the doors or windows, and these are filled by spirited groups of chubby children in alto relievo, modeled by Wynn, and executed in copper bronze by Messrs. Elkington. It is only fair to add that much of the richness of effect and real beauty of the whole is due to the excellent taste of the decorator, Mr. Schmidt, who has managed to give a rich glow of effective color and gilding, without in any way lessening the natural beauty of the flowers and foliage.—*Engineering.*

BELLS AND BELL TOWERS.

[From the Contemporary Review.]

The long, winding staircase seems to have no end. Two hundred steps are already below us. The higher we go the more broken and rugged are the stairs. Suddenly it grows very dark, and clutching the rope more firmly we struggle upwards. Light dawns again, through a narrow Gothic slit in the tower—let us pause and look out for a moment. The glare is blinding, but from the deep, cool recess a wonderful spectacle unfolds itself. We are almost on a level with the roof of a noble cathedral. We have come close upon a fearful dragon. He seems to spring straight out of the wall. We have often seen his lean, gaunt form from below—he passed almost unnoticed with a hundred brother gurgoyles—but now we are so close to him our feelings are different; we seem like intruders in his lawful domains. His face is horribly grotesque and earnest. His proportions, which seemed so diminutive in the distance, are really colossal—but here everything is colossal. This huge scroll, this clump of stone cannon-balls, are, in fact, the little vine tendrils and grapes that look so frail and delicately carven from below. Amongst the petals of yonder mighty rose a couple of pigeons are busy building their nest; seeds of grasses and wild flowers have been blown up, and here and there a tiny garden has been laid out by the capricious winds on certain wide stone hemlock leaves; the fringe of yonder cornice is a waste of lilies. As we try to realize detail after detail the heart is almost pained by the excessive beauty of all this petrified bloom, stretching away over flying buttresses, and breaking out upon column and architrave, and the eye at last turns away weary with wonder.

A few more steps up the dark tower, and we are in a large dim space, illuminated only by the feeblest glimmer. Around us and overhead rise huge timbers, inclining towards each other at every possible angle, and hewn, centuries ago, from the neighboring forests, which have long since disappeared. They support the roof of the building. Just glancing through a trap-door at our feet we seem to look some miles down into another world. A few foreshortened, but moving specks, we are told are people on the floor of the cathedral, and a bunch of tiny tubes, about the size of a pan-pipe, really belong to an organ of immense size and power. At this moment a noise like a powerful engine in motion recalls our attention to the tower. The great clock is about to strike, and begins to prepare by winding itself up five minutes before the hour. Groping amongst the wilderness of cross beams and timbers, we reach another staircase, which leads to a vast square but lofty fabric, filled with the same mighty scaffolding. Are not these most dull and dreary solitudes—the dust of ages lies everywhere around us, and the place which now receives the print of our feet has, perhaps, not been touched for five hundred years? And yet these ancient towers and the inner hights and recesses of these old roofs and belfries soon acquire a strong hold over the few who care to explore them. Lonely and deserted as they may appear, there are hardly five minutes of the day or night up there that do not see strange sights or hear strange sounds. As the eye gets accustomed to the twilight, we may watch the large bats flit by. Every now and then a poor lost bird darts about, screaming wildly like a soul in purgatory that cannot find its way out. Then we may come upon an ancient rat, who seems as much at home there as if he had taken a lease of the roof for ninety-nine years. We have been assured by the carillonneur at Louvain that both rats and mice are not uncommon at such considerable elevations.

Overhead hang the huge bells, several of which are devoted to the clock—others are rung by hand from below, while somewhere near, beside the clock machinery, there will be a room fitted up, like a vast musical box, containing a barrel, which acts upon thirty or forty of the bells up in the tower, and plays tunes every hour of the day and night. You cannot pass many minutes in such a place without the clicking of machinery, and the chiming of some bell—even the quarters are divided by two or three notes, or half-quarter bells. Double the number are rung for the quarter, four times as many for the half-hour, while at the hour, a storm of music breaks from such towers as Mechlin and Antwerp, and continues for three or four minutes to float for miles over the surrounding country.

The bells, with their elaborate and complicated striking apparatus, are the life of these old towers—a life that goes on from century to century, undisturbed by many a convulsion in the streets below. These patriarchs, in their tower, hold constant converse with man, but they are not of him; they call him to his duties, they vibrate to his woes and joys, his perils and victories, but they are at once sympathetic and passionless; chiming at his will, but hanging far above him; ringing out the old generation, and ringing in the new, with a mechanical, almost oppressive regularity, and an iron constancy which often makes them and their gray towers the most revered and ancient things in a large city. The great clock strikes—it is the only music, except the thunder, that can fill the air. Indeed, there is something almost elemental in the sound of these colossal and many-centuried bells. As the wind howls at night through their belfries, the great beams seem to groan with delight, the heavy wheels, which sway the bells, begin to move and creak; and the enormous clappers swing slowly, as though longing to respond before the time.

At Tournay there is a famous old belfry. It dates from the twelfth century, and is said to be built on a Roman base. It now possesses forty bells. It commands the town and the country round, and from its summit is obtained a clear view of the largest and finest cathedral in Belgium, with its five magnificent towers. Four brothers guard the summit of the belfry at Tournay, and relieve each other day and night, at intervals of ten hours. All through the night a light is seen burning in the topmost gallery, and when a fire breaks out, the tocsin, or big bell, is tolled up aloft by the watchman. He is never allowed to sleep—indeed, as he informed us, showing us his scanty accommodation, it would be difficult to sleep up there.

On stormy nights a whirlwind seems to select that watchman and his tower for its most violent attacks; the darkness is often so great that nothing of the town below can be seen. The tower rocks to and fro, and startled birds dash themselves upon the shaking light, like sea birds upon a lighthouse lantern. Such seasons are not without real danger—more than once the lightning has melted and twisted the iron hasps about the tower, and within the memory of man the masonry itself has been struck. During the long peals of thunder that come rolling with the black rain clouds over the level plains of Belgium, the belfry begins to vibrate like a huge musical instrument, as it is; the bells peal out, and seem to claim affinity with the deep bass of the thunder, while the shrill wind shrieks a demoniac treble to the wild and stormy music.

All through the still summer night the belfry lamp burns like a star. It is the only point of yellow light that can be seen up so high, and when the moon is bright it looks almost red in the silvery atmosphere. Then it is that the music of the bells floats farthest over the plains, and the postillion hears the sound as he hurries along the high road from Brussels or Lille, and, smacking his whip loudly, he shouts to his weary steed as he sees the light of the old tower of Tournay come in sight. Bells are heard best when they are rung upon a slope or in a valley. The traveler may well wonder at the distinctness with which he can hear the monastery bells on the Lake of Lugano, or the church bells over some of the long reaches of the Rhine. Next to valleys, plains carry the sound farthest. Fortunately, many of the finest bell-towers in existence are so situated. It is well known how freely the sound of the bells travels over Salisbury Plain. The same music steals far and wide over the Lombard plains from Milan Cathedral; over the Campagna from St. Peter's at Rome; over the flats of Alsatia to the Vosges Mountains and the Black Forest from the Strasbourg spire; and, lastly, over the plain of Belgium from the towers of Tournay, Ghent, Brussels, Louvain, and Antwerp. The belfry at Bruges lies in a hollow, and can only be seen and heard along the line of its own valley.

To take one's stand at the summit of Strasbourg Cathedral at the ringing of the sunset bell, just at the close of some effulgent summer's day, is to witness one of the finest sights in the world. The moment is one of brief but ineffable splendor, when, between the mountains and the plain, just as the sun is setting, the mists rise suddenly in strange sweeps and spirals, and are smitten through with the golden fire which, melting down through a thousand tints, passes, with the rapidity of a dream, into the cold purples of the night.

Pass for a moment, in imagination, from such a scene to the summit of Antwerp Cathedral at sunrise. Delicately tall, and not dissimilar in character, the Antwerp spire exceeds in hight its sister at Strasbourg, which is commonly supposed be the highest in the world. The Antwerp

spire is 403 feet high from the foot of the tower. Strasbourg measures 468 feet from the level of the sea; but less than 403 feet from the level of the plain. By the clear morning light, the panorama from the steeple of Notre Dame at Antwerp can hardly be surpassed. One hundred and twenty-six steeples may be counted, far and near. Facing northward, the Scheldt winds away until it loses itself in a white line, which is none other than the North Sea. By the aid of a telescope ships can be distinguished out on the horizon, and the captains declare they can see the lofty spire one hundred and fifty miles distant. Middleburg at seventy-five, and Flessing at sixty-five miles, are also visible from the steeple. Looking towards Holland, we can distinguish Breda and Walladuc, each about fifty-four miles off.

Turning southward, we cannot help being struck by the fact that almost all the Belgian towers are within sight of each other. The two lordly and massive towers of St. Gudule's Church at Brussels, the noble fragment at Mechlin, that has stood for centuries awaiting its companion, besides many others, with carillons of less importance can be seen from Antwerp. So these mighty spires, gray and changeless in the air, seem to hold converse together over the heads of puny mortals, and their language is rolled from tower to tower by the music of the bells. "*Non sunt loquellæ neque sermones audiantur voces eorum.*" ("There is neither speech nor language, but their voices are heard among them.") Such is the inscription we copied from one bell in the tower at Anvers, signed "F. Hemony, Amstelodamia (Amsterdam), 1658.

AN INTERESTING SKETCH OF THE DISTINGUISHED AERONAUT, JOHN LA MOUNTAIN.

The following sketch of La Mountain is from the pen of George Demers, of the Albany *Evening Journal*. Mr. Demers accompanied him in six of his balloon voyages:

John La Mountain was not an ordinary man, and his death calls for something more than a passing mention. Though deficient in those advantages which are imparted by early education, he possessed marked natural genius, great resoluteness of purpose, and much inventive ability; qualities that in other spheres might have won him success in life, but which, devoted with enthusiasm to the profession of ballooning, got him fame only as an eccentric and intrepid adventurer.

La Mountain did not become an aeronaut for the purpose of the mountebank exhibitor. His necessities compelled him to make ascensions for public amusement. His higher object was to render aerial navigation of practical use in the great enterprise of modern progress and commerce. He never was a convert to the belief that balloons could be propelled in any direction at will, and in despite of adverse currents, by the aid of machinery. But he early became satisfied that there is a current in the atmosphere corresponding with the Gulf stream in the ocean, and flowing steadily over a very wide belt, from west to east. His own experience and that of others, amply confirm this opinion. He concluded then, that as balloons had been kept in the air for many hours at a time under ordinary circumstances, it was possible, by making one of superior capacity, to mount into this upper current, float with it across the ocean, and land at will, for instance in England, in sufficient proximity to London to make the voyage of immense value, in the saving of time it would accomplish. Acting upon these ideas, he was determined to be the first aeronaut who should cross the Atlantic.

So soon as he could obtain sufficient means by his exhibitions, Mr. La Mountain began the construction of a balloon in which he hoped to accomplish his daring scheme. Everything about it was most perfect. The silk, of extra quality, was manufactured expressly for him, and under his supervision, by the Messrs. Ryle, of Paterson, N. J. The rope for netting he made himself at a factory near Troy, subjecting every fiber and strand to severe tests. Great care was used in oiling and coating the silk. Adroit mechanism insured absolute control of the valves. When the "Atlantic" was completed, it was undoubtedly the strongest and most symmetrical, as well as the largest balloon ever floated in any country.

By way of demonstrating the feasibility of his plan, Mr. La Mountain determined upon a preliminary land voyage of great length. St. Louis was fixed upon as the starting point, and he ascended from that city in the presence of an immense concourse, accompanied by John Wise, the veteran Pennsylvanian aeronaut.

The voyagers remained in the air a little over nine hours, during which time they crossed Lake Erie at its largest part, and traveled far into New York State. Unfortunately, in crossing Lake Ontario, they descended for purposes of observation, and became involved in a tremendous tornado of which they had no knowledge when above. This bore them with frightful velocity to the shore, and left the balloon a wreck in the woods of Adams, Jefferson county. In a little more than nine hours the "Atlantic" had traversed a distance of eleven hundred and eighty miles.

Thus ended, for a time, all prospect of the voyage to England. La Mountain was saddened, but not discouraged. All he lacked was money. To obtain this, he resumed his career as an exhibitor. A small balloon was constructed of the fragments of the wrecked "Atlantic." The citizens of Watertown made him a generous subscription, and he started on a pleasure trip from that place, in company with Mr. John A. Haddock, then editor of the Watertown *Reformer*.

The incidents of this voyage will long be remembered. The balloonists had proposed to be back in a few hours. But days passed, and they did not come. Time lengthened and there were no tidings from them. First was uncertainty then doubt, then despair in the minds of friends. All sorts of wild stories and vague speculations were started. The tragic fate of poor Thurston was then fresh in the public mind, and the belief became general that La Mountain and his companion had met a similar death; although there were some wild enough to believe that the insane venture of crossing the Atlantic in a small and unreliable balloon, had been made. At last the mystery was explained. Having no compass, the aeronauts had lost their bearings, and suffered themselves to be carried far into the dense woods of the Ottawa reservation, in Canada. After wandering in their blank mazes for many days, subsisting upon leaves and berries, they were accidentally discovered when in the last stages of starvation, by some Indian scouts in the employ of Mr. Cameron, a lumberman, and thus saved from a horrible death. Their thrilling story was widely published, and graphically pictured by the illustrated newspapers.

After this second misfortune, Mr. La Mountain did not at once renew his Atlantic project. The war of the rebellion began to assume large proportions, and La Mountain was at different times stationed at Cloud's Mills, near Alexandria, at Fortress Monroe, and elsewhere. So long as the armies were lying in camp, as they did during the early portion of McClellan's remarkable career, balloons were of some value.

We last heard of him in public as making an ascension from a town in Michigan. An impatient and careless crowd cast him off before he was ready, without an overcoat or instruments, and the valve rope tied several feet above the basket. He shot like a rocket up into a cloud of mist and sleet, which congealed his blood and froze the valve board fast before he could control it. His only alternative was to climb, with frost-bitten fingers, up the net-work and tear the balloon with his teeth. The rip extended above the hemisphere, the balloon collapsed, discharged its gas, and fell with great velocity from a hight of nearly two miles. The aeronaut was picked up benumbed, insensible, but not dangerously injured. Undoubtedly, the suffering and exposure endured at this time hastened his death.

The career of Mr. La Mountain was peculiarly one of danger and ill fortune. But he faced hazards without a tremor, and endured disaster without a murmur; never faltering in devotion to his leading idea. We accompanied him six times above the clouds, and saw him twice under circumstances of great peril, when he was as calm and collected as if sitting in a parlor—not a muscle relaxing nor a fiber quivering. His fault was a lack of business practicality. But he made up for this, in a great degree, by intense enthusiasm and earnestness. Notwithstanding the success of the Atlantic telegraph had rendered the question of crossing the ocean with balloons less interesting and important than formerly, we believe he would have made the attempt; and in this day of almost marvelous achievements, it is not wise to say that he would have failed.

MINERAL DEPOSITS.

[Lecture by William T. Brigham, before the Boston Society of Natural History.]

The deposits of minerals, the extraction of which forms the subject of mining, are found in two forms; beds originally more or less horizontal, and veins. The form in which a mineral is found is usually the same; thus coal is generally deposited at the bottom of fresh water and appears as a bed. The only other mineral of importance, if we except rock salt, found in this form, is bog iron. This ore is one of the best oxides of iron, and is frequent in the United States and in Sweden. The position of coal beds is usually determined by the dip of the stratum at its outcrop. These beds are often divided by intervening strata of limestone or shale. Augers similar to those used in boring artesian wells are employed to find the depth and thickness of these beds. This mode is extensively practiced in France. It is only within a little more than a century that coal has attained a commercial value, and within that period the scientific college of France sanctioned its use, declaring it not to be a poisonous fuel. Its consumption has now reached such a degree, that in a single year over a hundred and seventy millions of tuns were quarried, and of this quantity England produced one hundred millions of tuns.

By far the greater number of minerals used in the arts are found in the second form, viz.: that of veins, which are as definitely placed as beds. Where an eruptive rock has been forced upwards, breaking a series of strata, a vein is formed in the fracture, and also smaller veins are formed in the surrounding cracks. Accidents and faults occur in veins as in strata, and are caused by disturbances after the deposition of the metallic veins. These accidents are so various, and the veins so intricate, that science is sometimes at fault. This places geologists in bad repute among practical miners, and this feeling was so strong at the time of Prof. Silliman's visit to California, that he was refused admittance to many of the mines. Veins are often heterogeneous in their composition, and a section of a certain Spanish vein exhibited the following substances in the order of their enumeration: Partially decayed rock, or gossan; a brown iron ore; galena, or sulphide of lead; gray sulphate of lead; white sulphate of lead; pure white metal; iron with patches of ocher; barytes with patches of galena; galena in large grains; sulphate of lead; and lastly, the surrounding gossan. This is an extreme example, but veins are seldom simple.

A conformation not infrequent is that of a large vein termed *Vena Madre*, or mother vein, accompanied by smaller contiguous and parallel veins. This may extend for a hundred miles with a veritable width of from six to one hundred feet. Of this character are the celebrated Washoe and Comstock lodes, which latter produced from 1862 to 1865 inclusive, metal equal in value to forty-eight millions of dollars, two-thirds being silver and one-third gold. Lodes are sometimes of such definite width, that miners may and do divide them by the length, each owning a certain number of feet. Thus a vein is worked at several points. The surrounding medium is often quartz, in the fissures of which are found scales of gold. Silver is found in several forms, some of the most noticeable of which are ruby silver, horn silver, and hair silver, the latter being a most beautiful and delicate mesh or net-work much prized for collections.

The extreme hardness of the quartz, and difficulty of separating the metal, often makes the working of a mine impracticable. But here nature comes to our aid. By the action of water during long ages, the enveloping rock is decayed, and the golden scales and nuggets washed down, and deposited, together with a large amount of foreign matter, in the beds of the streams. These streams have been, by volcanic or other action, covered to some depth, with soil. The uncovering of these ancient river-beds, and the washing of the deposits there found, constitute placer mining. This method was first discovered in California by a Mormon, a member of Captain Suter's band, who in digging a race-way for a mill found many small yellow particles, which he supposed were gold. Of these he collected a large quantity, and in the autumn of 1848 sent them to San Francisco, then but a village. They attracted the attention of an old Georgian miner, who declared them similar to the nuggets found in the washings of that State. The news spread, and diggings for the valuable deposit were commenced in all parts of the State. In the spring of 1849 the panic extended to the Atlantic coast, and the memorable gold fever set in. During six months of that year no less than ninety thousand people went to California. As they exhausted the stream-beds found in the valleys, they followed the deposit up the mountain. This gave rise to that system of mining peculiar to America, called hydraulic mining. Rapid streams of water are conducted by elevated troughs, resembling old Roman aqueducts, and with immense pressure thrown against the sides of the mountains, washing down the soil, and uncovering these ancient beds. The matter thus washed down is made to pass over ditches constructed so as to catch the particles and nuggets of gold.

Platinum occurs in little flat grains, in appearance resembling dull silver. From this resemblance it derives its name *platina*, meaning little silver. This metal is unaffected by acids, and will not melt under a temperature of 2000 degrees. It is chiefly found in the Ural mountains, and is used in Russia as coin.

Copper is found like silver in veins, often mixed with silica and other impurities. It is very difficult to smelt, and this branch of industry is mainly carried on at Swansea in South Wales. There is also a smelting furnace at Boston. Carbonate of copper gives us two valuable compounds, viz.: blue carbonate, and green carbonate of copper, or malachite. Malachite is largely found in the Ural mountains, and is in common use in Russia. This metal is found pure, in sheets or nuggets, one having been found weighing five hundred tuns. It was so ductile that it was found impossible to blast it, and it had to be cut into sections with cold chisels.

Galena or common lead is found crystallized into cubes and in veins, running through limestone reefs. Owing to the irregularities of the original coral reefs, large cavities or chambers are found in limestone often filled with lead.

Tin is chiefly found in Cornwall in the form of tin stone. It is also obtained by washing, sometimes transparent and sometimes of a gray color, and is called stream tin. Mercury was formerly obtained only at the mine of Almaden in Spain; but soon after the demand arose for it in California, it was found south of San Francisco, and the mine was named New Almaden. These mines are of immense value and extent, but are in the hands of a gigantic monopoly, which will only produce a limited quantity. This cinnabar was used by the Indians for war-paint, and is sometimes found deposited in pouches like lead. Manganese is of a purple color, and to its presence the amethyst owes its beautiful hue.

Metals are sometimes found in solution in the sea, and certain seaweeds possess the power of secreting silver. Old copper sheathings also collect by galvanic action an appreciable amount of silver.

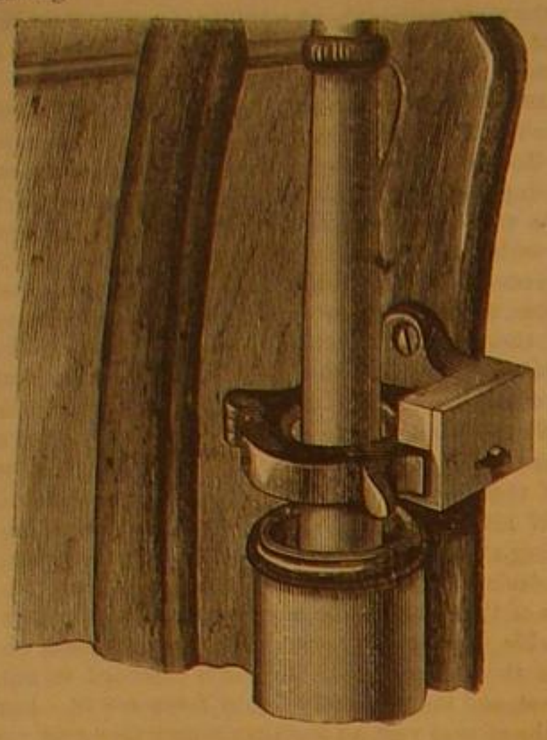
The lecturer briefly called the attention of the audience to the providential distribution of the various natural deposits. Coal, wood, and limestone are necessary to the successful working of iron mines, and in all countries where iron abounds, these materials are also at hand. When mining had reached such a stage that works were abandoned from inability to keep the mines clear from the water which collected, the steam-engine was invented and first used only for this purpose. The necessity for an increased amount of appropriate fuel then arose, and was supplied by the discovery and use of coal. Thus science supplies the needs and emergencies of the arts.

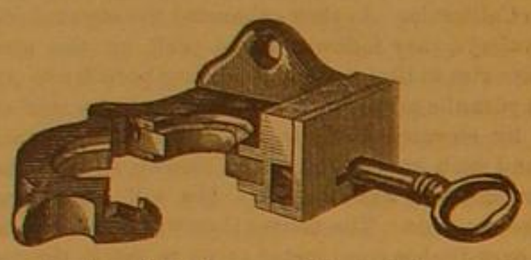
CEMENT FOR FASTENING INSTRUMENTS IN HANDLES.—A material for fastening knives or forks into their handles, when they have become loosened by use, is a much-needed article. The best cement for this purpose consists of 1 lb. of colophony (purchasable at the druggists'), and 8 oz. of sulphur, which are to be melted together and either kept in bars or reduced to powder. One part of the powder is to be mixed with half a part of iron filings, fine sand, or brickdust, and the cavity of the handle is then to be filed with this mixure. The stem of the knife or fork is then to be heated and inserted into the cavity; and when cold it will be found fixed n its place with great tenacity.

HILL'S LOCKING WHIP SOCKET.

This is not only a tasty, but an efficient device for locking whips in their sockets.

The lock is securely fastened to the dash, as shown, so that when the whip is placed in the socket, it is clasped by the semicircular hasp of the lock, which corresponds to a semicircular recess in the plate of the lock, as shown in the engraving.





Both the interior of the hasp and that of the recess which forms its counterpart, are lined with thick leathers, cut in the form of halves of a flat ring, and let into grooves formed in the interior side of the hasp and the recess. This prevents rattling and wear.

The whole arrangement is small, neat, strong, and convenient. The lock is of that kind known as spring locks, and requires the use of a key only to unlock it. The attachment is rather ornamental than otherwise, and will effectually insure whips from theft.

Patented, through the Scientific American Patent Agency, Sept. 28, 1869, by W. S. Hill, whom address for further information at Manchester, N. H.

Our Moscow Exchanges.

We have received several numbers of the Moscow German paper, *Moskauer Deutsche Zeitung*, and are gratified to see with what discrimination and freedom the editor discusses all questions of education and politics. If the paper were printed in New York it could not enjoy greater license. It is also refreshing to observe that way off in the interior of Russia editors know how to indulge in those pleasing personalities that give style and character to papers nearer home. Among other items, we find one headed, "A New Yankee Speculation," giving an account of the proposed sale in New York of excursion tickets around the world, including board and lodgings at hotels, and all incidentals. The paper says that the arrangements are nearly completed, and that such a ticket will cost $1,200, and that the scamper around the world can be accomplished in ninety days.

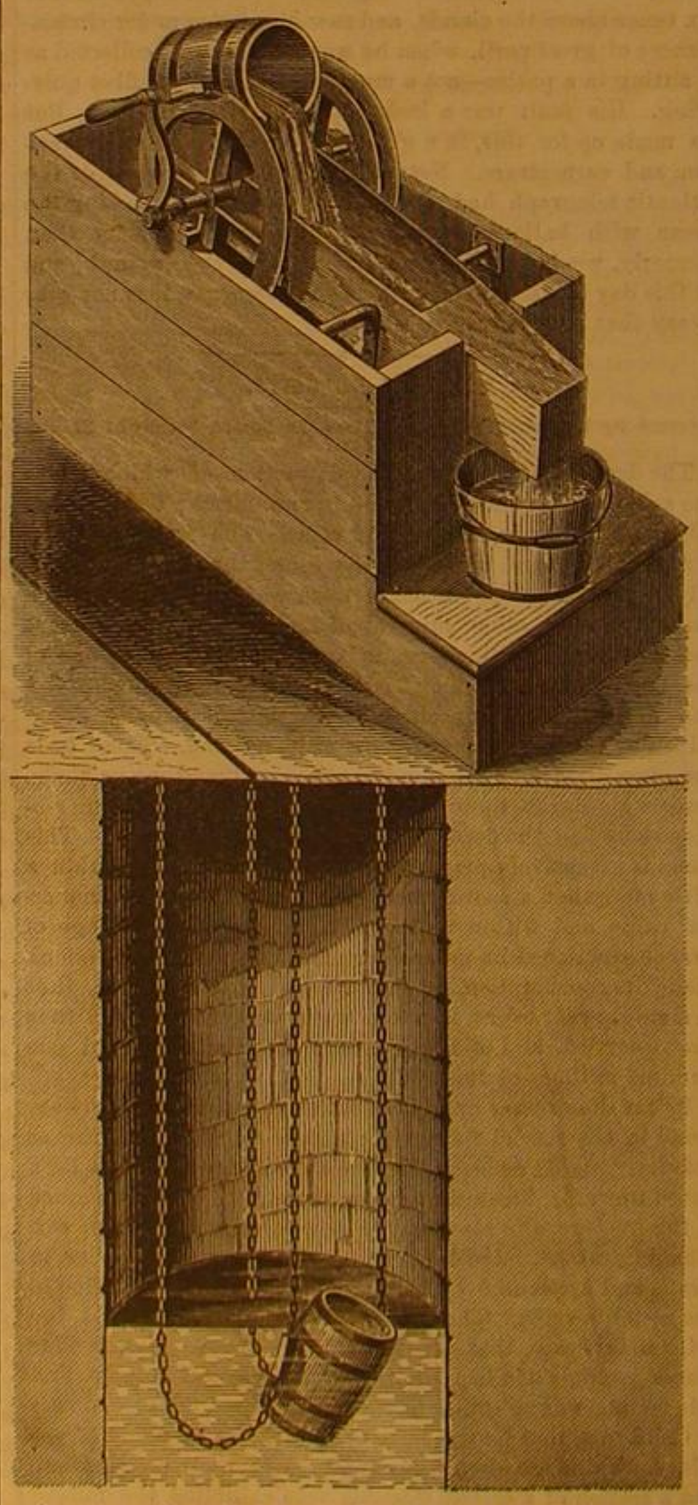
The Peforated Implements of the Stone Period.

Sir John Lubbock and the other archæologists are inclined to hold that the perforated axes and hammers of stone are coeval with the commencement of the bronze period. That many of them really do belong to this period there can be little doubt, since bronzes and stone are frequently found buried together, and it is well known that stone weapons continued to be made and used after the introduction of bronze. But this by no means proves that all perforated stone implements are to be referred to this period, and the present number of the "Archiv für Anthropologie" contains a paper by Rau, showing the mode in which they might be formed before a knowledge of bronze existed. M. Rau considers that the holes were made in two ways, or perhaps by means of two different borers. The more highly finished holes are of equal diameter throughout, and present a smooth surface, and exhibit at short distances from each other a succession of circular grooves. Such perforations as these, he thinks, were effected by means of a hollow cylinder of bronze. But there is another kind of perforation, the surface of which is more or less smooth, but which is not marked by the lines or grooves above mentioned. These perforations are constricted in the center, so as to present one section, more or less of an hour-glass form, indicating that they have been bored in from opposite sides. These, he thinks, belong exclusively to the stone period. In both methods it is probable that hard sand and water were employed to assist the process. His view is supported by an examination of weapons in which the perforations have not been completed, but carried only through a portion of the thickness of the stone. In the former class of borings, the hole on section presented somewhat of the appearance that would be presented by the bottom of a champagne bottle on section, the periphery being more deeply bored than the center; whilst, in the latter class of borings, the bottom of the depression was simply rounded and rather narrower than the superficial margin. M. Rau has been able to produce borings in a hard stone exactly resembling those on the weapons of the stone period, without the aid of any metallic instrument, but merely by means of the rounded extremity of a piece of hard wood made to rotate with a bow-drill, together with a little sand and water. The stone on which he experimented was a piece of diorite, so hard that a well-tempered knife-blade only marked it with a metallic streak, and of the same kind as that formerly employed, on account of its combining hardness with tenacity, in the construction of various weapons during the stone period, and still used for the same purposes by the North American Indians of the present day. In commencing the perforations, which required infinite patience, M. Rau found it advantageous to attach a piece of wood, with a hole in it, on the stone, which prevented the boring instrument from perpetually slipping off. Two hours' severe work were required to deepen the perforation by the thickness of an ordinary tracing with a lead pencil, and, though with many interruptions, he was fully two years in completing it. It was found requisite to add fresh sand every 5 or 6 minutes. When serpentine rock was experimented on, the perforation was accomplished with very much greater rapidity.

HAMILTON'S WATER ELEVATOR.

Ewbanks, in his treatise on "Hydraulics and Mechanics," has compiled a history of the various devices adopted in all parts of the world for raising water, from the earliest period of which we have any record up to a recent date. To obtain this essential to life, the minds of even the most rude and uncultivated savages have been stimulated into the invention of quite ingenious devices; and in modern times improvements in methods of elevating water form a large proportion of the inventions for which protection by patent is solicited.

The invention herewith illustrated is a good one, not only for shallow but especially for deep wells beyond the capacity of the atmospheric pump. It probably eliminates the element of friction to as great an extent as it can practically be done; and, therefore, applies a maximum proportion of the power to the useful work to be accomplished.



Our engraving gives an excellent idea of the device. Two grooved pulleys keyed to a shaft carry each an endless chain to which buckets are attached in the manner shown.

When the shaft is rotated in the proper direction, the buckets successively descend and fill, and are drawn to the top, when in passing over the center of the elevating shaft they empty their contents into the spout.

The spout is not fixed, but is pivoted in such a manner that it tips to allow the buckets to pass on their descent for a further supply; and it is also so balanced that as soon as the bucket has passed, it falls immediately into its normal position.

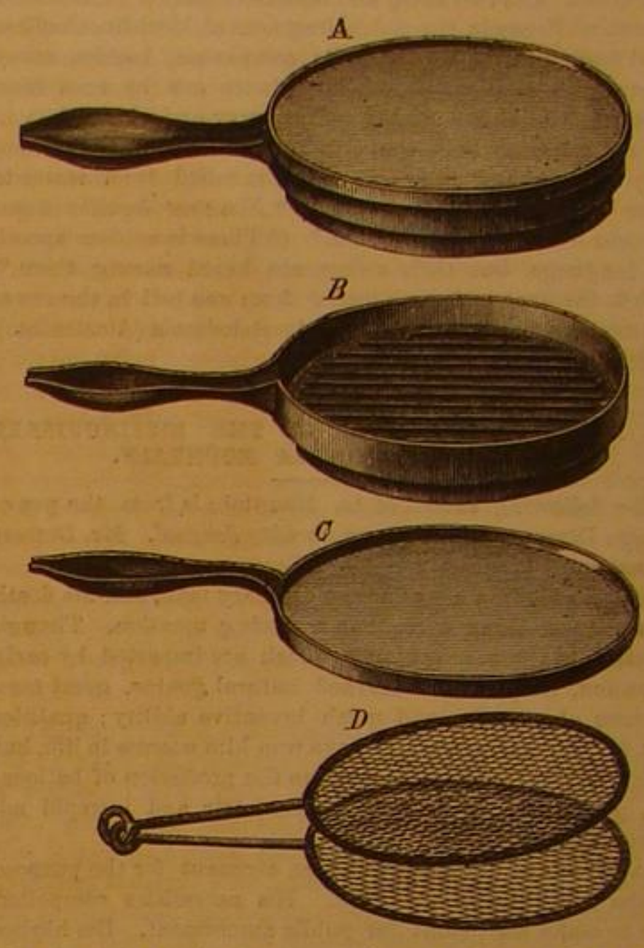
We judge that more water can be elevated by a given power, through a given distance, in a given time, by this apparatus than by the use of any pump; and the number of buckets may of course be multiplied, when it is desired to apply steam, or other power greater than can be applied to an ordinary hand machine like that illustrated.

Apparatus of this kind has the advantage over pumps that wells are constantly kept open, and the water being stirred at each drawing keeps the water thoroughly aerated.

This invention was patented, through the Scientific American Patent Agency, Feb. 1, 1870, by W. G. Hamilton, of Milton, Wis. Address as above for further information.

DENN'S IMPROVED GRIDIRON AND CAKE BAKER.

We have forgotten the name of the *gourmand* who said, that, if he were an autocrat, the individual who should presume to fry a beefsteak in his dominions should be himself fried. The punishment proposed, though somewhat severe, is not much more so than the pains of dyspepsia which Nature meets out to those who will eat fried meats contrary to her express commands.



But without proper appliances, the broiling of meats, undoubtedly the most wholesome as well as the most appetizing mode of cooking them, involves many positive inconveniences, such as the smoking of walls, the dripping of grease, and other annoyances which we need not specify.

The object of the present invention is to do away with all these inconveniences, and to provide a gridiron whereby not only broiling but other culinary operations may be performed, and by which the bad health arising from the continual use of fried meats may be avoided.

It consists of three principal parts, shown separately in the engraving. The gridiron, B, its cover, C, and the wire gridiron, D, which may be used inside of the other, when desired, to broil food that would fall through the bars of the other, such as oysters, or it may be used as a corn popper or bread toaster.

The cover may be used as a cake baker by placing it on the top of the stove with the hollow side of the handle up. It will be seen by an inspection of the engraving that the gridiron has a rim or projection on its underside to rest on the ledge in the hole of the stove, the rim being narrower at the part toward the handle for the purpose of giving the bars an inclination in that direction, to cause the gravy to flow out into the hollow handle and be saved for use.

It will also be seen that the device, when in use, makes an air-tight cover to the hole, preventing the escape of smoke into the house, and keeps up the draft in the stove.

The patentee is, we are informed, in receipt of numerous testimonials as to the efficiency of this device, from those who have it in use.

The sizes range from No. 6 to No. 10, inclusive, and are made to fit the corresponding numbers of stoves and ranges; they may also be made oblong so as to occupy both the openings over the fire space, being more convenient for large families or restaurants in that form.

This device was patented, through the Scientific American Patent Agency, June 23, 1868, by Clayton Denn, of Frankford, Pa., who will sell State, county, or the whole right for the United States. For particulars, apply to, or address the patentee, No. 4,506 Trenton avenue, Frankford, Pa.

Purification of Water from Smoke Impurities.

Several correspondents recommend the use of permanganate of potassa for purifying water from the impurities derived from coal smoke. Enough of the salt to give the faintest possible tinge to the water is recommended to be added, and as the coloring property of this salt is very great, a little used in this way would purify a large quantity of water. After standing twenty-four hours the impurities will all be precipitated, and the sudzing property of the water is not impaired. Our Western friends who have been greatly troubled with smoke-soiled water will do well to make a trial of this simple remedy.

THE BITRICYCLE, A FRENCH INVENTION.

We illustrate herewith a curious French invention, more on account of its unique character, than from any belief in the merit of the device. Our object also is to arouse the attention of inventors to the fact that there is still much room for improvement in construction of vehicles designed either for passengers, or the transport of wares and heavy materials for building and other purposes.

An attempt has been made in the construction of the "bitricyle" to secure immunity from overturning by broadening the base of the vehicle to such a degree that the center of gravity can in no instance fall outside of the base, and this is undoubtedly secured. The increased width of the vehicle resulting in the attainment of the above object, is an inconvenience for city travel, on account of the crowded state of the thoroughfares.

One smiles to think what a delightful snarl a crowd of these vehicles would produce in *any* of our New York thoroughfares, not to mention Broadway.

But an attempt has been made to carry out a correct principle in throwing the bulk of the weight upon wheels of very large size. It is well known that such wheels entail less work than small ones in proportion as roads are rough. With perfectly smooth and hard roads, perfectly round and inelastic wheels of different sizes would manifest no difference in draft, all other things being equal.

The plan of putting the large wheels in the center of the vehicle appears to us a very unmechanical contrivance, as it is manifest that on uneven surfaces the weight must be more or less unequally divided between the wheels —and it is easy to conceive of circumstances, in which only two of the wheels, or even the one central wheel on each axle, should temporarily bear all the load. The use of springs can only compensate for this irregularity to a certain extent; beyond that, we judge the rolling of this vessel upon her central wheels, over a rough road, would be something remarkable.

The inventor of this curious vehicle seems to have forgotten that immunity from overturning may be secured by lowering the center of gravity with a given width of base, as by widening the base while keeping the center of gravity at the same hight.

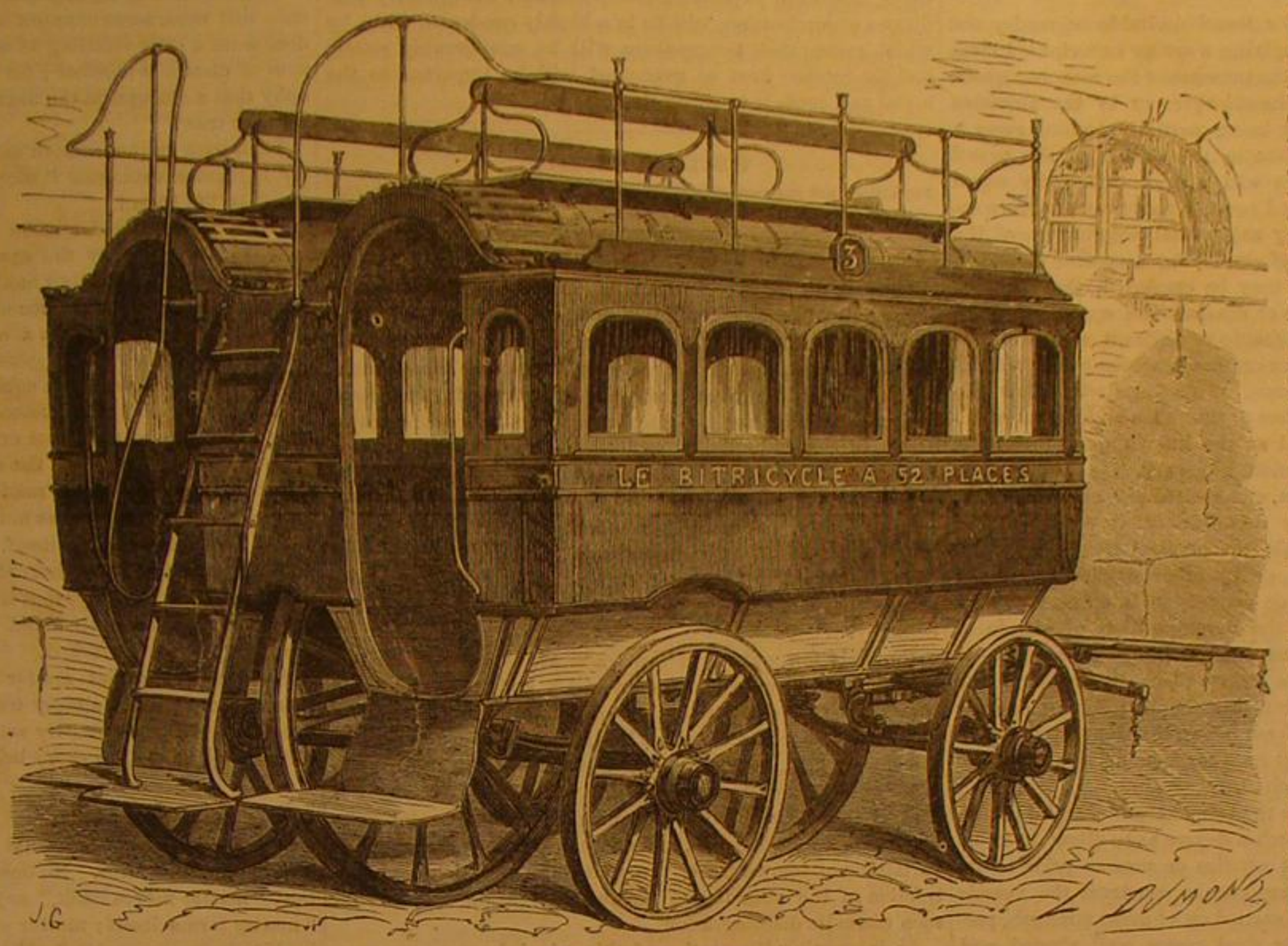
For all heavy draft vehicles, we believe that the hind wheels might be made much larger than at present is the case, with advantage; provided the construction of the vehicle is such as to throw the weight of the load mostly upon the larger wheels. The use of crank axles with such wheels would let down the body sufficiently to admit of easy loading.

We have seen this construction adopted for trucks used in moving heavy iron castings, blocks of stone, etc., with unquestionable advantage, and economy of labor, both to man and beast, yet for city trucking and farm work the high box or platform still prevails.

Of course the enlargement of the fore wheels cannot be carried beyond a certain point, on account of the resulting incapacity to turn shortly, a prime essential to a city truck; but it appears to us that the combination to be sought in the improvement of draft vehicles is the lowering of the load and the enlargement of the wheels.

In omnibuses likely to be run into by other vehicles, it seems necessary to raise the body so as to be in some measure out of the reach of injury from the contact of trucks, etc., which might endanger the passengers should they strike the body of the vehicle.

The vehicle we illustrate is made to carry fifty-two persons inside and out, the inside being divided into two compartments, as shown. A canopy, or awning, in hot and in wet weather, is used to shelter the outside passengers.



THE BYTRICYCLE.

THE BESSEMER PROCESS UNDER PRESSURE.

Our readers, who have read the article on page 184, current volume, SCIENTIFIC AMERICAN, entitled "A Visit to a Steel Manufactory," and who have felt sufficient interest in what is known as the Bessemer process, to have become familiar with its details, will at once understand the working of the improvement of which we give an engraving, and which has just been patented by Mr. Bessemer in the United States.

It has been found that when certain kinds of iron are treated after the Bessemer method the degree of heat attained upon the influx of air into the converters is very much inferior to that produced when other kinds are worked.

The object in the present invention is to force the air into the converters under pressure, and thereby to secure a greater volume of oxygen to support the combustion than is done in the ordinary way. The purer qualities of pig iron are advantageously worked in this way. In the old process the degree of heat obtained, when Swedish charcoal pig iron and some other varieties were worked, was insufficient to maintain fluidity in the mass until it could be poured into the ingot molds. Hence, a portion becoming hard gave rise to the formation of shells or "skulls"—as they are called—in the casting ladles. When malleable scrap or steel in solid state is worked with pig iron this evil is greatly increased.

The engraving which we copy from *Engineering* is accompanied with the following detailed description. Perhaps no invention of modern times illustrates better the fact that simplicity of construction may often secure the greatest advantages. This simple device of Mr. Bessemer is said to totally obviate the difficulty we have specified.

FIG. 1.

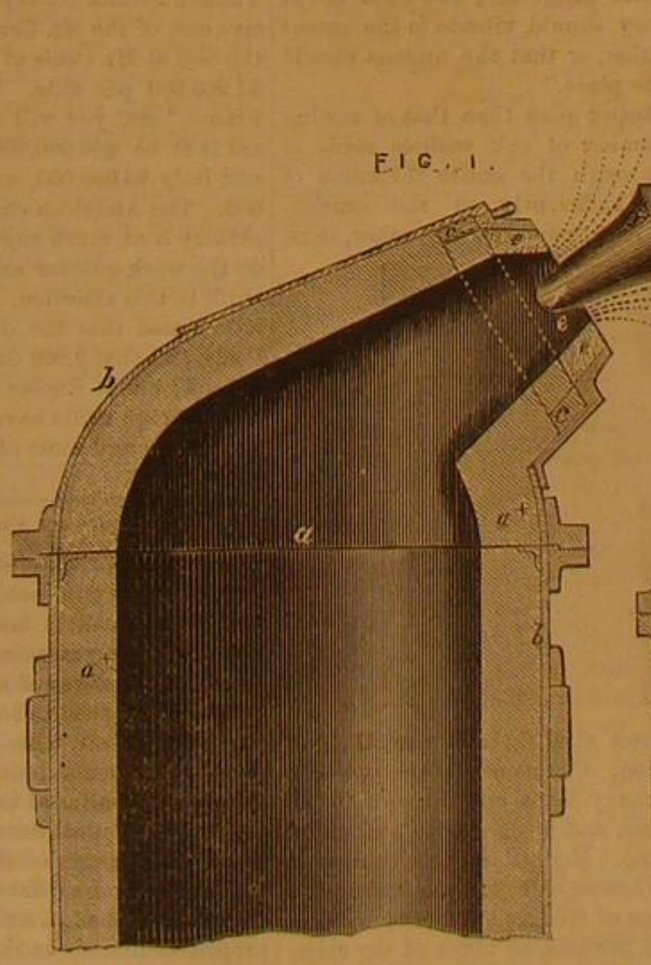
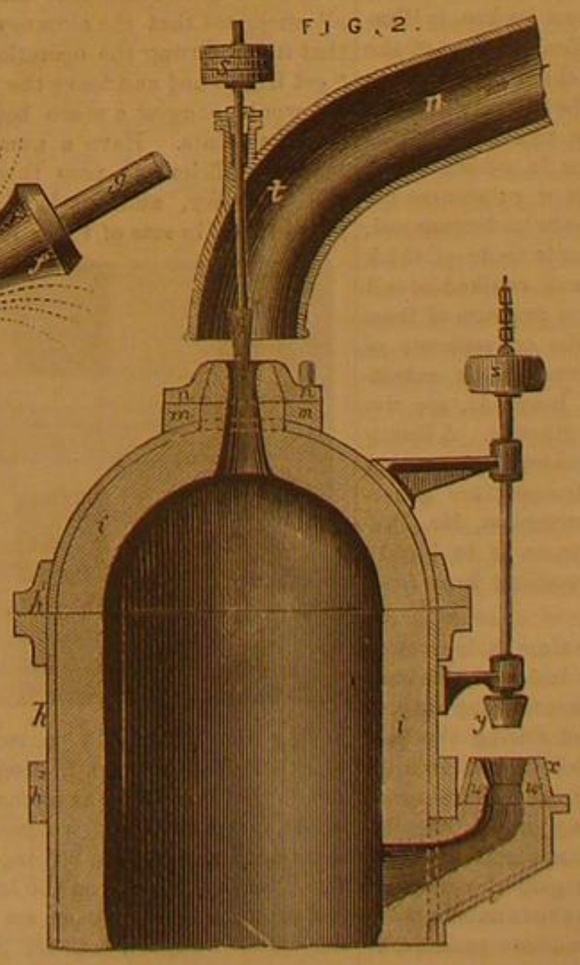


FIG. 2.



THE BESSEMER PROCESS UNDER PRESSURE.

"Mr. Bessemer makes the converting vessel of great strength, securely riveting and caulking all the laps and joints so as to render it air tight as near as may be, and he, by preference, forms the mouth of the vessel circular instead of oval, and of a smaller size than usual, lining the mouth with a single ring of well-burnt fire clay, or composition of clay and plumbago. He also forms the metal part of the mouth of the converter with a movable dovetailed flanged ring, so that the fire-clay mouth of the vessel may be readily taken out and renewed, by unbolting or uncottering the iron ring which retains it in place.

"In the annexed engravings; Fig. 1 is a vertical section of a Bessemer converter constructed on this plan, *a* being the upper part of the converting vessel; a^* the lining of ganister, and *b* the strong riveted iron shell or vessel on the inside of the mouth of which the iron hoop, *c*, is riveted; while *d* is a flanged iron ring beveled on the inside, and secured by screwed studs or cotter bolts to the hoop, *c*. A molded ring, *e*, of fire brick or other suitable refractory material, forms the escape opening or mouth of the vessel; it is retained in place by means of the flanged ring, *d*, and when it is worn out or damaged the ring, *e*, may be renewed by unfastening the ring, *d*; a mixture of fire clay and ganister being first smeared over those parts of the ring, *e*, which come in contact with the lining, a^*, and with the beveled interior of the ring, *d*, for the purpose of making the joint air-tight.

"The aperture in the movable mouth of the vessel thus formed may in some cases be made small enough to retain the gaseous products, resulting from the combustion of the carbon or other matter contained in the pig iron, under a pressure much above that of the surrounding atmosphere, so that the combustion going on in the converting vessel may be under "high pressure," as described in our account of Mr. Bessemer's new melting furnaces, which appeared on pages 187 and 197 of our last volume. The contraction of the mouth of the vessel would in this case be greater than is shown in Fig. 1 for the purpose of retaining the gaseous products under considerable pressure, so that the gaseous products resulting from the combustion of carbon and other matters in or among the fluid metal would be prevented from expanding freely, and by reason of the combustion so taking place under a pressure much greater than that of the external atmosphere a more intense heat would be produced and imparted to the metal.

"The amount of pressure thus obtained should vary with the heat-producing properties of the carburet of iron operated upon and the quantity of scrap or other unfused metal forming part of the charge, so that no precise rule can be laid down as to the pressure to be employed; but as a guide to the workmen, Mr. Bessemer states that for the conversion of the purer kinds of Swedish charcoal pig iron, and for mottled or white hematite pig iron mixed with gray, a back pressure in the vessel from 8 to 15 lbs. on the square inch will give good results, and in but few cases will a pressure of 20 lbs. per square inch be necessary; while a pressure as low as 3 or 4 lbs. will be of but little practical advantage, and below 2 lbs. per square inch he lays no claim to, as a useful effect. It will be understood that the pressure of the blast of air forced into the converting vessel must be increased in proportion to the back pressure caused by the penning up of the gases within the vessel.

"Mr. Bessemer, however, remarks that the mode of obtaining the required back pressure by simply diminishing the outlet, does not offer all the desired facility of regulating the pressure from time to time during the process, while at the same time the accumulation of slags in the aperture may in some cases reduce the area of outlet so much as to retard the inflow of air through the tweers. For these several reasons the opening in the mouth of the converting vessel may be made much too large, if left open to retain the gaseous matters in the converter at the high pressure desired; such larger sized mouth being provided with a conical stopper inserted in the opening, and so arranged as to be advanced or further withdrawn by being itself movable or by the motion of the vessel on its axis, the vessel being made to advance towards or recede from a fixed conical

stopper. Mr. Bessemer, however, prefers to use a movable conical stopper attached to the end of an iron rod, as shown in Fig. 1. The conical piece of fire-brick, *f*, is circular in form, and spreads outward in a curved line at f^3, for the purpose of deflecting the flame and preventing its too powerful action on the iron rod, *g*, which supports the cone, *f*. The rod, *g*, protrudes through the back wall of the converting house, or may be supported on a bracket or piece of iron framing in connexion with the standards which support the vessel, and by means of a screw or lever, the cone, *f*, is made to advance further into or recede from the mouth of the converter, thus increasing or diminishing the area of the annular opening at e^3, and regulating the pressure of the confined gases in the vessel.

"In some cases it may be found desirable to render the stopper, *f*, self-acting by applying a spring or weighted lever to press it forward against the pressure of the escaping gases, so that either by reason of its enlargement by the accretion of slags on its surface or by being partially burned away it will occuppy such a position in the mouth of the vessel throughout the process as will give a sufficiently equal amount of back pressure, and prevent that pressure from exceeding what is necessary by any partial clogging up of the escape opening; or in lieu of employing a conical stopper a flat or other shaped surface may be employed, the object in either case being to enlarge or contract the opening for the escape of flame as found desirable at different stages of the process. The pressure of the confined gaseous products is indicated by a mercurial column. This gage will allow the workmen to employ from time to time such an amount of internal pressure in the vessel as the known qualities of the material he employs may render necessary.

"When crude molten iron, or remelted pig, or refined iron is decarburized, or partially decarburized, or converted into refined iron, or into malleable iron or steel by the action of nitrate of soda or potash, or by other oxidizing salts, or when such decarburation or conversion is effected by any other processes in which the decomposition of nitrate of soda or potash, or other oxygen yielding salts alone or mixed with metallic oxides takes place in, or below the fluid metal in a converting vessel or chamber, a large amount of heat is absorbed and rendered latent, thus tending to solidify the metal and rendering it unfit for forming into ingots or castings without being remelted.

"To obviate this and raise the temperature of metal (while so treated or converted) to such a degree as to allow it to be cast into ingots or other cast articles or masses prior to its solidification, Mr. Bessemer proposes to construct the vessels in which the process is to be carried on of great strength, preferring to use stout iron or steel plates well riveted and caulked, and, if needful, further strengthened by stout hoops. The mouth of the vessel is to be made very small, Mr. Bessemer preferring for that purpose to employ a well burned fire-brick ring, into which a long taper cone of the same material is placed. The cone is fastened to a long rod working in suitable guides, so as to keep it central with the mouth of the vessel. The space between the exterior of this cone and the interior of the fire-clay ring determines the area of outlet for the gaseous products given off during the time that the decomposition of the nitrate or other oxygen yielding materials is going on, and a weight or spring lever acting on the rod to which the fire-clay cone is attached may be made to regulate the amount of pressure required to lift the cone and permit the escape of the gaseous matters.

"The arrangement of which we have just spoken is illustrated in Fig. 2, which represents a vertical section of the upper portion of a converting vessel or chamber in which molten pig or other carburet of iron is to be treated either by the injection of the fluid nitrate into the molten metal, as patented by Mr. Bessemer in March last, or in which vessel the nitrates or other oxygen yielding salts or substances are so brought in contact with the hot metal as to be decomposed. The outer shell, *h*, of the vessel or chamber is made of thick plates of iron or steel securely riveted and caulked at all joints, and capable of withstanding safely a pressure of from five to ten or more atmospheres. For the convenience of lining the vessel, the upper part may be removed by unbolting the stout flanges, h^1, and one or more hoops, h^2, are riveted to the exterior of the vessel to strengthen it. A lining of fire-brick, ganister, or other refractory material, *i*, is used to defend the outer shell from the high temperature generated within, and previous to its use for conversion, Mr. Bessemer prefers to make a fire in the interior so as to highly heat the lining and lessen its power of absorbing heat from the metal.

"On the upper part of the dome an iron ring, *m*, is riveted, to which a flanged ring, *n*, is fitted. The inside of this ring is conical, and is made to embrace the conical fire-clay ring, *p*, through which the gaseous matters evolved during the process are allowed to escape. A cone of fire-clay or of iron, *g*, is attached to the guide rod, *r*, for the purpose of closing or diminishing the area of the outlet opening in the fire-clay ring, *p*, and on the upper end of the rod, *r*, are placed weights, *s*, to regulate the pressure. The rod, *r*, is guided vertically upward and downward by passing through the tubular guides and stuffing-box formed at *t t*, on the curved exit passage, *u*, which leads to a chimney, and conveys away the gaseous products escaping from the converting chamber.

"On one side of the vessel or chamber is a projection, *v*, on the upper part of which a ring of fire-brick, *w*, is retained in place by a conical flanged iron ring, *x*. The opening in the ring, *w*, serves for the admission of the molten metal to the vessel, after which the cone, *y*, smeared with fire-clay is lowered down into the opening of the molded fire-brick, *w*, and by means of the weight, *z*, is retained in place and prevents the escape of gaseous matters during the converting process.

"The cone, *y*, and its rod and weight, *z*, are suspended by a chain in the position shown during the period of running in the metal. When the metal so run in comes in contact with the nitrate or other oxygen yielding materials large volumes of gaseous matters are evolved, these matters instead of escaping freely from the converter rapidly accumulating in the vessel until the pressure within it is sufficient to raise the cone, *g*, and escape by the small annular opening thus made, the pressure being regulated by the weight, *s*. Hence the combustion of the carbon contained in the molten iron by reason of its union with oxygen derived from the decomposition of the nitrates or other oxygen yielding materials will be effected under considerable pressure; and the gaseous products, instead of expanding freely as under the ordinary conditions of combustion, will be in a highly condensed state, by which means their temperature will be considerably raised, and the intense heat so generated will be imparted to the metal and cause it to retain its fluidity."

Correspondence.

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

Straightening Chimneys.

MESSRS. EDITORS:—I was much interested in the account in your number of March 12, of straightening the tall chimney at Barmen, Prussia. Anything relating to building and maintaining chimneys of great hight involves questions of much interest to a great many people in these days of steam and machinery; and, judging from the numerous cases reported of the deflection of such chimneys from the perpendicular, and the methods adopted to straighten them, there is a want of more and better information on the subject.

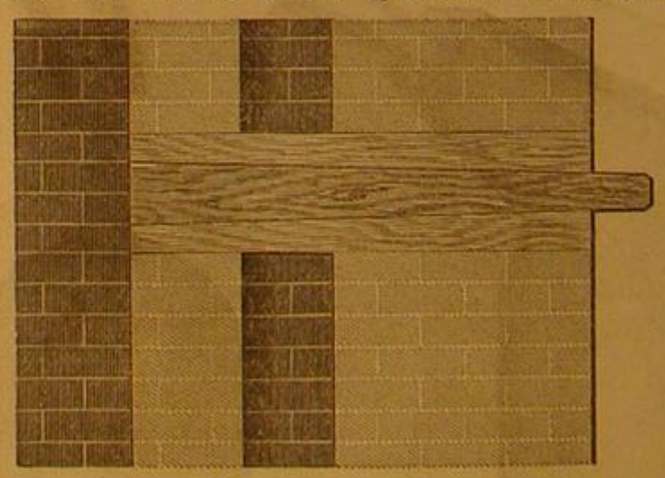
In reading the account above mentioned, I did not see any allusion to what is an indispensable part of all chimneys of that kind, namely, the inner chimney, or core. If that was absent, that fact alone would account for the deflection of the chimney.

Probably few outside of the trade are aware that the tall chimneys that surround us in cities and manufacturing towns are each composed of two separate and distinct chimneys, one inside the other. The inner one to conduct away the smoke, heat, and gases, and the outer one to support the inner one, and protect it from the weather. The reason is that if the outer chimney were subjected on the inside to heat more or less intense, and on the outside to the ordinary variations of temperature, the unequal expansion and contraction of the outside and inside of the same wall would soon cause its disintegration.

An interesting illustration of this principle was seen some years ago in this city, where a chimney was built with the core carried up inside, detached from the outer chimney, as it should be, until it reached the top, where, instead of dropping the inner chimney, and forming the coving, or crown, with the outer chimney, leaving the inner one free to expand or contract, they were connected with each other and built up together. The consequence was that when the fires were started and the inner chimney was subjected to heat, its expansion caused it to lift the whole crown up clear off the outer chimney, causing a horizontal fracture 3 or 4 inches in hight.

In regard to the Barmen chimney before mentioned, I would say that I consider the method adopted to straighten it as most unworkmanlike and dangerous, and I am not at all surprised that the chimney should vibrate to the extent that it did during the operation, or that the masons should "get frightened and leave the place."

I would suggest a much better plan than that of sawing out the joints. Have a number of oak wedges made of length sufficient to pass through the entire thickness of the chimney, and project sufficiently on the outside. Place them in sets of three each, one over the other, thus,



having the surfaces in contact straight and smooth, and blackleaded to diminish friction. Commence on the opposite side to that in which the chimney leans, cut through to the inside, insert one set of wedges, and wedge above and under them until they take a bearing. Repeat the process around the chimney, except on the lowest side, leaving spaces of a foot or more between each set of wedges. Then by driving the center wedge in each set inwards, as much of the chimney as rests on them is gradually lowered just at the places and to the amount required to bring it to an exact perpendicular. When that is done, brick up the intervening spaces, loosen and withdraw the wedges, and brick up in their places.

In conclusion I would say that my experience in that kind of work leads me to believe that sufficient care in planning and executing constructions of this kind is not always taken; and when a chimney like that at the Charlestown Navy Yard, in the building of which expense was a secondary consideration, swerves from the perpendicular, to the extent that it does, to say nothing of the large number of others that give trouble in many ways, it behooves those whose business requires tall chimneys, to look well to the construction thereof.

Boston, Mass. CHAS. A. FOX.

Matter and Motion.

MESSRS. EDITORS:—In your article on page 175, in reply to Mr. Blake, you quote from four writers, to show that the term inertia is not always used to mean the same thing; when, if I can understand them, they agree as to the definition of the word, though one of them denies the fact of which it is the expression.

Certainly it is to be expected that new discoveries in science will work some changes in our ideas of things, but it does seem a little startling to say that the idea of the inertness of matter is obsolete; for is it not a principle of philosophy that a conception the negation of which is inconceivable must be true?

Then with respect to such motions as are imparted to matter, is it conceivable that it moves itself? If not, what else can it be but inert?

But suppose it under some circumstances to move itself; how is it done but by the exertion of force? And are not the force and the resulting motion commensurate? Then it follows (why not?) that force and motion are correlative, and that a given force produces a commensurate motion and no more; because inertia is opposed to it, and an equivalent of inertia is exchanged for an equivalent of motion. Except for this plain and easily understood principle, what would prevent an infinite motion from ever so small a force?

So it appears to me that the argument of Mr. Nichols and your own from molecular motion to the denial of inertia is a pure *non sequitur*, as it does not seem to alter the case at all, to say that matter moves itself.

The absurdity of the alternative to which the denial of inertia forces you, namely, that it is a natural property of matter that it moves itself about from place to place, is too absurd not to be remarked.

As to the idea that matter does either as molecules or masses move itself, I simply wait for the proofs, which when they come will undoubtedly astonish the apostles of the new philosophy, as well as every body else.

S. H. WILDER.

Deep River, Ct.

[Our correspondent must not put his own language into other people's mouths. No one has to our knowledge said that "matter moves itself," any more than they have said "matter forms itself; matter extends itself; matter makes itself to be impenetrable." What those who deny the state of rest in matter, say, is simply that matter constantly moves; and that under certain conditions, the motion of portions of matter decreases simultaneously with increase of motion in other portions; the increase and decrease being equal in all cases. It is believed by many that motion is an essential property of matter, as much as extension; in fact, that the so-called essential properties of matter, are merely concomitants of motion; that matter and motion are coexistent, and that neither can be recognized by the human intelligence without the other.—EDS.

Relative Cost of Hoosac and Mt. Cenis Tunnels.

MESSRS. EDITORS:—Your recent article upon the Hoosac Tunnel, I think conveyed a wrong impression as to the relative cost of the Mt. Cenis tunnel and the Hoosac. You place the cost at Mt. Cenis at $1,500,000 per mile, and at Hoosac $1,900,000 per mile. By reference to Buffum's "Sights in France," etc., you will see that the cost of the Mt. Cenis tunnel is to be $26,000,000, of which France pays $20,000,000 and Italy $6,000,000, making the cost per mile over $3,335,000. The American engineers claim that their drilling machinery is of much superior construction, enabling them to do the work quicker and cheaper, and there appears to be truth in this assertion. For example, in the book referred to, it is stated that the drills are used up pretty fast at Mt. Cenis, and that 2,000 drills will be broken up before the work is done; but at Hoosac it is stated that not more than 50 of the Burleigh drills have been employed, all told: all are still good, although some of them have been in use for over 3½ years B.

Spontaneous Combustion of Oil Scrapings.

MESSRS. EDITORS:—On reading the article on Spontaneous Combustion, published in Vol. XXII., page 121, SCIENTIFIC AMERICAN, it instantly reminded me of what I myself saw about two years since. I was then engaged as foreman for a manufacturer of oil silk. In this process the belts of silk when dipped in the oil are hung upon hooks and part of the dripping oil falls to the floor. In the course of a few months the accumulation upon the floor is considerable. In the instance alluded to the proprietor ordered me to scrape the floor and put the scrapings in barrels and place them in a certain corner of the room up stairs. I refused to do it, explaining to him the danger of combustion, but my argument was ridiculed, and the scrapings were collected by the proprietor himself in three barrels and placed as described. They remained there but two days, and on the morning of the third I entered the rooms about six o'clock, A. M., and noticed a dense blue smoke. Feeling positive that the gas could not have produced it, I at once searched for the cause, and soon found it. I at once seized the nearest barrel which blazed from the bottom in a most terrific manner, and notwithstanding the intense heat, I succeeded in removing it out of the building. On returning I found it had set fire to the floor plank, an inch and a quarter thick. This extinguished, I drew away the second barrel, which also burst into

blaze from the bottom as soon as moved. The same result took place with the third, so that only for my timely entrance I feel certain the flames would have caused a loss of $30,000.

The above I submit as a warning to all engaged in the manufacture of such goods to place the scrapings from the floor where they can have free access to open air.

GARRET W. ANDERSON.

Peekskill, N. Y.

Effect of Compressibility on Buoyancy.

MESSRS. EDITORS:—I have read the following answer in the column devoted to correspondents, No. 10, current volume: "Any solid substance which will begin to sink in water, will sink, if unobstructed, to the bottom. The reason is this. Any solid now known, is more compressible than water; compressing it increases its specific gravity and renders it less buoyant than before the pressure was put upon it. As it goes down then, its tendency to sink is increased rather than diminished." I have found the assertion contradictory to the established figures of recent experiments relating to the compressibility of liquid and solid substances; the coefficient of compressibility of water is about fifty-millionths for each atmospheric pressure, while that of mercury is but three millionths. Solid substances are far less compressible than liquid ones; so the coefficient of compressibility of iron is 0·5 millionth only, for the same pressure; this being deducted from its coefficient of elasticity demonstrated by M. Wertheim to be exactly equal; the formula has been adopted by M. Grassi for the correction of observed compressibility in piezometer.

This being admitted, the specific gravity of water will be increased more rapidly in comparison with the iron, when submitted to the same pressure and at the ratio of one hundred to one.

Describing by d, the difference of specific gravity between water and any heavier solid substance; by c, the coefficient of compressibility of water; and by $\acute{c}$, that of the solid; the value of required condensation of water, expressed by x, to counterbalance the specific gravity of the heavier body, can be found by the following equation: $x = \frac{dc}{c - \acute{c}}$

Applying the formula to iron (specific gravity 7·8), the water to be equalized with its specific gravity put in the same condition of pressure, its primitive volume must be diminished 7·8787 times; that means, a compression equal to 157,574 atmospheric pressures, to a water column equal to one-fourth the terrestrial radius; passing this limit, the iron will float on the stratum.

This manner of calculation supposes that the coefficients of compressibility preserve their proportional value at this enormous pressure, which is not determined; but at all events, it demonstrates sufficiently that the tendency to sink will be diminished rather than increased, as the solid substance goes down in the water. M. W. BEYLIKZY.

New York.

Absorption of Oxygen by Charcoal.

MESSRS. EDITORS:—On page 189, current volume, an inquiry is stated by a correspondent, "Is there not in the property of charcoal to absorb oxygen a source of cheap extraction of this gas from the air?"

Two French chemists, MM. Laire and Montmagnon have been making experiments in this direction, and find that 100 measures of wood charcoal, freshly burnt, absorb 985 of oxygen and only about 705 of nitrogen. They proposed to pump out the oxygen and nitrogen from the charcoal and pass it over fresh coal, and re-pump it until the greater part of the nitrogen was eliminated and tolerably pure oxygen remained.

The direction in which experimenters should work is to find some substance, charcoal, membrane, etc., that will filter out the nitrogen and permit the oxygen to pass.

The late Mr. Graham came near the accomplishment of this result by using shavings of india-rubber, but the details of his process are wanting. Oxygen and nitrogen are so different in their properties that we ought to discover an easy way of separating them. J.

New York city.

Machinery Wanted at the South.

MESSRS. EDITORS:—I perceive you have noticed our annual State Fair that is to take place, commencing on the 23d of April.

I thought to drop you a memorandum of what is needed in our State, so that inventors throughout the United States could see what we most needed, and have their articles on hand.

Cart or wagon wheels of new pattern; force pumps to supply great bodies of water to our sugar houses; horse-power brick machines are much wanted—those that require that the bricks should be least exposed to the sun preferred. Every kind of new patent boilers for fuel is an object with us now; also knitting machines of all kinds; saw mills of all kinds, with new patent head blocks; cross-cut saws that will saw a tree up into fire wood where it falls, and a machine to split the wood. M. SCHLAHE, JR.

Plaquemine, Parish of Iberville, La.

Wear of Locomotive Wheel Tires.

MESSRS. EDITORS:—During the last few years I have been engaged in turning locomotive tires, and I have noticed that almost invariably the tires on the forward driving wheels were worn from $\frac{1}{32}$ to $\frac{3}{32}$ of an inch smaller than those on the back wheels.

The instances noted were from locomotives with four driving wheels and the ordinary four-wheeled truck in front. Can you or some of your readers give a reason for this excess of wear on the forward driving wheels of locomotives?

Clinton, Iowa. HIRAM R. JONES.

Dangerous Stoves.

MESSRS EDITORS:—In your issue of March 12, there is an article headed "Dangerous Stoves," I therefore take the liberty to inform the writer and your numerous readers that, in my estimation, feet or legs to a stove are a superfluous nuisance. In selecting my stove, I took particular notice it had a large base that dipped down well below the bottom on which the fire rests; I then made a frame of wood just to fit under the stove, and covered it with zinc. I then placed the stove upon this platform, minus legs and feet, in two or three inches deep of ashes, and built a fire, and have feared no danger from fire or the stove falling down. I manage to heat four rooms with one stove in the following manner: In the ceiling of the living room over where the stove sits (for it don't stand) there is a ventilating thimble which allows heat to pass into a chamber sufficient to warm it and make it comfortable in all kinds of weather. The stovepipe passes through a side wall into a "drum," [which heats a bed-room, then up through the ceiling into another room to heat a chamber bed-room, thence into the chimney.

Now for the results; the heat is all expended in the house just where it is most needed, and the wood consumed is no more than is commonly used to warm one room. I would say that my stove is soap stone No. 2, and does not get cold from the time the fire is lighted up in the fall till it is taken down in the spring. JNO. T. SMITH.

Cedar Rapids, Iowa.

Dangerous Stoves.

MESSRS. EDITORS:—I see an article on page 173, present volume of your paper, headed "Dangerous Stoves," made so by the legs falling out, and the stoves falling down.

A similar accident took place a number of years since with my stove, nearly killing a small child. A neighbor met with a similar accident in which a kettle of boiling water was precipitated on a child, scalding it to death.

To prevent a like occurrence, we procured a half-inch drill, drilled a hole through the bottom plate of the stove and legs, counter sunk the hole in the plate to prevent the head of the bolt to be placed in it, from rising above the plate; the bolt extending through the legs to receive a nut which was screwed up tight, holding the plate and legs firmly together, all was quickly and cheaply done; since then, when we buy a new stove, the first thing done is to fasten the legs in this manner. The expense and time required to do this are so small that all stove makers and menders should be compelled to make preparation to have their stove legs so fastened before sold.

E. G. PATTER.

Bellevue, Iowa.

An Error Corrected.

"It is said a new description of lava is being thrown from the crater of Vesuvius since the last eruption, consisting of crystallized salt. This beautiful phenomenon has hitherto been unknown in volcano natural history. The scientific bodies are engaged in investigating."

MESSRS. EDITORS:—I clipped the above from the New York *Christian Leader* of Jan. 1st. I first saw it in that paper, and on the 8th of January it made its appearance in the SCIENTIFIC AMERICAN, with the exception of the last brief sentence of six words. I am of the opinion it is time it was corrected. If corrected in time, I am in hopes those investigators alluded to, will not hazard their precious lives by penetrating into the bowels of Vesuvius on a salt-exploring expedition, until they have read Humboldt's Cosmos, Vol. V., page 413. It is:

"Common salt is from time to time found as products of sublimation, even in lava streams on Hecla, Vesuvius, and Etna, in the volcanic chain of Guatemala (volcano of Izalco), and above all in Asia, in the volcanic chain of the Thian-shan. MRS. GEORGE HENRIUP.

Geneva, N. Y.

Lacquer.

No. 1.—Shellac, 120 parts; sandarach, 45 parts; mastic, 30 parts; amber, 30 parts; black resin, 90 parts; dragons' blood; 30 parts; turmeric and gamboge, each 24 parts; rectified spirit, 1,000 parts. Digest until dissolved; then strain. No. 2.—Seedlac, 120 parts; sandarach, 120 parts; dragons' blood, 16 parts; gamboge, 2 parts; turmeric, 2 parts; Venice turpentine, 50 parts; clean sand, 150 parts; rectified spirit, 1,000 parts. Digest in a sand bath, and strain. No. 3.—Seedlac, gamboge, and dragons' blood, each 120 parts; saffron, 30 parts; rectified spirit, 1,000 parts. Digest with heat, and strain. No. 4.—Seedlac and sandarach, each 120 parts; dragons' blood, 15 parts; turmeric, 2 parts; gamboge 2 parts; Venice turpentine, 60 parts; spirit of turpentine, 1,000 parts. Digest with heat and strain. Aloes is sometimes used to give it a dark color.

ADHESION OF AIR TO GLASS.—M. Auguste Houzsau has called the attention of the French Academy to the presence of nitrogen in what was supposed to be pure oxygen. He shows that it is extremely difficult to get rid of the film of air adhering to glass vessels, even after considerable "sweeping" with currents of oxygen, or other gas. In his experiments on the production of ozone by the electric shock, he found it necessary to make the narrow tubes he employed red hot, and while they were in that state to pass oxygen currents through them

New Blue Pigment.

The new pigment is obtained in the following way, according to the directions of M. Tessié du Motay, and can be easily prepared in a few days. Take of tungstate of soda, ten parts; tin salt—protochloride of tin, eight parts; yellow prussiate of potash, five parts; prechloride of iron, one part. Dissolve these substances separately in as small a quantity of water as possible. Mix the solution of the tin salt with that of the tungstate of soda, and the solution of the perchloride of iron with that of yellow prussiate of potash.

The two mixtures so produced are then to be added to each other, the whole thoroughly shaken, and allowed to stand for some hours. The precipitate produced in this way is caught on a filter, and then when slightly washed and drained, is spread on earthenware plates and exposed to the sunlight for a day or two. The precipitate, at first an undecided blue, gradually assumes a more marked shade. After a day's exposure to light the substance is powdered and washed on a filter with water, so as to free it from soluble matters. It is again spread out and exposed to light for several days longer, until a pure blue tint is developed. It is again powdered and preserved for use.

The new blue is of a beautiful tint, resembling the variety of Prussian blue, called "Berlin blue," but it possesses more "body" than the latter.

In order that our readers may be able to judge of the value of this substance we give M. Tessié du Motay's analysis of it. He finds that it contains in one hundred parts—

Moisture	7·85
Tin	31·69
Iron	5·42
Cyanogen	19·44
Blue oxide of tungsten,	35·60
	100·00

It is evidently a mixture of the finer variety of Prussian blue with the remarkable blue oxide of tungsten.

So far for the composition of the new pigment: its properties may now claim our attention. It is believed to be quite unalterable by light, because it is produced by the same agency; and M. Tessié du Motay remarks that it is illogical to suppose that the power which has produced the new blue will also destroy it. So far as the logic is concerned we think that little importance need be attached to such an argument, as there is no good reason why the action of light should not go on to destruction of the color; but we are rather inclined to think that preservation of the pigment in darkness would be very likely to destroy the color of the blue oxide of tungsten, as it has a considerable tendency to pass by oxidation into tungstic acid or anhydride—a greenish-yellow substance; but the presence of the Prussian blue is, to a certain extent, a safeguard against this danger.

It is well known that ordinary Prussian blue is easily bleached by an alkali, as our readers are no doubt aware that it is not very unusual for grocers to write on their blue papers in which they usually make up tea with a weak solution of caustic potash; wherever the colorless liquid comes in contact with the blue liquid, the Prussian blue used in preparing the paper is bleached, the letters or figures then appearing as white on a blue ground. The new pigment is but slightly altered by similar treatment, as the oxide of tungsten is unaffected by alkalies.

Again; the beautiful ultramarine blue so largely used in painting is unchanged by treatment with an alkali, but very readily decomposed and the color destroyed by very weak acids, though the latter have no effect on Prussian blue. M. Tessié du Motay's new pigment resists this treatment like wise, so that, while possessing a shade of color intermediate between ultramarine and Berlin blue, it resists the reagents which destroy the two other pigments.

It is only necessary to add that tungstate of soda can be manufactured in large quantities and at a very low rate, since a mineral of tungsten, called "wolfram"—tungstate of iron and manganese—occurs in considerable quantities in Cornwall accompanying the ores or tin. This wolfram is a nuisance to the Cornish miner, who would be glad to find a good market for it; and therefore, since all the other materials, including solar light, are cheap, the "photographic blue" bids fair to attract some attention—more especially since it is less likely to be injured by the prolonged action of light than other blue pigments.—*British Journal of Photography.*

AT a recent meeting of the Paris Academy of Sciences, M. Feil exhibited specimens of flint glass of great density (Faraday's glass) obtained by a new process, enabling masses of this material to be manufactured, weighing from 25 to 35 kilos., perfectly pure, homogeneous, and free from striæ, and of a density equal to, and even greater than that of Faraday's. He also showed specimens of imitation precious stones, such as emeralds, sapphires, and white and colored rubies, as well as a specimen of a deep violet blue, rich in tone, and of a brilliancy surpassing that of the finest amethysts. They are stated to be nearly equal in hardness also. The author, in his communication, states that he uses for the flint glass aluminates of lime, of lime and baryta, of lead, and of bismuth, etc., and for crown glass, aluminates of magnesia, silicates of magnesia, and of alumina.

MIXTURE FOR CLEANING FURNITURE.—Cold-drawn linseed oil, 1 quart; gin, or spirit of wine, half a pint; vinegar, half a pint; butter of antimony, 2 ounces; spirit of turpentine, half a pint. N. B. This mixture requires to be well shaken before it is used. A little of it is then to be poured upon a rubber, which must be well applied to the surface of the furniture; several applications will be necessary for new furniture, or for such as had previously been French polished or rubbed with beeswax.

Improved Apparatus for Measuring Liquids.

A means whereby the measurement of liquids could be accurately accomplished without the use of sets of measures into which various liquids must be drawn, has long been a desideratum. The possibility of drawing the required quantity with rigid exactness, directly into the vessel designed for its transportation, is something much to be desired, both as a matter of convenience and of cleanliness. In the case of inflammable liquids, such measurement is also desirable on the score of safety, since the near approach of any artificial light is not necessary.

With the apparatus herewith illustrated, liquids may be accurately measured in drawing, when there is light enough to place the receiving vessel properly; and the annoyances and inconveniences attendant upon the use of portable measures are wholly avoided.

The operation of the apparatus will be at once understood by inspecting the engravings; Figs. 1 representing the complete device, and Fig. 2 showing the same in vertical section.

In these engravings, A represents the outer case, divided into an upper and lower chamber by a diaphragm, B; any convenient quantity of liquid being poured into the upper chamber through the opening at C. It is drawn when wanted through the strainer, D, and subsequently through the measuring chambers, E F G H, and through the tube, I, out through the faucet into the vessel destined to receive it; the dotted line showing the course of the fluid from its entrance to its exit from the apparatus. The chambers, E, F, G, H, and the tube, I, hold, together, one gallon in this instance; but they may be made to hold any quantity desired. The chamber, E, holds half a gallon; the chamber, F, one quart; the chamber, G, one pint; the chamber, H, a half pint, and the tube, I, also one half pint. The measurement of these chambers and the tube, I, are adjusted to accuracy by screw spindles, L.

The upper chamber of the apparatus and the measuring chambers, E,F,G,H, and I, communicate with each other only when valves actuated by the rods, K, are raised. The rods, K, are inclosed by vertical tubes, which ascend to the top of the case; and vent tubes (not shown in the engraving) are also supplied to each measuring chamber so that the flow may be rapid.

The valve rods, K, are held up by springs, so that, when it is not desired to draw any liquid, the chambers all communicate; and of course the measuring chambers will instantly fill and keep full so long as one gallon remains in the upper chamber. The state of the liquid in the upper chamber may be indicated by any suitable form of gage. Thumb knobs at the top of the rods are arranged as shown, and marked one gallon, half gallon, one quart, one pint, and half pint. The thumb knobs engage in the horizontal portion of the slots in which they slide, by a slight rotary movement, so that any valve once closed will remain closed until the knob is released.

If it be desired to have a half pint of the liquid, the knob so marked is depressed. This closes the valve corresponding to the knob, and all flow from chambers above the pipe, I, is cut off. Upon opening the faucet, only the contents of the pipe, I, will be discharged; that is, a half pint. If one pint is desired the knob corresponding to that measure is depressed, and so on for all intermediate measures up to the full measuring capacity of the apparatus.

Each of the several chambers has an inclined false bottom, so that full delivery of its contents is secured, and the chambers are reached for regulating and sealing through doors shown in Fig. 1.

The apparatus may be applied to the filling of barrels, a large size being made for that purpose, and is capable of extension to all wholesale and retail measuring. It may also be connected to liquor casks and applied to milk cans, for which it seems particularly suited, as the measures can be made so as to be readily reached to scald and clean them.

Patented by Martin McDevitt, of Hampton, Va. For further particulars, or for State, county, and town rights, address McDevitt & Woodward, Hampton, Va.

Fig. 1

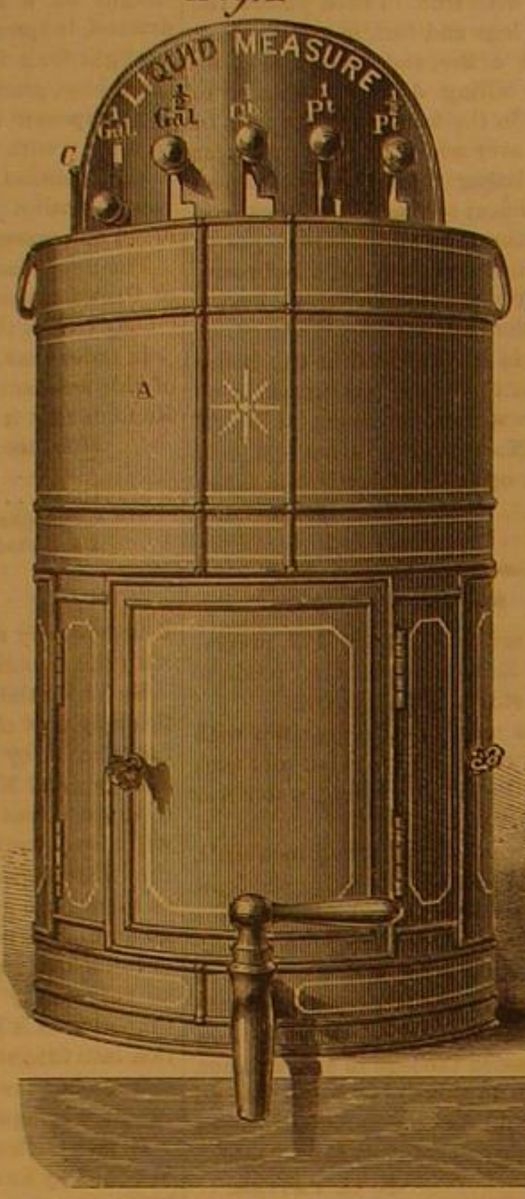
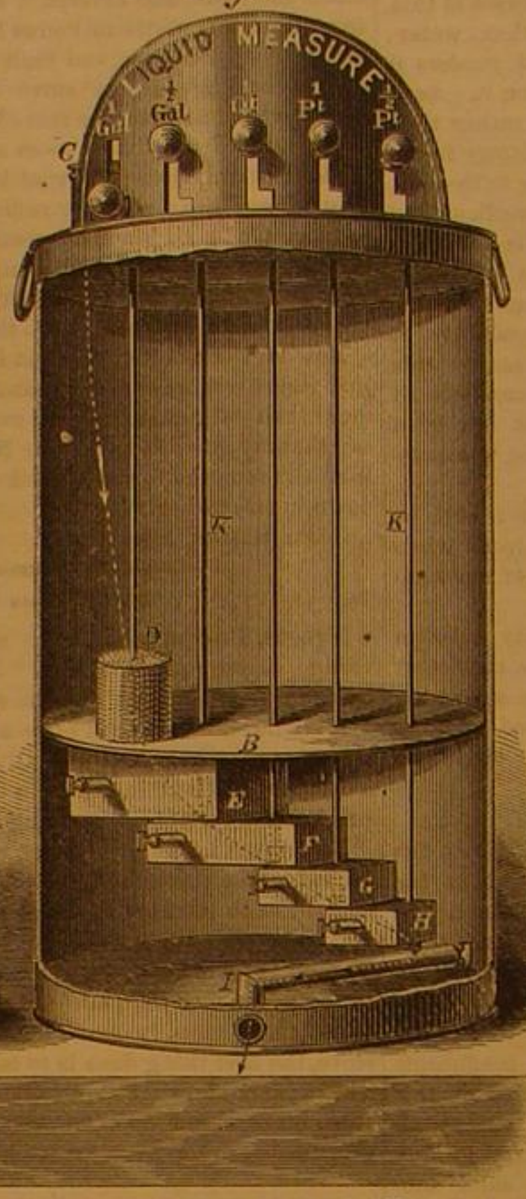


Fig. 2



LIQUID MEASURING APPARATUS AND STORE CAN.

The Fire at Hoosick Falls.

The Troy *Times* gives the particulars of the fire on Sunday in the village of Hoosick Falls, by which all of the works of the Walter A. Wood Mowing Machine Company on the north side of the Hoosac river were totally destroyed, excepting one large storehouse. The fire broke out in the main building connected with the works, the machine shop, and destroyed that edifice, the carpenter shop, the blacksmith shop, one storehouse, the office, the foundery, a building in which castings were cleaned, and five tenement houses, occupied by the families of seven of the operatives of the company. The patterns of the company were not injured—the men employed at the works rushing into the pattern shop and removing them at the risk of their lives. The loss is upward of $400,000; and upon it there is an insurance of $245,000, in nearly fifty different companies.

The buildings on the south side of the river were uninjured. These consist mostly of the Caledonian Mills (formerly the Merritt property), and will be kept running as formerly. Immediately upon the extent of the calamity being determined, Mr. Wood gave orders for the erection of new works, the plans were prepared, and to-day a large force of men is engaged constructing the new shops. It is believed the new foundery will be in operation soon—the cupola of the old one being available for use immediately.

In 1859, also, the works were destroyed by fire. Mr. Wood then set himself with his accustomed energy to the task of rebuilding them, and in two weeks they were in operation.

Previous to the late fire the company were turning out one hundred and fifteen machines per day, and within a week it is thought arrangements will be made by which at least fifty per day will be manufactured. Four thousand complete mowing machines were stored in the storehouse which was not burned, and these will be sufficient to enable the company to keep up with their orders.

Galmann and Ruhe's Improved Joist Protector.

It is well known that the ends of joists placed in walls, particularly in lower floors, are in the ordinary way, exposed to dampness, and consequent decay. In the device we herewith illustrate, we think, an adequate remedy for this has been found.

Fig. 2

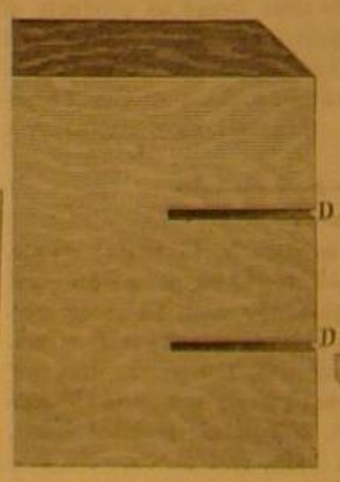
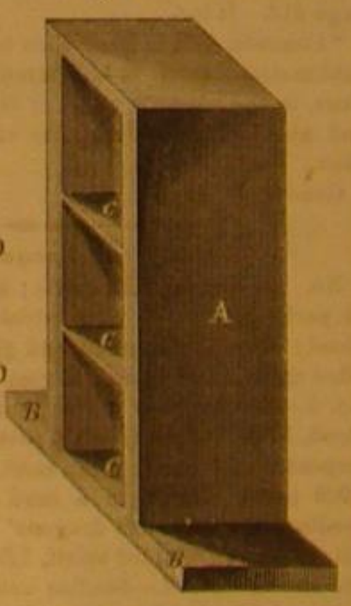


Fig. 1



It is simply a box support or protector, of cast iron, made in the form shown in Fig. 1, A being the side walls of the box, C horizontal partitions, and B a bottom flange or base.

In inserting the joist, slots, D, are sawn in the end, into which the partitions, C, enter when the joist is placed in its proper position. This gives a greater number of bearings.

We think this device, simple as it appears to be, is a very practical and useful one, and have no doubt it will meet with with favor from architects and builders.

Patented, through the Scientific American Patent Agency, Feb. 1, 1870, by H. Galmann and Charles Ruhe, of Buchanan, Pa. Address as above for further information.

It is thought the Mont Cenis tunnel will be completed about the end of January, 1871.

Obituary--Seth Boyden.

We regret to record the death of Mr. Seth Boyden, who, at the time of his death, was one of the oldest, as he had been in his life one of the most prolific, inventors this country has produced. Mr. Boyden invented and commenced the manufacture of patent leather at Newark, N. J., in 1819, having taken up his residence in that city in 1815. He invented a brad machine, in 1816, which largely reduced the cost of manufacturing brads. In 1826 he made the first specimens of malleable castings, and continued in their manufacture till 1831. About this period he devised the first locomotive with outside connecting rods. He also devised a cut-off, and was of much assistance to Professor Morse in working out the details of electric telegraphy. It is said that he produced the first daguerreotype ever taken in this country. He also, in 1849, succeeded in making spelter, and laid the foundation for such success as zinc mining has attained in this country. He subsequently succeeded in imitating Russian sheet-iron, but at a cost which would not admit of competition with the foreign article. One of the latest of his inventions was a machine for making hat bodies, which has gone into general use.

The last time we met Mr. Boyden was about a year since, in a hat-manufacturing establishment in Newark, where his machines were employed. We found him in the office reading proof sheets of a paper upon some subject connected with electricity. Age and the ordinary cares and pains which accompany it, seemed entirely forgotten in his enthusiasm for science; for Mr. Boyden, though a practical man, was one of those scientifically practical men whose zeal is directed by knowledge. Perhaps no man of his time has done more to promote the industrial arts in this country than Mr. Boyden, who, though his inventions have been mines of gold to others, lived a poor man, and died at the age of 82 a poor man, in all except the respect and honor which reward a good life.

Length of Journals.

Another consideration of considerable importance to the smooth and safe working of shafting is the length of the journals. From a number of years' experience I have been led to believe, that with cast iron, one and a half times the diameter of the shaft is the best proportion for the length of the bearing, and with wrought iron, one and three quarters the diameter.

On the question of shafts revolving in the steps of plummer blocks and the proportions necessary to effect motion without danger of heating, it is essential (without entering largely into the laws of friction on bodies in contact) that we should ascertain from actual practice and long-tried experience the best form of journals of shafts adapted for that purpose. The lengths proportionate to the diameters have already been given, but we have yet to consider the dimensions of the journals of large shafts where they are small in comparison with the pressure or the weight they have to sustain. Let us, for example, take a fly-wheel shaft and the foot or toe of a line of vertical shaft extending to a hight of six or seven stories in a mill filled with machinery, and we have the safe working pressure per square inch as indicated in the last column in the following table:

DESCRIPTION OF SHAFT.	Length and diameter of shaft in inches.	No. of square inches in bearing.	Weight on bearing in lbs.	Weight in lbs. per square inch on bearing.
Fly-wheel shaft, wrought iron	18 x 14	282	45,024	178·21
Vertical shaft, cast iron	" x 11	95	23,081	242·79
Horizontal shaft, cast iron	15 x 10	150	6,000	40·00
Horizontal shaft, wrought iron	6 x 3	18	540	30·00
" "	2 x 4	8	160	20·00

From the above it will be seen that in fly-wheel shafts the pressure should never exceed 180 lbs. per square inch, and in that of the toes of vertical shafts 240 lbs. per square inch. Even with this latter pressure it is difficult to keep the shafts cool, and it requires the greatest possible care to keep them free from dust or any minute particles of sand or other sharp substances getting into the steps. The feet of vertical shafts also require the very best quality of gun metal for the shaft to run in, and fine limpid oil for lubrication to prevent the toe from cutting. It is, moreover, necessary for the shaft to fit well on the bottom of the step, and not too tight on the sides, and to have a fine polish.

Another point for consideration is the proper form of the journals of shafts, and that is, they should never have the journal turned or cut square down to the diameter.

From a series of interesting experiments it has been shown that the square-cut shaft loses nearly one fifth of its strength, and by simply curving out the shaft at the collars of the bearing, the resistance to strain is increased one fifth.—*Fairbairn's Principles of Mechanism.*

The North German Ocean Observatory last year concluded an important examination of the courses followed by steamships between the Lizard and New York, to discover by what route a steamship can accomplish the distance between the two points in question, at various seasons of the year, in the shortest time.

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Contents:

(Illustrated articles are marked with an asterisk.)

Mr. Bessemer's Conservatory.....231
An Interesting Sketch of the Distinguished Aeronaut, John La Mountain.....232
Mineral Deposits.....232
Bells and Bell Towers.....233
*Hill's Lock Whip Socket.....234
Our Moscow Exchanges.....234
The Perforated Implements of the Stone Period.....234
*Hamilton's Water Elevator.....234
Purification of Water from Smoke Impurities.....234
*Dean's Improved Grid Iron and Cake Baker.....234
*The Bitricycle, a French Invention.....235
The Bessemer Process under Pressure.....235
*Straightening Chimneys.....236
Matter and Motion.....236
Relative cost of Hoosac and Mt. Cenis Tunnels.....236
Spontaneous Combustion of Oil Scrapings.....236
Effect of Compressibility on Buoyancy.....237
Absorption of Oxygen by Charcoal.....237
Machinery Wanted at the South.....237
Wear of Locomotive Tires.....237
Dangerous Stoves.....237
An Error Corrected.....237
Lacquer.....237
Dangerous Stoves.....237
New Blue Pigment.....237
*Improved Apparatus for Measuring Liquids.....238
The Fire at Hoosick Falls.....238
*Gallmann & Ruhe's Improved Joist Projector.....238
Obituary—Seth Boyden.....238
Length of Journals.....238
Glazed Bricks for Building Purposes.....239
Dualin—What is claimed for it.....239
Nature's Elevator.....239
The Measurement of Water Power.....239
Michael Faraday.....240
Magnetic Iron Sands of Canada.....240
Hoisting Stone in Quarries.....241
Pyrometers.....241
Prize Offered for a Machine so separate Rhea or China Grass Fiber.....241
Answers to Correspondents.....242
Recent American and Foreign Patents.....242
List of Patents.....243
Applications for the Extension of Patents.....243
Inventions Patented in England by Americans.....244

GLAZED BRICKS FOR BUILDING PURPOSES.

An article on the "Materials for Economic Building" which appeared in the London *Builder* of Feb. 5, contained a suggestion that for interior walls, and indeed for surfaces exposed to weather, one end and one side of the bricks should be covered with a vitreous glaze.

The suggestion is, in our opinion, an excellent one, and worthy earnest consideration. Not only might increased durability be thus secured without the use of paint, but ornamental effects of the highest order might easily be obtained.

The article in the *Builder* has called forth an interesting correspondence upon the subject, from which it appears that the plan proposed by that journal, namely, the glazing of walls after their construction, by the use of a heated iron plate to fuse the coating of glazing material previously applied, has in it many elements of impracticability.

It is argued that difficulty would be experienced in laying on the glazing material with a brush, where colors had been previously employed for ornamentation, without at the same time disturbing the colors; and that if a glaze sufficiently hard to resist the action of the weather be used it would be impossible to fuse it in the manner proposed. A better way would be to lay the glazing material upon half burned bricks, and complete the burning in a muffled kiln; that is, a kiln with a lining of thin fire-clay, to protect the surfaces of the bricks from dust.

The half-burnt bricks will take color well when it is desired to ornament them. In this case it is suggested that the half-burnt bricks be laid in a wall in the position they are to occupy when put in buildings, and the design painted upon them, after which they are to be taken down and burned as above stated.

It is thought that in this way impervious walls of a highly decorative order might be obtained, and we fail to see any impracticability in the plan. In fact, one of the correspondents of the *Builder* states that he has glazed several common bricks, in imitation of the old Assyrian and Babylonian bricks to be seen in the Museum of Geology, in Jermyn street, London, with perfect success; not only making the bricks non-absorbent, but imitating the colors of the ancient specimens referred to. He also states that he has had perfect success in painting designs and burning them in, and that he is convinced common bricks can be thus glazed at a moderate cost. He also has succeeded in glazing bricks and retaining their bright red color, and states that the bricks thus produced would make highly ornamental interior walls, without the use of plaster, paper, or paint.

A great collateral advantage in the use of such bricks for outside walls, aside from the fact that they need not be painted to render them impervious, is, that their surfaces would be cleaned by every fall of rain, and would therefore always look fresh and bright.

There is no doubt that the prevailing monotony of bricks and mortar, which now pervades many of our American cities, might be greatly enlivened and relieved by the introduction of glazed and ornamented bricks for fronts. What architect will be the first to carry out the idea in this country?

DUALIN---WHAT IS CLAIMED FOR IT.

We are in receipt of a letter from Mr. Carl Dittmar, the inventor of dualin, who, while admitting the spirit of fairness shown in our recent article upon this explosive, sets forth its claims more fully than we were able to do at the time that article was written. We gathered our information from various sources, which we supposed to be reliable, yet Mr. Dittmar states that our showing does not do full justice to the merits of his invention.

While we have not room to publish Mr. Dittmar's communication at length, we will give the substance of it in the present article, and will add that there can be no doubt that if these claims are established, a valuable addition to the list of explosive agents has been made. The inventor expresses his willingness to submit his powder to any and all proper tests and to rest the validity of his claims upon the results.

He claims that dualin is safer than common powder, fully as strong as nitro-glycerin, and cheaper in its application than either, and he asserts that the use of the preparation in Central Europe has proved these claims to be valid.

What will, perhaps, take our readers most by surprise, is the fact that Mr. Dittmar claims to have been the original inventor of dynamite. He says:

"Mr. Alfred Nobel has patented this invention, he has even disposed of the patent right he held for it in this country, yet he is by no means the inventor of dynamite, which I did invent and bring first to Mr. Nobel's notice. I held at that time the position of technical director of the first nitro-glycerin manufactory which Mr. Nobel had ever established in Germany."

It seems strange that Mr. Nobel should have been so universally acknowledged as the inventor of dynamite, or giant powder, if the statements of Mr. Dittmar are correct. Upon the merits of this part of the subject, we cannot, of course, pretend to decide; but we have no doubt Mr. Dittmar is amply qualified to judge of the advantages as well as the disadvantages of dynamite, or giant powder.

He admits that dynamite is a great improvement on nitro-glycerin, but enumerates the well-known inconveniences met with in its use, such as the generation of deleterious gases in mines, its inexplosiveness at low temperatures, the necessity of using an exploder to fire it, etc., etc.

He denies that dualin will explode when brought in contact with flame, unless it is confined in a well-tamped blast-hole, shell, or its equivalent, and he sends us a paragraph from the North Adams *Transcript*, which details an experiment performed with it in front of the Wilson hotel in that town, in which a cartridge of it was set on fire in the road in front of the hotel, without explosion and with effects and appearance resembling a Roman candle when ignited.

He states, moreover, that dualin will explode when wet, notwithstanding what has been said to the contrary, and that he uses and recommends water tamping in preference to all others. As proof of this he instances experiments in Hoosac Tunnel, where seven pound cartridges made of common paper, were placed in blast-holes not only filled with water, but two feet under the surface.

He further asserts that dualin has been found to be at least 30 per cent stronger than dynamite in European experiments, and that "iron plates, 16 inches and 23 inches thick, on which a dyna mite explosion would produce no effect whatever, were rent into fragments by the explosion of a quantity of dualin of less weight than the quantity of dynamite used."

If these statements shall be verified by experience, Mr. Dittmar will certainly lose nothing by permitting his powder to be tested anywhere fairl y upon its merits, and he expresses his entire readiness to permit such trials, and to abide by their results.

NATURE'S ELEVATOR.

"What goes up must come down," we boys used to sing in one of our youthful games. The converse, what comes down must have gone up, or have been forced up, leads to the consideration of some of the most stupendous operations of nature.

On all hands we may see these operations proceeding in silent grandeur. Masses of matter, which, aggregated, become almost inconceivable in magnitude, are constantly moved upward from the earth's surface, to descend in due time; again to be raised and again to fall. So the ponderous engine of nature oscillates constantly, without faltering, yet it moves so quietly and with so little friction, that only occasionally, when the thunder shakes the earth, or the hurricane ravages the land and sea, do we note the tremendous power of the common natural forces, which, in the calm summer day or the winter's storm, are always at work about us.

The water constantly accumulating in the air descends and fills the rivers. We see, and wonder at the aggregated power of these torrents as they impetuously rush toward the sea, leaping precipices and sweeping every obstacle before them; but we do not realize the great truth that all the while the silent force of solar heat is transporting to the clouds as much water as the rivers are carrying down.

We stand by some mountain side whose forests are being felled and transported to the valleys, without reflecting that all this vast mass of material was carried up, molecule by molecule, in the atmosphere and in the sap, until its accumulation became so great as to be demanded for the uses of mankind.

The unseen power that does all this work is solar heat. "Where there is life there is heat," and it would seem that heat is essential to all life. At least we cannot conceive of life without heat; and so intimately connected are heat and mass motion that it is difficult to conceive of them as other than co-existent.

Heat is the great prime mover, all else is secondary in natural as well as artificial mechanics. Does falling water turn our wheels? Heat raised the water first. Does wood or coal generate our steam? Solar heat stored up the carbon which constitutes the bulk of that fuel, and set the rivers running and the winds blowing, by which we transport it to our furnaces. Do we employ animals to carry our burdens? The food which nourishes them and enables them to perform labor, was collected by the action of the solar heat.

We find then, all life, all motion, all work traceable to the power of solar heat. This is the great mechanical engine employed by nature to keep everything running. To-day bold inventors are endeavoring to bring this heat into direct subjection, as a motor, but should they succeed, so that coal, wood, peat, or other fuel should no longer be needed to impel machinery, they will only have eliminated a few terms of the great mechanical equation. It is the sun that does the work on the water-wheel and in the steam boiler, as truly as in Ericsson's solar engine.

And in the present state of science there is little doubt, that not only mechanical energy, but every other form of terrestrial energy included in the category of force, may be ultimately traced to the sun as its source. The sun is, in this view, the great central motor of the solar system. From whence it derives its power, what constantly maintains its heat, is one of the grandest problems science has ever grappled with, and one which is not yet solved.

THE MEASUREMENT OF WATER POWER.

This is one of the most simple operations in hydraulic engineering, so far as fundamental principles are concerned. In fact one proposition comprises the whole subject. The weight of water discharged per minute, multiplied into the "head" or the number of feet through which the water is to be applied to work—or, as it is more often termed, "the fall"—gives the power of the flow in units of work, 33,000 of which constitute the conventional horse-power.

Notwithstanding the simplicity of this proposition, considerable care and skill are requisite to avoid errors in practice. The measurement of the volume of an open running stream, although much more simple than the measurement of the flow of liquids through pipes is still a matter of some nicety.

The usual method is the use of the weir, and as this can easily be made and used by any person of medium mechanical skill, we will describe its most approved form and the manner of using it.

The weir is a plate of thin iron with a retangular notch cut out of it calculated to a width sufficient to carry the water to be measured with a moderate depth of stream over the weir. The bottom of the notch must be set level, and this may be conveniently performed by a plumb line attached to an upright, attached to one end of the weir at right angles to the bottom of the notch.

The depth of overfall is measured from the top of a stake, set back of the weir to such a distance that the depression which takes place in the water as it approaches the weir, will be wholly avoided. The top of the stake is made flat, and a common rule may be used to measure the depth of the stream passing over the stake. The proper placing of this stake is a matter of importance, for if it is not set far enough back the measurement cannot be relied upon.

The amount of water flowing per minute over a weir of this kind may be found by multiplying the mean depth over the top of the stake in inches into the square root of the mean depth, and this product by 22·2437. This will give the flow in pounds per minute. The final product multiplied by the fall in feet will give the flow in foot-pounds per minute, which, divided by 33,000, will give the horse-power for each inch in width of the weir; and this multiplied by the width of the weir in inches will give the total horse-power.

The total horse-power, multiplied by the percentage of useful work known to be developed by the wheel it is desired to employ, will give the actual working horse-power that can be obtained from the stream by the use of that wheel.

We append a table from Box's "Practical Hydraulics," giving the amount of flow over a weir one inch in width for various depths over the head of the stake in gallons. To find the flow in pounds for any width of weir and for any depth given in the table, multiply the flow given for that depth by the width of the weir in inches, and that product by 8·331. We would not in making a test employ an overflow of over 18 or 20 inches for ordinary sized streams; but for very large streams; it might be necessary to use a weir of greater capacity.

TABLE OF THE DISCHARGE OF WATER OVER WEIRS, ONE INCH WIDE IN GALLONS PER MINUTE.

Depth.	Gals.	Depth.	Gals.	Depth.	Gals.	Depth.	Gals.	Depth.	Gals.	Depth.	Gals.	Depth.	Gals.
In.		In.		In.		In.		In.		In.		In.	
	·2338	4 1/16	22·37	10	84·43	33	308·1	64	1397	95	2472		
	·6162	4 1/8	23·39	10 1/16	90·34	34	323·3	65	1399	96	2512		
	·944	4 3/16	24·38	11	97·41	35	332·8	66	1432	97	2531		
1	·329	4 1/4	25·40	11 1/16	104·1	36	376·7	67	1464	98	2550		
1	·734	4 3/8	26·56	12	111·0	37	600·0	68	1497	99	2630		
2	·185	4 7/16	27·64	12 1/16	118·0	38	625·4	69	1531	100	2670		
1	2·670	4 1/2	28·74	13	125·1	39	650·4	70	1564	101	2711		
1 1/16	3·185	5	29·85	13 1/16	132·3	40	675·5	71	1597	102	2751		
1 1/8	3·818	5 1/16	30·97	14	139·8	41	700·9	72	1631	103	2791		
1 3/16	4·305	5 1/8	32·12	14 1/16	147·4	42	726·7	73	1665	104	2825		
1 1/4	4·925	5 3/16	33·28	15	155·1	43	752·9	74	1700	105	2873		
1 5/16	5·531	5 1/4	34·44	15 1/16	163·0	44	779·3	75	1734	106	2914		
1 3/8	6·167	5 5/16	35·62	16	170·9	45	806·0	76	1769	107	2955		
1 7/16	6·855	5 3/8	36·85	16 1/16	179·0	46	833·8	77	1804	108	2997		
1 1/2	7·554	5 7/16	38·01	17	187·1	47	860·9	78	1839	109	3039		
1 9/16	8·271	5 1/2	39·24	17 1/16	195·5	48	887·9	79	1875	110	3080		
1 5/8	9·011	5 9/16	41·72	18	203·9	49	915·8	80	1910	111	3122		
1 11/16	9·773	5 5/8	44·25	19	221·1	50	944·0	81	1946	112	3165		
1 3/4	10·55	5 11/16	46·82	20	238·8	51	972·4	82	1983	113	3207		
1 13/16	11·36	5 3/4	49·45	21	256·9	52	1001	83	2019	114	3250		
1 7/8	12·18	5 13/16	52·13	22	275·5	53	1030	84	2056	115	3293		
1 15/16	13·02	5 7/8	54·84	23	294·4	54	1060	85	2093	116	3336		
2	13·87	5 15/16	57·61	24	313·9	55	1089	86	2130	117	3379		
2 1/16	14·75	6	60·41	25	333·8	56	1119	87	2167	118	3421		
2 1/8	15·64	6 1/16	62·54	26	354·0	57	1149	88	2204	119	3466		
2 3/16	16·55	6 1/8	66·17	27	374·6	58	1179	89	2242	120	3510		
2 1/4	17·48	6 3/16	68·11	28	395·6	59	1210	90	2280				
2 5/16	18·42	6 1/4	72·09	29	417·0	60	1241	91	2318				
2 3/8	19·39	6 5/16	73·12	30	438·7	61	1272	92	2356				
2 7/16	20·37	6 3/8	75·18	31	460·6	62	1304	93	2395				
4	21·36	9 3/8	81·99	32	483·3	63	1335	94	2433				

MICHAEL FARADAY.*

Toward the end of the last century, in an obscure part of London, over some stables in a yard, lived an honest blacksmith named James Faraday. He was the son of a stonemason and tiler, and was one of a family of ten children, all of whom were laboring men and women in the humblest walks of life.

James had married the daughter of a farmer, and was a member of a peculiar religious sect called Sandemanian, after its founder, and was a thoroughly religious man. He had four children, Elizabeth, Robert, Michael, and Margaret. Michael was born in 1791, and when a little boy used to tend his baby sister in the stable yard, and sometimes was able to earn a penny by holding a horse or running an errand. When he got to be big enough to be trusted with parcels he was regularly installed as a newspaper boy, and on Sundays hurried through with his business so as to be at home in time "to make himself neat and to go to church with his parents." Robert chose the father's profession and was apprenticed to a blacksmith. He appears to have been a generous man, as he used occasionally to give his brother Michael money to go to chemical lectures or to buy apparatus for experiments; but we soon lose all track of him, and his fame never went beyond the sound of his anvil.

We are not told why Michael was apprenticed to a bookbinder rather than to some other mechanic, but can infer that he read the papers he carried and showed an early fondness for books, so that his father placed him at a trade where he could earn something and yet have an opportunity to read. The bookbinder and stationer with whom Faraday learned his trade was a kind master and evidently pleased with the fidelity and industry of his apprentice.

We find that Faraday, while binding books, took occasion to look at their contents, and among other works that fell into his hands was one by Mrs. Marcet, on chemistry. He had a great fancy for proving the accuracy of all the statements in the book by simple experiments, and spent all the pennies he could spare in procuring the necessary apparatus. An article on electricity, in the "Encyclopedia Britannica," particularly attracted his notice, and he set about to construct an electrical machine. His master was so much pleased with the success of this effort that he showed the apparatus to a member of the Royal Institution, who came to the shop to have some work done. This gentleman had some conversation with the apprentice, and finding him uncommonly bright and intelligent, invited him to go to hear Sir Humphry Davy lecture at the Royal Institution. This was a treat of the utmost importance to the young man. He wrote out full notes of the lecture with such drawings and illustrations as he could make, and afterwards sent them with a letter to Sir H. Davy. "The reply was immediate, kind, and favorable;" and some time afterward a grand carriage, with a servant in livery, drove to his humble lodgings with a note, asking him to call to see Sir H. Davy, and offering him the place of assistant, just vacant, at a salary of twenty-five shillings per week, with the use of two rooms at the top of the house. On March 1, 1813, Faraday was regularly appointed by the board of managers to be Davy's assistant. His days of bookbinding were thus brought to an end, and he became himself the maker of books for other people to bind and to prize most highly.

Sir Humphry Davy in a letter to the managers recommending him for the place, wrote that he "had found a person who is desirous to occupy the situation in the Institution lately filled by William Payne. His name is Michael Faraday, a youth of twenty-two years of age. His habits seem good, his disposition active and cheerful, and his manner intelligent."

The youth of twenty-two years had made a marvelous use of his time previous to the appointment under Davy. He had read everything he could lay his hands upon, and in a note book wrote down the names of the books and subjects that interested him. This he called "The Philosophical Miscellany—being a collection of notices, occurrences, events, etc., relating to the arts and sciences, collected from the public papers, reviews, magazines, and other miscellaneous works, intended to promote both amusement and instruction, and also to corroborate or invalidate those theories which are continually starting into the world of science. Collected by M. Faraday, 1809–10."

Fortunately this book has been preserved and can serve as a model for all young men of humble origin and slender means. We are astonished at the extent and variety of his reading at that early day, as gathered from that collection, and as displayed in a correspondence with Mr. Abbott, a Quaker clerk. The letters to Abbott, commencing when Faraday was twenty years of age, are often verbose, inflated, and abounding in big words, but nevertheless display the early training, study, reflection, and anxiety to learn, of the bookbinder's apprentice. Abbott had been educated at a good school, and hence Faraday looked upon him as greatly his superior.

There is a great temptation to quote from these letters, as they cover a period of Faraday's life hitherto wholly unknown to the world. In his first letter he gives an account of some galvanic experiments, and of a pile he had constructed out of disks of malleable zinc (a great curiosity in those days), copper coins, "and pieces of paper soaked in a solution of muriate of soda." He was surprised to find that with seven pairs of plates he could decompose the sulphate of magnesia. In another letter he has a good deal to say about chlorine, and gives the theory of bleaching as maintained by scientific men of the present day. "Pure chlorine has no effect upon vegetable colors; but when water is present it decomposes it, and the oxygen causes the change of color." He writes to his friend some admirable ideas on the subject of lectures, how they should be prepared and how delivered, which show the foundation upon which he afterwards built up his fame as the best lecturer in England. Here is a choice passage, written when Faraday was twenty-one years of age:

"A lecturer falls deeply beneath the dignity of his character when he descends so low as to angle for claps and asks for commendation. Yet have I seen a lecturer, even at this point. I have heard him dwell for a length of time on the extreme care and niceness that the experiment he will make requires. I have heard him hope for indulgence when no indulgence was wanted, and I have heard him declare that the experiment now made cannot fail from its beauty, its correctness, and its application, to gain the approbation of all. Yet surely such an error in the character of a lecturer cannot require pointing out, even to those who resort to it; its impropriety must be evident, and I should perhaps have done well to pass it."

In reference to the choice of a friend he writes: "A companion cannot be a good one unless he is morally so; and however engaging may be his general habits, and whatever peculiar circumstances may be connected with him so as to make him desirable, reason and common sense point him out as an improper companion or acquaintance unless his nobler faculties, his intellectual powers, are, in proportion, as correct as his outward behavior."

And in the same letter he adds: "In every action of our lives, I conceive that reference ought to be had to a Superior Being, and in nothing ought we to oppose or act contrary to His precepts."

We have thus a picture of Michael Faraday before he went to act as an assistant to Sir Humphry Davy. The son of religious parents, himself a thoroughly conscientious man, endowed with good health and indomitable industry, his start in life was such as to inspire his friends with every confidence in his ultimate success. As soon as he entered the Royal Institution he continued the researches he had begun with humble means while working as an apprentice, and, with such a teacher as Sir Humphry Davy, was soon able to overcome all defects of early training. Davy and Faraday were two widely different characters. The former was also of humble birth and had been aided by Mr. Gilbert, who heard that the "boy was fond of making chemical experiments," and had by his remarkable discovery of the metals of the alkalies, rendered his name famous and had won knightly honors. He had become Sir Humphry Davy, and it was not long before he gave up further original investigation, and retired to Geneva, in Switzerland, where he died in 1829. He was always seeking for honors and eternally pining for rank, and in his early treatment of Faraday displayed unworthy traits of character. For example, while traveling on the continent, he declined to accept an invitation to dine because Faraday, his Secretary, was also invited. The host, De la Rive, of Geneva, sent back word, "then I shall be obliged to give two dinners." And Davy opposed Faraday's election to the Royal Society. But Faraday uttered no word of complaint, and never ceased to feel and express gratitude to his early benefactor.

It is probable that no man of science ever lived whose whole life could better serve as a model than Faraday's. Although born poor he never coveted riches, but on the contrary gave up all remunerative occupations in order that he might devote himself exclusively to scientific research. Of humble birth he never sought social distinctions, but declined the offer of knighthood, and utterly refused to accept the office of President of the Royal Society which was pressed upon him. The humility, simplicity, singleness of purpose, and liveliness of disposition never deserted him even in the hight of his prosperity. He was ever ready to help a beginner, and seemed never to forget how he had been aided at a critical period of his life. He was indeed a perfect contrast to Sir Humphry Davy.

In 1821 Faraday was married, and having been appointed superintendent of the house and laboratory, took his wife to reside in the Royal Institution. He never was blest with children, but lived for forty-seven years of perfect happiness with the choice of his youth; the only change being, as he said, "in the depth and strength of its character."

When Faraday first went to the Royal Institution, he took up the study of chemistry with great zeal, and among other important discoveries made by him was that of benzole, to which we virtually owe the whole aniline industry. His researches on the condensation of gases, in which he proved them to be the vapors of volatile liquids; also on regelation, on glass, on steel, on alloys, were among his earliest works; but the crowning glory of his life was the publication of his "Experimental Researches on Electricity," which he commenced at the age of forty and continued during a period of twenty-six years. The value of these discoveries to the world cannot be easily overrated. We can trace them into practical life, in the electric light, in magneto-electric machinery, in electro-metallurgy, in the applications of electricity to medicine, in telegraphy, and in the success of the submarine cable, and yet the work was carried on in penury; he made himself poor that others might be rich, and he has left a name without parallel in the annals of science.

The Queen of England, no doubt instigated by Prince Albert, assigned a house for Faraday's use in the royal park, at Hampton Court, and had it put in thorough repair for his occupancy. Here he spent the declining years of his life, surrounded by affectionate relatives and devoted friends; and in the summer of 1867, while sitting in his arm chair at his study window, was suddenly summoned to his eternal rest.

The same year of his marriage Faraday joined the Sandemanian church by profession of faith, and he afterwards became an elder and used to preach; but in his sermons there was wanting that clearness and precision, that familiarity with the subject, that characterized his lectures on scientific topics. He never adopted the same course of reasoning in religious matters that he did in scientific. In science he believed nothing without the facts or experimental demonstration; but in religion he accepted everything with the humble faith of a Christian.

* "The Life and Letters of Faraday." By Dr. Bence Jones, Secretary of the Royal Institution. 2 vols. 8vo., pp. 427, 499. Philadelphia: J. B. Lippincott & Co. 1870.

Magnetic Iron Sands of Canada.

The American Exchange and Review contains the following epitome of a letter of Dr. T. Sterry Hunt, on the magnetic iron sands of Canada, of considerable interest to iron and steel masters:

"The sands from the crystalline rocks of Canada are in large degree a mixture of nearly pure magnetic ore with a titanic iron ore and garnet sand, the last two ingredients not being attracted by the magnet, and the titanic ore containing from 30 to 35 per cent of titanic acid. The bar iron made from these sands at Moisie is of excellent quality, not alloyed by titanium. The slags, however, contain the titanic acid as silico-titanate. The magnetic portion is separated from the titaniferous sand and from the silex by a magnetic separator which, according to Dr. Hunt, will, in one hour, separate from three tuns of sand, containing one tun of magnetic ore, one tun of ore, containing 99 per cent of magnetic iron, or twenty-four tuns in twenty-four hours. It is six feet long by five wide and four high. These magnetic sands are said to be found on the north side of the St. Lawrence, in quantities practically inexhaustible, from the Saguenay to Newfoundland, at Batiscan, between Montreal and Quebec, and there is a large accumulation at the mouth of Lake Huron; also, on both shores of Lake Erie, and along the seaboard of Connecticut and Rhode Island. The iron sands of Taranaki, New Zealand, are well known. Dr. Hunt places considerable reliance upon the magnetic separator for success in working the sands. This separator is the invention of Dr. Larne, professor of chemistry in the Laval University, Quebec. The advantage arising from these sands is found in their freedom from phosphorus and sulphur.

"In this connection it will be interesting to speak of the metallurgical process of reducing these magnetic sands, as performed at Moisie, a name not found in Lippincott's Gazetteer, and, therefore, needing some notice as a place. Moisie is said to be the seat of the most northern iron works of this continent, and remarkable for the exclusive use of the magnetic sands spoken of above. Moisie is near the mouth of the St. Lawrence, some seventy miles west of Anticosti island, at the mouth of the Moisie river, which empties into the St. Lawrence upon its northern shore. The sands are about half a mile distant on either side of the works, which consist of charcoal bloomeries, or modified Catalan forges, with all their necessary accompaniments. The blast is heated in U pipes, placed in the chimney. The hearths have each a cast iron frame, are three feet square and high, closed by a plate in front for a foot from the bottom, with slag-holes and with a shelf on the level of the tweer, which is semi-circular, with a radius of an inch, placed on one side at an inclination of fifteen degrees. The ore is thrown upon the fire from time to time, as the bloomers see fit, until a bloom is made of the average weight of 200 pounds, and after about three hours' work. An interesting fact appertains to the charcoal economies of the place. The charcoal is burned in kilns cylindrical at the bottom and dome-shaped at the top, of about thirty feet diameter at the base and twenty-five feet high, with walls a foot thick and requiring about 40,000 bricks. They hold about 100 cords apiece, yielding 4,000 bushels of charcoal; require about twenty-five to thirty days' burning, affording a fine coal at a reckoned cost of four and a half cents a bushel, weighing fifteen pounds to the bushel, the wood being almost all fir tree and some birch, but small, and hence denser. The wood is supposed to cost at the kiln eighty cents a cord. Ten of these kilns afford about 40,000 bushels a month, a little more than is sufficient to supply four forges. Four forges make about three tuns of blooms per day, using 1,400 bushels of coal.

"Of the ore, it is interesting to know that the storms work the sand at times as well as could be done by manual labor, leaving the true magnetic ore in irregular patches, and advantage is taken of the beneficial effect of the waves and winds. A patch of sand one hundred yards long by fifty yards wide, averaging two inches thick, should yield about seven tuns of ore. The separation of the ore from sand and impurities is done by washing tables. The gentleman from whose account we have derived our information for this condensed statement, and who visited the place October, 1869, gives a very interesting description of the exceeding isolation of the works, and of the unlimited forests around, together with the loneliness of a situation which, as we have stated, is upon the northernmost boundaries of the iron manufactures of the North American continent."

POLISH FOR PATENT LEATHER GOODS.—Take half pound of molasses or sugar, 1 ounce of gum-arabic, and 2 pounds of ivory black; boil them well together, then let the vessel stand until quite cooled, and the contents are settled; after which, bottle off. This is an excellent reviver, and may be used as a blacking in the ordinary way, no brushes for polishing being required.

TO REMOVE OLD IRON MOLD.—Dr. Thomson recommends that the part stained should be remoistened with ink, and this removed by the use of muriatic acid diluted with five or six times its weight of water, when it will be found that the old and new stain will be removed simultaneously

Hoisting Stone in Quarries.

The dangers that attend the men who go down to the sea in ships and occupy their business in great waters, are scarcely greater than those which await the toilers who descend into the bosom of the earth to win the mineral treasures to which this country, in particuler, owes so much of her greatness. Whether it be in the mine or in the quarry, death or disablement are there awaiting the unfortunates who may happen to fall a prey to them. In the case of mines, we hear too frequently of fatal catastrophes, but, strangely enough, the disasters which occur in quarries rarely find their way into the columns of the press, perhaps because each disaster is, in itself, too insignificant as compared with the wholesale slaughter of a colliery explosion. We have good reason, however, to know that the annual loss of life and limb, in quarrying operations is by no means trivial; unfortunately, too, a large proportion of these quarry accidents are more or less preventible by improvements in the hoisting machinery and appliances used to raise the stone when hewn to the surface of the ground.

A large quarry, in full work, presents a considerable area of operations, and, as a rule, there is but one engine to hoist the material; this is usually placed on the edge of the quarry, at the end of the tramway, along which the stone is taken when raised. The engine is generally on the surface ground, but a sort of step or recess is cut close alongside it, and whose level is about ten feet lower; the tramway is brought to the edge of the quarry along this step so that the lorries for the stone are beneath the engine level. In a large and deep quarry it is evident that nothing in the way of a jib crane can be made available, and a gantry and traveler would be too expensive, even did such an apparatus give sufficient scope to reach all the area in work. Instead, therefore, of either, the following plan is adopted. A large chain is stretched from the enginehouse across quite to the other side of the quarry, and there secured, but not permanently so, this end being shifted from time to time, as the position of the stone being hewn requires. On this chain a sort of carriage runs; it is something like an iron block, with two sheaves set side by side in the direction of their diameters, not of their axis. They are wide and deep enough in the grooves of their edges to run on the chain as on a rail. This block carries a real block, or what answers to one, suspended under but close to the chain; through this the rope or chain for lifting is passed.

It will be evident that the hoisting rope has a merely vertical action, but the block,or "horse," as it is technically called, gives both a vertical and horizontal motion, as the chain is most generally on a considerable inclination.

The *modus operandi* is as follows: When a certain stone is to be raised, the chain is moved over it and the quarry end made fast. The "horse" is run along the chain till "plumb" over the stone. A "toggle" or pin is secured in a link behind it to prevent it moving down the slope of the chain, and the hoisting rope is payed out and the stone hooked on, which is raised till the lifting hook reaches the "horse," when it is secured to it. The engine then draws the "horse" along the chain till the stone is fairly brought out of the quarry, and over the step already described, as well as over a lorry placed there in readiness. A "toggle" is put into a link of the chain to prevent the "horse" going back, the stone is lowered into the lorry, and the operation is complete.

Any person with the most moderate knowledge of engineering must perceive that, however cheap and convenient this arrangement may be,it is fraught with danger to those working or passing beneath the chain; the very best chains carefully tested are uncertain affairs, even when subjected to a simple statical strain, and the strain of the main, or as we may term it, "gantry" chain in a quarry is not a purely statical one by any means, as the "horse," when it begins to move, "jumps" over the links sufficiently to cause a considerable "jar," which, as a matter of course, is constantly breaking the chain,or if the hauling chain or rope from the engine happen to break, the "horse" runs violently down the incline of the chain, and the latter, already, perhaps, loaded nearly to its limit of strength, succumbs to the vibration, and the stone and ends of the fractured chain, in all probability, fall on some luckless workmen beneath.

We have good reason to know that appalling accidents from this cause are common, a fact scarcely to be wondered at, seeing that there is no adequate inspection of the arrangements of quarries, and the chains and whole apparatus are of inferior quality in too many instances.

We will proceed to sketch the outlines of an arrangement which we consider to present some advantages over that already described. The chain should be abolished altogether, and either a steel wire rope or a rail substituted. The rope would be little, if at all, more expensive than a chain,while it would be infinitely more trustworthy; less power, too, would suffice to raise the loads, as the wheels of the "horse" would have a comparatively smooth and uniform surface over which to travel. We believe a rail might be arranged made of round iron jointed much as a gas pipe is, the ends of the joint sockets being rounded on their outer edges to give freer passage to the wheels of the "horse." Instead of the "toggle" used with the chain, to prevent retrograde motion, a "clip" should be put on the rail (or rope) made of two pieces of iron hinged at one end, and with a coach screw at the other, each half being nearly semicircular in the center; this part would embrace the rail, and, if screwed up tightly, would prevent backward motion, or at the worst would act as a brake if the strain were too much for it. As to the catenary formed by a chain or rope, the rail would equally well assume that curve, as if of good iron its diameter need not exceed by more than one half that of the round iron in the chain links, and being without a weld, would be reliable to an extent such as the very best chain can never equal. This round iron rail arrangement would be far cheaper, too, than the chain.—*Mechanics' Magazine.*

Pyrometers.

A trustworthy means of determining with accuracy the high temperatures of furnaces, or any elevated temperature exceeding that of boiling mercury, has not as yet, perhaps, been successfully secured. The earliest pyrometer which actually came into use was that of Wedgewood, invented about 1780. The principle on which this invention was founded is the well-known property of clay to contract under the action of heat. In form, the pyrometer of Wedgewood was extremely simple. It consisted merely of a gage for measuring the dimensions of certain little clay cylinders before and after their subjection to the heat of the furnace. The test was in itself a very rude one, but the uncertainty of the indications of the instrument was increased by the fact, subsequently discovered that clay may contract under the influence of a comparatively low temperature, long continued, to as great a degree as under a higher or less duration.

It was proposed, at about the same time with the origination of Wedgewood's invention, to construct a thermometer for high temperatures on the plan of the mercurial thermometer, employing a fusible alloy instead of mercury, and a tube of clay enamel, or translucent porcelain, instead of glass. This was the conception of Achard, and it has a *prima facie* plausibility in its favor; but it is not known to have been reduced to practice. In fact, considering the liability of the porcelain to contract in the furnace—the property from which the pyrometer of Wedgewood derives all that it has of practical utility—the indications of the high-temperature thermometer here proposed would be liable to uncertainty in a very high degree. Several very distinguished physicists have endeavored to reach a more satisfactory solution of this difficult practical problem by availing themselves of the expansibility of air under high temperatures. These efforts have been to a certain degree successful; but the methods to which they have conducted depend for their accuracy upon the truth of the assumption, not yet fully established, that the expansibility of gases at the highest artificial temperatures follows the same law as at those at which this law has been experimentally verified.

One of the most promising methods of pyrometric measurement which has yet been proposed is the suggestion of Professor Edmond Becquerel, of Geneva, and is founded on the principles of thermo-electricity. In the Exposition of 1867, Mr. Ruhmkorff, of Paris, exhibits a thermo-electric pyrometer constructed under the direction of Professor Becquerel, which, in the experimental trials to which it has been subjected, has furnished indications remarkably consistent with each other; while it is free from complication of parts and apparently capable of being made practically available for all the uses for which such an instrument is needed. The thermo-electric combination employed by Mr. Becquerel is a single couple formed of two equal wires of platinum and palladium, each being one millimeter in diameter and two meters in length, united by one extremity in a junction formed by binding them firmly together with a fine platinum wire. The two elements, which are placed parallel to each other, are in contact to the extent of about one centimeter at the junction. In order to keep them separate for the rest of their length, the palladium wire is passed through a tube of porcelain; and this tube, with the two wires, is subsequently introduced into a larger tube of the same material, which last is to be exposed to the heat of the furnace. Both tubes are then filled with sand. The two wires are suitably connected at their outer extremities with the binding screws of a Weber's galvanometer, which indicates electric intensities with great exactness. A scale of temperatures related to the intensities of the developed currents has been prepared by Mr. Becquerel, by comparing the indications of an air pyrometer with those of the electric pyrometer when both are similarly exposed side by side. The divisions of this scale are equivalent to ten degrees Centigrade each.

It cannot yet be said, perhaps, of any form of pyrometer, unless of that of Wedgewood, which, as we have seen, is untrustworthy, and which at best indicates differences of temperature very imperfectly, that its use for practical purposes is entirely unattended with inconvenience; but the electric pyrometer of Mr. Becquerel seems to come as near to fulfilling this condition as any that has yet been suggested.—*Barnard's Report on the Industrial Arts.*

Prize Offered for a Machine to Separate Rheea or China Grass Fiber.

The Government of India, after communication with various agricultural and horticultural societies in India, and with persons interested in the subject, has arrived at the conclusion that the only real obstacle to the development of an extensive trade in the fiber of Rheea or China-grass, is the want of suitable machinery for separating the fiber and bark from the stem, and the fiber from the bark; the cost of effecting such separation by manual labor being great.

The requirements of the case appear to be some machinery or process capable of producing, with the aid of animal, water, or steam power, a tun of fiber of a quality which shall average in value not less than £50 per tun in the English market, at a total cost, all processes of manufacture and allowance for wear and tear included, of not more than £15 per tun. The said processes are to be understood to include all the operations performed, after the cutting and transport of the plant to the place of manufacture, to the completion of the manufacture of fiber of the quality above described. The machinery must be simple, strong, durable, and cheap; and should be suited for erection, at or near the plantations, as the refuse is very useful as manure for continued cultivation.

To stimulate the invention or adaptation of such machinery or process, the Government of India hereby offers a prize of £5,000 for the machine and process that best fulfills all the requirements.

Rewards of moderate amount will be given for really meritorious inventions, even though failing to meet entirely all the conditions named.

Arrangements will be made by the Government of India for the supply of carefully dried stems, and specimens of fiber separated from the bark, but subjected to no other process, to mechanical firms and others desirous of competing, on application to the Secretary to the Government of India in the Home Department.

All machinery, etc., must be brought by the competitors, at their own charge, to a locality which will be notified hereafter, probably in the north-west provinces of the Punjab, and there worked under the supervision of their own representatives for a sufficient time to enable the judges appointed by Government to determine whether all the conditions named have been complied with. The prize machine is to be transferred, if required, to Government at 5 per cent above cost price; the patent right in any such machine to be also transferred, if required, to Government, on the latter securing to the patentee a royalty of 5 per cent on the cost price of all machines manufactured under the patent during its currency.

One year from February 10th, 1870, will be allowed for the preparation of the machines, and their transport to the locality named for the competition, and the trials will then be made, and the decisions of the judges announced. If no invention of sufficient merit is received in the above-named period to obtain the prize offered, the Government will continue to allow machines to be tendered for trial till the end of two years from the same date, after which, or on the award of the prize, the offers herein made will be withdrawn.

By order of the Governor General in Council,

E. C. BAYLEY,
Secretary to the Government of India,
Fort William, Calcutta.

WILL IT PAY TO BUILD THE DARIEN CANAL.—In our recent editorial under the above title, an error crept in which obscured our meaning. Instead of saying "If we condense the Erie Canal one tenth in length *without altering its cubic contents*," we were made to say the same with the italicized words omitted. Printers will readily see how such errors as this sometimes escape notice; but as the general reader might be misled, we make this correction. Instead of saying it would make a canal 36·3 miles long, 400 *feet wide at the top*, 280 *feet wide at the bottom*, and forty feet deep, we should have said *forty feet* wide at top and twenty-eight feet wide at the bottom.

PATENT OFFICE DECISIONS.

In the matter of the application of David Stuart and Lewis Bridge for letters patent for a design for a cooking stove.—The applicants on November 3, 1868, patented the arrangement of ovens and flue in a cook stove having a peculiar external conformation. On February 5, 1870, they filed an application for a design, substantially identical with that shown in their patent of 1868.

Upon this state of facts the Examiner asks:

1st. Should the application be rejected on the patent?

2d. If so, can the patentees reissue in two divisions, one of which shall be for the design?

3d. If, so, what fees are required?

Section 11 of the act of March 2, 1861, provides that the new design, etc., shall not be "known or used by others before his, her, or their invention, or production thereof, and prior to the time of his, her, or their application for a patent therefor," etc.

It will be observed that no provision is made for use or sale of the invention prior to the application, as in the case of other inventions; and the reason of the distinction is found in the fact that as designs relate to form and shape only, no time is required for experiment before application. At all events, the language of the statute is plain. The design must not have been known or used by others prior to the application of the inventors. It is obvious that, if the design be described in a prior patent, granted either to himself or others, it is known to others within the meaning of the law. The present application must therefore be rejected upon the former patent.

The second question is, whether the original patent can be surrendered and reissued in two divisions, one of which shall be for the design.

Patents for designs may be granted for three and one half, seven, and fourteen years, at the election of the applicant, made at the time of application. Patents for other inventions are granted for seventeen years.

The patent granted to applicant in November, 1868, was of the latter kind, and was granted for seventeen years.

It is provided by section 13, of the act of 1836, that upon applications for reissue it shall be lawful for the commissioner, etc., to cause a new patent to be issued to the said inventor for the same invention, for the residue of the period, then unexpired, for which the original patent was granted.

This language is explicit, and it is obvious, that, under this section, any reissue of this patent, or any division of such reissue, must be granted "for the residue of the period then unexpired for which the original patent was granted;" that is, for the residue of seventeen years. But no patent for a design can be granted for seventeen years, or for the residue of an unexpired period of seventeen years; and this fact seems decisive of the question.

The result is, that an invention of a design, if shown in a patent for a mechanical invention is lost, and cannot be included in a subsequent application and patent for a design.

(Signed) SAMUEL S. FISHER, Commissioner.
February 23, 1870.

In the matter of the application of Israel C. Mayo, for letters patent for a design for a transparent shield.—The applicant makes application for a patent for a design. He pays ten dollars into the Treasury, and adds to his petition the following proviso: "Should the Commissioner be willing to allow a patent on this application, the undersigned wishes to pay into the Treasury the further sum of twenty dollars and have such patent granted for fourteen instead of three and a half years."

Section 11 of the act of March 2, 1861, provides that upon application for a patent for a design "the Commissioner on due proceedings had, may grant a patent therefor, as in the case now of application for a patent, for the term of three and one half years, or for the term of seven years, or for the term of fourteen years, as the said applicant may elect in his application; provided that the fee to be paid in such application shall be for the term of three years and six months, ten dollars; for seven years, fifteen dollars; and for fourteen years, thirty dollars.

This language contemplates an election to be made by the applicant, at the time of his application, of the term for which he desires his patent to issue, and the payment of a fee corresponding to that election. It does not contemplate the contingency of an application for one term and the payment of one fee, and a subsequent election, at the time of issue, of another term, and the payment of another fee. The words are, "elect in his application." The choice is to be made there, and not elsewhere or otherwise, and being made, must be final.

I can see that the practice proposed might be desirable and might result in the granting of design patents for a longer period, and the receipt of a larger revenue; but I have no power to alter the plain language of the statute, or to extend the time of election beyond the time of making the application for any purpose.

In the present case the applicant has paid a fee of ten dollars. His patent, if granted, can issue only for three and a half years.

(Signed) SAMUEL S. FISHER, Commissioner.
February 23, 1870.

Inventions Examined at the Patent Office.—Inventors can have a careful search made at the Patent Office into the novelty of their inventions, and receive a report in writing as to the probable success of an application. Send sketch and description by mail, inclosing fee of $5. Address MUNN & CO., 37 Park Row, New York.

U. S. Patent Office.

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Those who have made inventions and desire a consultation are cordially invited to advise with MUNN & CO. who will be happy to see them in person at the office, or to advise them by letter. In all cases, they may expect an HONEST OPINION. For such consultations, opinion, and advice, NO CHARGE is made. A pen-and-ink sketch and a description of the invention should be sent.

TO APPLY FOR A PATENT,

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

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

PRELIMINARY EXAMINATION

Is made into the patentability of an invention by persona search at the Patent Office, among the models of the patents pertaining to the class to which the improvement relates. For this special search, and a report in writing, a fee of $5 is charged. This search is made by a corps of examiner of long experience.

Inventors who employ us are not required to incur the cost of a preliminary examination. But it is advised in doubtful cases.

COST OF APPLICATIONS.

When the model is received, and first Government fee paid, the drawings and specification are carefully prepared and forwarded to the applicant for his signature and oath, at which time the agency fee is called for. This fee is generally not over $25. The cases are exceptionally complex if a higher fee than $25 is called for, and, upon the return of the papers, they are filed at the Patent Office to await Official examination. If the case should be rejected for any cause, or objections made to a claim, the reasons are inquired into and communicated to the applicant, with sketches and explanations of the references; and should it appear that the reasons given are insufficient, the claims are prosecuted immediately, and the rejection set aside, and usually

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CAVEATS

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

The Government fee on filing a Caveat is $10, and MUNN & CO.'s charges for preparing the necessary papers are usually from $10 to $12.

REISSUES.

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

DESIGNS, TRADE MARKS, AND COMPOSITIONS

Can be patented for a term of years, also, new medicines or medical compounds, and useful mixtures of all kinds. When the invention consists of a medicine or compound, or a new article of manufacture, or a new composition, samples of the article must be furnished, neatly put up. Also, send a full statement of the ingredients, proportions, mode of preparation, uses, and merits.

PATENTS CAN BE EXTENDED.

All patents issued prior to 1861, and now in force, may be extended for a period of seven years upon the presentation of proper testimony. The extended term of a patent is frequently of much greater value than the first term; but an application for an extension, to be successful, must be carefully prepared. MUNN & CO. have had a large experience in obtaining extensions, and are prepared to give reliable advice.

INTERFERENCES

Between pending applications before the Commissioners are managed and testimony taken; also, Assignments, Agreements, and Licenses prepared. In fact, there is no branch of the Patent Business which MUNN & CO. are not fully prepared to undertake and manage with fidelity and dispatch.

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American inventors should bear in mind that five Patents—American, English, French, Belgian, and Prussian—will secure an inventor exclusive monopoly to his discovery among ONE HUNDRED AND THIRTY MILLIONS of the most intelligent people in the world. The facilities of business and steam communication are such, that patents can be obtained abroad by our citizens almost as easily as at home. MUNN & CO. have prepared and taken a larger number of European Patents than any other American Agency. They have Agents of great experience in London, Paris, Berlin, and other Capitals.

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An experienced mechanical and railway engineer wishes a position as Master of Machinery, or Manager. Address "Engineer," Station "G," Philadelphia Postoffice.

Manufacturers of washing machines are requested to send illustrated description to Postoffice Box, 3372.

The Best is the Cheapest.—The genuine Hammond Window-sash Spring, made only by W. S. Hammond, Lewisberry, York Co., Pa.

Manufacturers of portable steam saw mills please send circulars to A. B. Hayden Old Saybrook, Conn.

Wanted to buy—Small engine and boiler in good order, one to three-horse power. Address A. Assman, 26 Liberty st., New York.

Jas. J. Gregg, Augusta, Ga., wishes to correspond with parties who have machinery or plans for boring deep wells in sandy soils. Also, means for elevating the water. Depth necessary to sink the well 40 to 100 feet.

A good business for a machine shop.—The right to manufacture, on royalty or otherwise, a first-class article already introduced; demand unlimited. Address Wm. Johnson, Lambertville, N. J.

Dickinson's Patent Shaped Carbon Points and adjustable holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24th, and Nov. 20, 1869. 61 Nassau st., New York.

Peck's patent drop press. Milo Peck & Co., New Haven, Ct.

Wanted—No. 1 2d-hand Brown & Sharp's Screw Machine, by Chas. Place & Co., 60 Vesey st., New York.

For Sale.—One Stave Planer, at a bargain. Apply to Hartmann, Laist & Co., Cincinnati, Ohio.

The Tennessee Manufacturing Co., Nashville, Tenn., wish to contract for water, gas, and steam piping for a large cotton mill. Address S. D. Morgan, Pres't T. M. Co.

The Pew Hat Rack.—E. S. Blake, Pittsburgh, Pa.

For description of the best lath and blind slat sawing machine in use, address W. B. Noyes, Gen'l Ag't, P. O. Box 553, Manchester, N. H.

Important advance on the draft and easement of carriage. See Jackson's Patent Oscillating Wagon, with tests of draft, models, etc., No. 149 High st., Newark, Essex Co., N.J. See Scientific American, Sept. 25, 1869.

The "Anti-Friction" Lever Horse Power, for from one to eight horses, is the best for driving every kind of farm or factory machinery. Send stamp for circular to R. H. Allen & Co., Postoffice Box 376, N. Y.

Our Catalogue of Agricultural and Horticultural Implements, Machines, and Tools (300 pages, 600 illustrations) is sent, postpaid, for $1. This is refunded on receipt of first order. Every manufacturer or dealer should have a copy. R. H. Allen & Co., Postoffice Box 376, New York.

Photographs.—Rockwood & Co., 839 Broadway, for five dollars, make 8x10 photographs of machinery or views within the city.

Machinery Wanted.—Good Calender Mills, suitable for working India-rubber. Address (stating description and prices), Postoffice Box 2213, Boston, Mass.

1250 lbs. portable platform scales, $25; hay scales, 4-tun, $75. Send for free price list, No. 373. Edward F. Jones, Binghamton, N. Y.

American Boiler Powder.—A safe, sure, and cheap remedy for scale. Send for circular to Am. B. P. Co., P. O. Box 315, Pittsburgh, Pa.

Kidder's Pastilles.—A sure relief for Asthma. Price 40 cents by mail. Stowell & Co., Charlestown, Mass.

Needles for all sewing machines at Bartlett's, 569 Broadway, N Y.

Pat. paper for buildings, inside & out, C. J. Fay, Camden, N. J.

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

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Portable Pumping or Hoisting Machinery to Hire for Coffer Dams, Wells, Sewers, etc. Wm. D. Andrews & Bro., 414 Water st., N. Y.

Keuffel & Esser, 71 Nassau st., N.Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves

For tinmans' tools, presses, etc., apply to Mays & Bliss, Brooklyn, N. Y

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

Two 60-Horse Locomotive Boilers, used 5 mos., $1,300 each. The machinery of two 500-tun iron propellers, in good order, for sale by Wm. D. Andrews & Bro., 414 Water st., New York.

To ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's manufacturing news of the United States. Terms $4·00 a year.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

Caveats are desirable if an inventor is not fully prepared to apply for a patent. A Caveat affords protection for one year against the issue of a patent to another for the same invention. Patent Office fee on filing a Caveat, $10. Agency charge for preparing and filing the documents from $10 to $12. Address MUNN & CO., 37 Park Row, New York.

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Answers to Correspondents.

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

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

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

P. S. R., of Ga.—The velocity of water issuing from a pipe is that of a heavy body falling through space, reduced by the retarded motion of friction. What the actual retardation of that friction is can only be determined by experiment. Many experiments have been made on this subject, perhaps those as reliable as any others are published in Eytelwein's "Handbuch und der Hydraulik," by which it appears that, if we call the velocity in feet per second v, the diameter of the pipe in feet d, the head of water in feet h,

$$v = 50\sqrt{\frac{dh}{l+50d}}$$

l being the length of the pipe in feet. Or, to translate this formula into common language, multiply the diameter of the pipe in feet into the head of water in feet, and divide the product by the length of the pipe in feet, plus fifty times the diameter in feet. Fifty times the square root of the quotient will be the velocity in feet per second sufficiently near for practical purposes, in a pipe without bends.

M. M., of Pa.—When fresh milk has a bad odor, you may be sure there is a cause for it, which a little patience will reveal. Cows are much more sensitive creatures, and their milk is much more easily affected than most people imagine. Even the odor from carrion inhaled by the cow, will taint her milk very unpleasantly. In one instance a farmer lost $1,000 in consequence of the rejection of his milk during a single season, on account of its bad odor, for which he was unable to account. He finally discovered that it was caused by the decaying body of a dead horse in the pasture where his cows fed. The mere breathing of the carrion odor by the cows tainted the milk. This shows how important it is that pastures, streams, the air of stables, and everything connected with the cow, should be pure and clean if we want good milk.

R. O., of Me.—Your application of the turbine principle to the construction of a rotary steam engine is by no means new, and is worthless. It has all the defects of ordinary rotary steam engines, with comparatively few of the advantages of other rotary steam motors. There are radical defects in this entire class of machines, which will probably render them always uneconomical converters of steam pressure into work.

R. P. G., of Vt.—The elongation of a steel wire by tension within the limits of its elasticity, is in proportion to the tension. This is true of all elastic rods. The law does not apply, however, to tensions which will produce a permanent elongation, and this may be accomplished by too great duration of the tension by a weight, which, acting but temporarily, would not be heavy enough to produce permanent set.

P. D. W., of Tenn.—The great problem in bridge construction is to secure greatest strength and rigidity with equalized strain at all points, and the least possible weight in the structure. Neither of these things have been accomplished in your device, and there is nothing novel or patentable about it.

E. F. R., of Mass.—There is no way that we know of whereby you can dissolve rubber sponge, and when it hardens have it resume its spongy consistence. We advise you to communicate with H. E. Towle, 176 Broadway, New York, who may be able to set you on the right track.

D. B. S., of Mass.—The cement you allude to is undoubtedly made nearly like the old recipe, 16 parts gutta percha, 4 parts india-rubber, 2 parts common caulkers' pitch, 1 part linseed oil. The ingredients are melted together, and used hot. It will unite leather or rubber.

L. M., of Va.—The first use of copper plates at the ends of telegraph wires, in [making the earth] circuit, is attributed to Herr Steinheit, of Munich, Bavaria, who is said to have adopted this plan as early as 1837.

D. L. T., of Miss.—No method of operating the ordinary blacksmiths' bellows can give a perfectly uniform blast. In this respect the bellows is a far inferior instrument to the fan-blower.

R. H., of Wis.—The center of a magnet is neutral, manifesting neither attraction nor repulsion. Your electro-motor will work: not a doubt of it.

E. S. N., of Pa.—We think the best way to mark figures on an engineer's brass tape is to stamp them on with small steel dies.

M. C. D., of Mass.—You are wrong. The reflecting telescope made by the Earl of Rosse is the largest ever constructed.

C. C., of D. C.—We do not deem it prudent to publish your statement of how U. S. Securities may be counterfeited.

J. C., of Pa., wishes some expert to tell him how he can stop cracks in gas retorts, so as to render them fit for use.

J. M. F., of N. Y.—You will find a rule for placing and shape of bridge walls on page 146, current volume.

B. L. H., of Mo.—The mineral you send is sulphuret of lead.

Recent American and Foreign Patents.

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

COMBINED SEEDER AND HAY TEDDER.—Jonas House, Howard, N. Y.—This invention consists in the combination of a seeder, of peculiar construction, with a tedder for spreading hay, in such manner that one set of wheels may operate both devices, either separately or in conjunction, as may be desired.

GAGING INSTRUMENT.—Eli S. Prime, Baltimore, Md.—This invention consists in the combination of a gage rod a "variety" scale, and a bung slide in such a manner as to enable the operator to accurately ascertain the contents of a cask without performing any mental computation.

STEAM PRESSURE GAGE AND DETECTOR.—Elijah Clark, Louisville, Ky.—This invention has for its main object to prevent engineers from raising the pressure of steam upon their boilers beyond a certain fixed limit.

MODE OF STORING POWER.—Henry F. C. Krumme, Ridgeway, Pa.—This invention consists in an apparatus for enabling a railroad train, when drawn by a pneumatic engine, to bring itself to a halt by the resistance afforded to pumps connected with the driving or other wheels of its locomotive, and employed in condensing atmospheric air into the main tank, by which process brakes are rendered unnecessary, and power is stored up for drawing the train when it is set in motion again.

WASHING MACHINE.—John O. Kopas, Washington, D. C.—This invention consists in the combination of a wringer with a washing machine, when the latter is provided with a reciprocating rubber that slides in a weighted vertical sash, by means of which the rubber is pressed downward upon the inclined washboard or upon the garments inserted between the rubber and washboard, and when the wringer and rubber are operated from the same shaft.

DROPPER FOR HARVESTER.—N. S. Ketchum, Marshalltown, Iowa.—This nvention has for its object to furnish an improved dropper for attachment to such harvesters as are provided with an endless apron, carrier, or elevator, for removing the cut grain from the cutter platform.

COUPLING FOR CONNECTING THE INLET PIPE TO THE RETORT COVER OF A GAS MACHINE.—John Butler, New York city.—This invention has for its object to furnish an improved coupling for connecting the inlet pipe to the retort cover of a gas machine, which shall be so constructed as to allow the pipe and cover to be readily disconnected when desired for convenience in detaching the said retort cover.

HOT-BLAST FURNACE.—A. Burtenshaw, Hope Furnace, Ohio.—The object of this invention is to provide a more durable construction and improved arrangement of what are known as ring hot-blast furnaces. It is also designed to provide an arrangement, whereby repairs may be more easily made, and old and worn-out rings may be removed. The invention also comprises an air-heating chest and throat of improved construction.

RAILWAY BRAKE.—D. P. Lófevre and L. Philippe Dorré, France.—This invention refers to a new or improved system of self-acting railway brake, operated by the buffers.

HULLING MACHINE.—David Kahnweiler, New York city.—This invention consists in the arrangement and adjustment of the knives of the cylinder of a machine for hulling cotton seed and for other purposes, and in the formation of the cylinder and concave, and the parts connected therewith.

BED BOTTOM.—Joseph Sperry, Charleston, Ill.—This invention relates to a new and useful improvement in bed bottoms, whereby they are made more durable and useful than slat bed bottoms have hitherto been, and it consists in a double slat bottom, made without metallic or rubber springs, and entirely of wood, save the necessary screws for fastening the parts together.

BOAT DETACHING APPARATUS.—N. C. Reynolds, Ellsworth, Me.—This invention relates to a new and useful improvement in a device or apparatus for simultaneously detaching the ends of a boat from a davit tackle, and it consists in operating a detaching lever hook at the bow and at the stern of a boat by means of a lever and connecting rod.

MACHINE FOR PICKING CRANBERRIES.—J. P. Prickett, Medford, N. J.—This invention relates to a new and useful improvement in a machine for picking or gathering cranberries, whereby that slow and tedious operation (usually performed by hand) is performed by machinery.

KING BOLT FOR CARRIAGES.—William Clark, Johnsonville, N. Y.—The object of this invention is to provide a king bolt attachment to the axles of wheeled vehicles, whereby the horizontal as well as vertical oscillations of the axles are permitted without the use of a fifth wheel or other complicated apparatus.

MOLD FOR CORNICES.—Michael Meany, John McGinnis, and Wm. Cunningham, Brooklyn, N. Y.—This invention relates to a new device for forming plaster cornices in rooms, halls, etc., and has for its object to produce a device which is adjustable to any angle of corners, and which will complete a molding and perfect it to the corner.

STUMP AND ROCK LIFTER.—Silas Smith, West Stockholm, N. Y.—This invention relates to improvements in machines for raising rocks, stumps, and other heavy bodies, and consists in an improved arrangement of shear frame, chain driver, and drum operating apparatus on a truck.

COMBINED COLLAR AND HAMES.—W. O'Brien and H. Wentworth, Omaha, Neb.—This invention relates to improvements in the construction and arrangement of collars and hames in one structure. The invention consists in an improved, simple, and cheap construction of the stocks or parts which serve the function of the hames, and the base for the padding and lining of wood, with metal mountings at the end, of peculiar construction, to form the joints. It also consists in an improved mannner of connecting the leather linings and facings.

COFFEEPOT.—John P. Williams, Mobile, Ala.—This invention relates to improvements in coffeepots, and consists in an arrangement with the exterior vessel of ordinary construction, of an inner coffee holder, from which the water of the outer vessel may be so separated that it may be kept in a boiling condition, while that in the coffee holder is in a fit state for use, the boiling water being forced into the coffee holder only when there is sufficient steam in the outer vessel to convey it through a tube extending from below the steam surface to the coffee holder, at the top, from which it may be poured for use, while the water boils in the said exterior vessel.

REVERSIBLE FEED FOR SEWING MACHINES.—J. J. Hirschbuhl, Louisville, Ky.—This invention relates to improvements in reversible feed apparatus for sewing machines, applicable to the Weed, and other like machines, and consists in the attachment to the feed bar, of an arm, projecting below the feed-operating shaft, and in attaching a rocker arm to the said shaft for working the feed, by connection with this arm, at the side of the said shaft, opposite the rocker arm now used to give the direct feed, so that a reverse motion will be imparted to the feed bar by connecting these arms, and disconnecting the others. The invention, also, consists in arranging the feed shaft, to slide longitudinally for shifting the connection of the said rocker arms with their respective bars.

CHIMNEY TOP.—D. S. Robinson, Pittsburgh, Pa.—This invention relates to a new chimney top, which will be acted upon by the wind in such a manner as to always leave a free passage for the escape of smoke; and it consists in a novel manner of suspending a V-shaped swinging hood, and in a novel construction of chimney cap.

METHOD OF MEASURING AND SHAPING CORSETS.—Miss Mollie Williams, Camden, Ohio.—This invention relates to a new method of measuring and shaping the pieces of cloth required for a well-fitting corset, with the aid of but four measurements, and it consists in the use of three tools or implements, whose edges are so shaped that they will, after the requisite measments have been produced, give curves to the several pieces.

WASHING MACHINE.—M. Ingalls, Muscatine, Iowa.—This invention has has for its object to furnish a simple, cheap, convenient, and effective washing machine, by means of which the washing may be quickly and conveniently done, and in such a way as not to injure the most delicate fabric, the washing being done by forcing the boiling suds through the clothes.

APPARATUS FOR SEPARATING THE SEED FROM FRUIT PULP.—R. H. Mayo Paris, Texas.—This invention has for its object to furnish a simple, convenent, and effective machine for separating the seed from the Bois-de-Arc, or Osage Orange, and other apples, where the seed is required to be separated uninjured, for planting or other purposes.

COTTON-SEED PLANTER, ETC.—Wm. W. Croom, Gainesville, Ala.—This invention has for its object to furnish an improved machine for planting and fertilizing cotton seed, which shall be so constructed and arranged as to drop the seed regularly and uniformly, and not in clumps, and which may be easily adjusted for planting indian corn, sorghum, peas, etc., doing its work accurately and well in either capacity.

WAGON BRAKE.—Michael Powell, Umatilla, Oregon.—This invention has for its object to furnish an improved brake, more particularly designed for trail wagons, but which shall be equally applicable to other wagons, and which shall be strong, durable, easily made, conveniently operated, and which will not bounce off the wheels when in use.

NECK YOKE.—Joseph King and Charles S. Gould, Janesville, Wis.—This invention relates to improvements in neck yokes for horses, and consists in an arrangement of sliding ferrules, or sleeves, for supporting the rings by which they are suspended from the neck straps, to admit the horses to move towards or from each other, as the condition of the road requires. It also consists in a novel arrangement of means for connecting the said sliding rings, to cause them to move in unison.

FRUIT FUNNEL.—Thomas Scantlin, Evansville, Ind.—This invention has for its object to provide a funnel to be used in filling fruit cans and jar with fruit, which will rest on the jars and cans fairly, without projecting inward so far as to interfere with filling them to the top. The invention consists in providing a short and broad funnel for wide-mouthed cans or jars, with a horizontal flange a short distance above the bottom, whereby the said funnel will rest fairly on the tops of the cans, and will admit of use with cans or jars having openings of different sizes.

WHIP AND REIN-HOLDING ATTACHMENT.—J. R. Finney, Youngstown, Ohio.—This invention relates to improvements in whip and rein-holding apparatus for carriages, designed to provide a simple and convenient combined attachment, so arranged as to be simply and readily attached to the dash-board, and that the socket or whip-holder will form a part of the rein-holder; also, so arranged that the whip-holder may be readily detached for the substitution of another when required, and to adapt it for more durable service in holding the whip.

HAY AND COTTON PRESS.—J. S. Duffy, Battle Ground, Ind.—This invention relates to improvements in presses for hay, cotton, and other similar articles, designed to provide an arrangement whereby a sufficient amount of power may be applied by hand, and in a short space of time, and so arranged that the applied power will increase as the bale becomes more compact.

ADJUSTABLE SHEARS.—James Booth, Worcester, Mass.—This invention relates to improvements in adjusting apparatus for book-binders' and other shears for cutting broad sheets, and consists in the application in the axis in the hollow hub of the movable shear arm, of an adjusting center block, on which it is suspended by center pins, and against which set screws tapped through the hub work, in a manner to adjust the hub and shear arm.

LEATHER ROLLING MACHINE.—J. G. Curtis, Emporium, Pa.—This invention relates to improvements in leather rolling machines, and consists in the combination with the roller, arranged on the lower end of the pendant vibrating beam, and the concave bed commonly used, of a springing or movable support for the said bed, and one or more pairs of rocker arms, with eccentric segmental bases, and a reciprocating rod, or bar, arranged between the ends of these arms opposite the said bases, one of which bears under the movable bed and the other on a permanent bed below, so that it moves the said arms on their eccentric bases, to and fro in a way to raise or lower the concave rolling bed, relatively to the roller. The movement of the said rod or bar being effected by a crank arm, rock shaft, and foot treadle, or lever, whereby the operator may govern the amount of pressure brought to bear upon the leather, by using his foot, leaving the hands free to handle the leather at the same time.

MILL PICK HANDLE.—F. Bellinger, Lockport, N. Y.—This invention relates to improvements in handles for mill picks, and consists in a handle composed of two parts of metal divided longitudinally, connected at the end to be taken in the hands, and at a short distance from the other end; the two parts at the latter end are made capable of springing between the latter connection and the ends, which are fitted to pass through an eye in the pick, and to be wedged against the side walls of the eye by a long steel or other metal wedge, running through the handle from end to end, in grooves in the two parts of the handle, which form a central hole when the said two parts are connected together.

MEDICAL COMPOUND.—Philester Lee and Lemue Matthews, Lebanon, Oregon.—This invention relates to a new and useful medical compound for use as a purgative and tonic.

APPLICATIONS FOR EXTENSION OF PATENTS.

MODE OF ATTACHING PADS TO SADDLE TREES.—James Ives, Mount Carmel, Conn., has applied for an extension of the above patent. Day of hearing May 25, 1870.

NON-ELASTIC BANDS FOR BALES OF COTTON AND OTHER FIBROUS MATERIALS.—Mary Ann McComb, Memphis, Tenn., administratrix of David McComb, deceased, has petitioned for an extension of the above patent. Day of hearing June 1, 1870.

MACHINE FOR PARING APPLES.—Horatio Keyes, Terre Haute, Ind., has applied for an extension of the above patent. Day of hearing June 1, 1870.

CARTRIDGE.—Edward Maynard, Washington, D. C. has petitioned for an extension of the above patent. Day of hearing June 1, 1870.

SHOEMAKERS' EDGE PLANE.—Isaac A. Dunham, North Bridgewater, Mass., has petitioned for the extension of the above patent. Day of hearing June 8, 1870.

SAFETY HATCHES FOR WAREHOUSES.—Wm. H. Thompson, Boston, Mass., and Eustis P. Morgan, Biddeford, Maine, has applied for an extension of the above patent. Day of hearing June 8, 1870.

METALLIC HOOK FOR LABELS.—Samuel B. Fay, New York city, has petitioned for an extension of the above patent. Day of hearing June 15, 1870.

FRUIT BOX.—Jabez W. Hayes, Newark, N. J., has applied for an extension of the above patent. Day of hearing July 27, 1870.

BUCKLE FOR WEARING APPAREL.—Edward Parker Plymouth, Conn., has petitioned for an extension of the above patent. Day of hearing August 17, 1870.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING March 29, 1870.

Reported Officially for the Scientific American.

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101,204.—ELEVATED RAILWAY.—John M. Abbott, Hillsdale, Mich.
101,205.—ANTI-FRICTION CARRIAGE AXLE.—Alonzo Allcott, Haverhill, Mass.
101,206.—COTTON SEED PLANTER.—John P. Allen, Dawson, Ga.
101,207.—SCREW AND SCREW DRIVER.—Allen S. Apgar, New York city, assignor to himself and Isaac Arnold, Jr., Haddam, Mass.
101,208.—CARRIAGE WHEEL HUB.—William J. Arrington, Jefferson county, Ga.
101,209.—KNIFE.—N. E. Babcock and G. D. Goodsell, Rockford, Ill.
101,210.—HINGE MACHINE.—Joseph H. Baird, Oakville, Conn.
101,211.—SUSPENDER.—Thomas W. Bartholomew, New York city.
101,212.—HASP FOR TRUNKS, ETC.—S. T. Barton, and John W. Affron, New Orleans, La. Antedated March 29, 1870.
101,213.—APPARATUS FOR TANNING LEATHER.—O W. Bean and W. B. Rowland, Tecumseh, Mich.
101,214.—PICK HANDLE.—Franklin Bellinger, Lockport, N.Y.
101,215.—VAPOR BURNER.—David Berkey, Huntington, Ind.
101,216.—CULTIVATOR.—Charles Bird, Ackley, Iowa.
101,217.—MODE OF CUSHIONING STEAM PISTONS.—George F. Blake, Boston, Mass.
101,218.—MACHINE FOR PICKING AND DUSTING WOOL.—M. Bliss, Ionia, Mich.
101,219.—BRACKET HANGER.—Charles E. Bliven, Toledo, Ohio.
101,220.—SHEARS.—James Booth, Worcester, Mass.
101,221.—TURBINE WATER WHEEL.—Clark Boyd, Andover, N. Y.
101,222.—APPARATUS FOR PHOTOGRAPHIC PRINTS.—Warren S. Burgess and G. A. Lenzi, Norristown, Pa.
101,223.—HOT-BLAST FURNACE.—A. Burtenshaw, Hope Furnace, Ohio.
101,224.—COUPLING FOR CONNECTING THE INLET-PIPE TO THE RETORT OF A GAS MACHINE.—John Butler, New York city.
101,225.—STEAM BOILER FEEDER.—J. M. Case, Worthington, Ohio.
101,226.—WASHING MACHINE.—Geo. R. Chandler, Detroit, Mich.
101,227.—KING BOLT FOR CARRIAGE.—William Clark, Johnsonville, N. Y.
101,228.—MACHINE FOR NICKING SCREWS.—N. S. Clement, Northampton, Mass.
101,229.—SAW GAGE.—Wm. Clemson, Middletown, N. Y.
101,230.—MACHINE FOR BENDING RAKE TEETH.—Columbus Coleman, Allegheny City, Pa.
101,231.—COTTON PICKER. — Robert F. Cooke, Brooklyn, N. Y.
101,232.—COTTON SEED PLANTER, ETC.—William W. Croom, Gainsville, Ala.
101,233.—STEAM GENERATOR.—Hugh E. Curry, Louisville, Ky.
101,234.—ROLLING MACHINE FOR LEATHER.—John G. Curtis, Emporium, Pa.
101,235.—KNIFE GUARD.—G. K. Dearborn, Pawtucket, assignor to Timothy Earle, Smithfield, R. I.
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REISSUES.

3,897.—Coal Stove.—H. G. Giles, Troy, N. Y., assignee, by mesne assignments, of Gilbert J. Kingsbury.—Patent No. 23,587, dated April 12, 1859; reissue 1,409, dated Feb. 17, 1863.
3,898.—Straw Cutter.—James Palmer, Brooklyn, N. Y., assignee, by mesne assignments, of D. J. Powers.—Patent No. 27,154, dated Feb. 14, 1860.
3,899.—Pump Piston.—New England Pump Manufacturing Company, Boston, Mass., Pacific Pump Manufacturing Company, San Francisco, Cal., Charles F. Mudge, Bridgeport, and Bridgeport Manufacturing Company, Bridgeport, Conn., assignees, by mesne assignments, of Nathan Stedman.—Patent No. 41,545, dated Feb. 9, 1864.
3,900.—Lamp.—C. A. Kleemann, Erfurt, Prussia.—Patent No. 37,867, dated March 10, 1863; reissue 3,068, dated Aug. 4, 1868.
3,901.—Knitting Machine.—The Pepper Knitting Machine Company, Boston, Mass., assignee, by mesne assignments, of John Pepper. Patent No. 13,289, dated July 17, 1855; reissue 1,536, dated September 15, 1863; extended seven years.

DESIGNS.

3,941.—Bust.—Henry Berger, New York city.
3,942.—Folding Door Key.—Henry H. Elwell, South Norwalk, Conn.
3,943.—Trade Mark.—J. H. Gamhart, St. Louis, Mo.
3,944.—Trade Mark.—J. S. Kirk, Chicago, Ill.
3,945.—Stove Ornament.—Isaac Applin Sheppard, Philadelphia, Pa.
3,946.—Muff.—R. M. Seldis, New York city.

EXTENSIONS.

Cotton-seed Planter.—A. W. Washburn, Yazoo City, Miss Letters Patent No. 14,529, dated March 25, 1856.
Machine for Cutting Loaf Sugar.—Adolph Brown and Felix Brown, New York city.—Letters Patent No. 14,490, dated March 25, 1856.

Inventions Patented in England by Americans.

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3,189.—Substitute for Curled Hair.—M. W. Blanchard, Dutch Flat, Cal November 3, 1869.
231.—Meter for Water and other Fluids.—J. F. de Navarro, New York city. January 25, 1870.
251.—Lawn Mower.—J. D. Frary, New Britain, Conn. January 28, 1870.
281.—Windmill.—Charles Mahler, San Francisco, Cal. January 31, 1870.
283.—Sewing Machine.—Grover & Baker, New York city. January 31, 1870.
303.—Electro-deposition of Nickel.—I. Adams, Jr., Boston, Mass. Feb. 2, 1870.
318.—Manufacturing Wrought Iron or Steel.—James Henderson, New York city. February 3, 1870.
319.—Friction Clutch.—F. A. Pratt and Samuel Colt, Hartford, Conn. February 3, 1870.
320.—Spring Bed Bottom.—R. Barker, S. A. Barker, and L. Fisher, Providence, R. I. February 3, 1870.
322.—Printing Presses.—Merritt Gally, Rochester, N. Y. February 3, 1870.
326.—Knitting Machine.—Henry von Hartz and Julius Feiss, Cleveland, Ohio. February 4, 1870.
332.—Mechanical Movement.—G. E. Harding, New York city. February 5, 1870.
372.—Marine and other Compasses.—R. C. Cutting, Liverpool, England and Amasa Mason, Boston, Mass. Feb. 9, 1870.
400.—Pitcher.—F. T. Ferguson, Boston, Mass. February 10, 1870.
426.—Rotary Digging Machinery.—O. C. Evans, ——, —, U. S. Feb. 12, 1870.
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SCIENTIFIC AMERICAN

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

Vol. XXII.—No. 16. [NEW SERIES.] NEW YORK, APRIL 16, 1870. $3 per Annum. [IN ADVANCE.]

Combined Safety Valve and Low-Water Alarm.

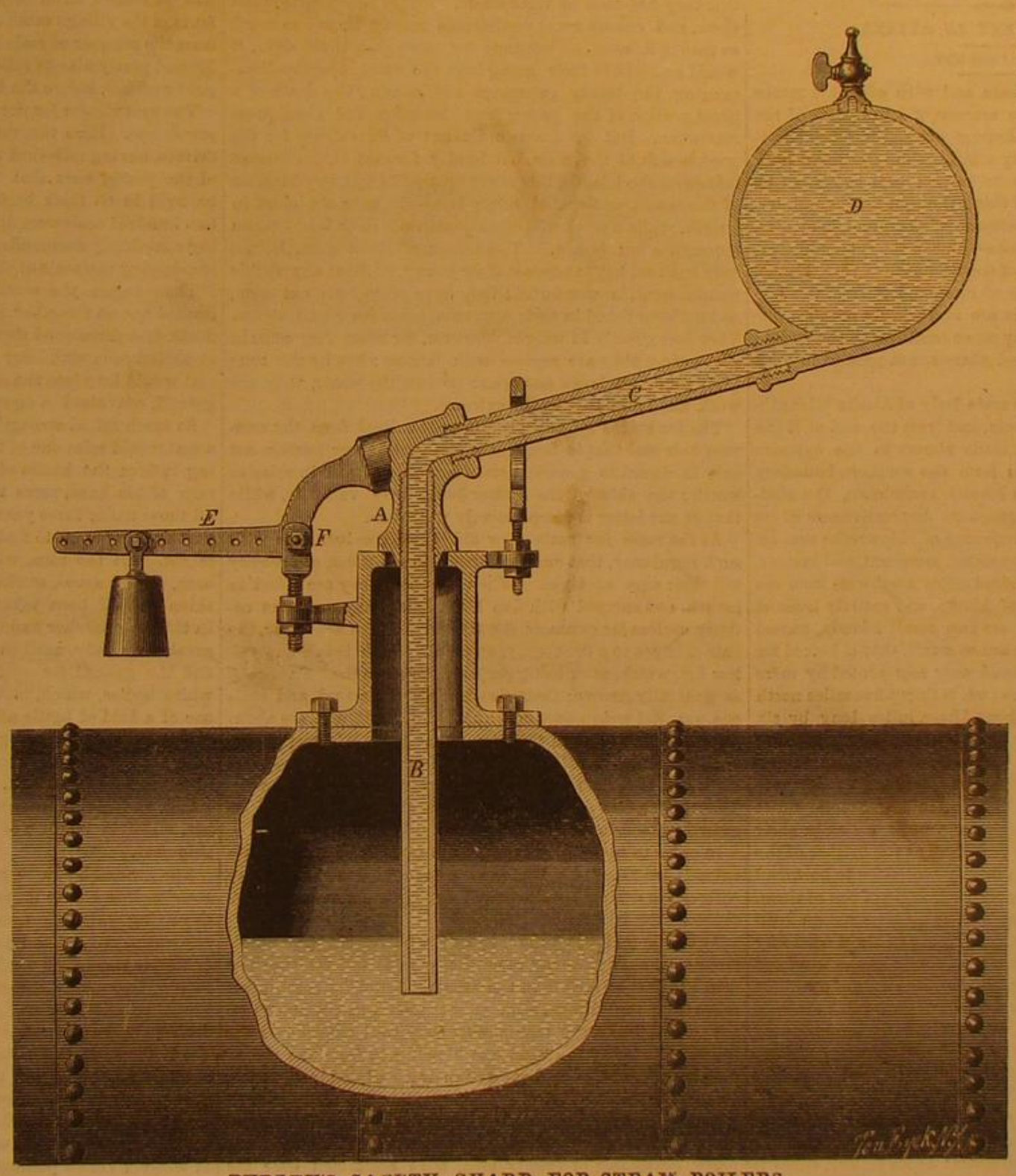
The dangers arising from too low water in boilers are scarcely less than from too high steam. It was long ago seen that an escape valve, adjusted to relieve the boiler from any excess of steam above a fixed pressure, was a prime necessity as a measure of safety in the use of steam; but while the safety valve has thus been an accompaniment of boilers almost from the earliest period in the history of steam, the application and adoption of automatic low-water detectors and alarms, are comparatively recent.

It is not our purpose to discuss the general utility and desirability of reliable instruments of this kind in the present article; we have too often given expression to our views on this subject to render it necessary to repeat them. Our object is to describe a device of the kind under consideration, of which we give an engraving, and which differs from many low-water detectors, in that it is a low-water detector, alarm, and safety valve combined, each of its functions being independent of the other.

The safety valve is made, as shown in section at A, with a flat annular face, its upper portion being nearly at right angles with the vertical part, and a tubular opening passes through its entire length.

Into the lower part of the bent tubular opening is screwed the vertical pipe, B, and into the upper part the inclined pipe, C, having at its outer end the hollow sphere, D. The sphere, D, has a pet cock at the top to allow the efflux of air when the valve is first adjusted to work. On the opposite side of the valve, A, from the pipe, C, projects a bent arm, E, pivoted at F, and carrying a weight by which the valve can be adjusted to the required pressure. The pipe, B, descends below the normal water level, as shown.

In adjusting this valve, the pet cock in the sphere, D, is opened, when the air escapes, and the pressure of the steam upon the surface of the water in the boiler causes the water to rise and fill the cavity. The weight upon the arm, E, is then set to counterpoise the weight of the water to the pressure it is desired to maintain. Any pressure exceeding the required pressure raises the valve and relieves the boiler. It will be also evident that as soon as the water falls below the pipe, B, steam will take the place of water in the pipe, C, and the sphere, D, and the valve will then open immediately. The sound of the steam, as it issues from the valve, will give the alarm, or a whistle may be employed if desired.



BURLEY'S SAFETY GUARD FOR STEAM BOILERS.

In this case the valve is opened by both the force of steam and the counterpoise, and a very wide opening being made the discharge of steam will be so copious as to be readily distinguished from the smaller escape due to pressure alone.

These valves have been tried and are highly recommended by many users of steam in Cincinnati and Columbus, Ohio. Two patents, dated respectively December, 17, 1867, and June 15, 1869, have been obtained on this device by Charles Burley, of Cincinnati, Ohio. A part of the right for the Eastern and Middle States will be sold. Address, for further information, Burley & Co., No. 84 West Third street, Cincinnati, Ohio.

PATENT RIGHT AND COPYRIGHT.

The following extract from an address by Mr. Cleland before the Liverpool Polytechnic Society, is a masterly reply to the sophistries of some of the modern enemies of the patent system:

As the opinions formed by Lord Derby, in his capacity of chairman of the committee of 1864, naturally carry great weight with them, at least until we see how partial was the evidence from which these opinions grew, it is worth while to take some pains to expose the fallacy as to the distinction between patent right and copyright, which he, in common with Mr. Macfie and others, has promulgated.

Lord Derby, then Lord Stanley, said "the difference is simply this, the obvious fact, that no two men ever did or ever would write, independently of one another, the same book; whereas it might happen, and often did happen, that two or three men, quite independently of one another, would hit upon the same invention. That alone establishes a distinction between the two cases." Obviously his lordship here speaks of patentable inventions, not mere ideas, suggestions, prognostications, or sketches; and his proposition is distinct enough, except for one slight ellipsis, which we will take the liberty to correct, as it deprives the proposition of that clearness which is so desirable in any statement that has to be formally discussed. He said "exactly the same book," and doubtless meant exactly the same invention. In this sense we will understand and endeavor to reply to him.

What is a book but the visible type, expression, or embodiment of the author's ideas? What is a patentable invention but the visible type, expression, or embodiment of the ideas of the inventor? As the author's ideas are the soul of the visible book, so are the inventor's ideas the soul of the visible invention. As the body that contains the author's ideas will vary indefinitely, according to the various minds of various authors, so will vary the body that contains the ideas of the inventor. We admit that two authors writing on the same subject must exhibit differences of arrangement, style, construction, grammar, etc., arising inevitably from the differences between themselves; so we must admit that two inventors, independently carrying out, expressing, or embodying the same ideas, will exhibit analogous differences in arrangement, style, construction, and what may be called the grammar of physics. That two inventors, working independently, should throw their ideas into a form of process "exactly" the same, is as improbable, and as inconsistent with what we know of human nature, as that two independent authors should write books in which there should not be even a difference of wording or punctuation.

As some difference, if it were only verbal or grammatical, would surely betray the independent authorship, so some difference in the members or details, if it were in nothing more than nails instead of screws, would certainly betray independent invention. Did time permit, it would be interesting to trace the analogies between machines and books in arrangement, logical coherence, construction, style, etc., but probably enough has been already said to show that the "obvious fact" on which Mr. Macfie, Lord Derby, and others rest their partiality to copyright is not a fact, and is by no means obvious, and that wherever the natural and necessary distinction between authors' and inventors' rights may lie, it is not where his lordship supposes he has found it. If it is replied that the book and machine are not meant in that straight, narrow, and mechanical sense, but rather the ideas which the book and machine express, I rejoin, that cannot be the meaning of the proposition, since it would cut the feet from the distinction which it desired to establish, it being well known that, in that sense, various authors have independently written the same book, and various inventors hit upon the same invention.

Mr. Macfie, comparing books with inventions, seems to think he has used a knock-down argument, when he says that if he buys a railway guide he is at liberty to make use of the information it contains, and to find his way by its guidance to any part of the kingdom; but that if he buys a specification, it only tells him of something which he is not at liberty to do. This is a curious example of the haziness of which I have so much complained. I would ask the author—Is your railway guide a free pass for any of the railways it mentions? Will it authorize you to run your private locomotive on the rails, or even to lay down another line alongside? You see there are three things to be named on both sides, to make the comparison just. On the one side, the town to which you wish to travel, your fare, and railway ticket. On the other, the end, the product or manufacture you want to arrive at, your royalty, and license.

To apprehend the nature of the bargain between the State and the inventor contained in patent law truly, let me remind you that to patent means to publish, or to inform the public of the subject patented. Letters patent are granted, not strictly for inventions as many seem to suppose, but for the publication of inventions, not for publication merely but for prior publication, and not purely for prior publication but for prior publication through a well-known channel formed for that express purpose, where the information given may be preserved for, and be always readily accessible to the public. Priority is an indispensable condition of the bargain. This condition has been objected to in the paper before us, and elsewhere by Sir Roundell Palmer and others, on grounds that seem to me as untenable as those of the objections to property in ideas. Here the State adopts the proverbial maxim that a "bird in the hand is worth two in the bush." It buys a caged bird in preference to a bird in the woods, and buys it from the first comer, because it knows no other. It wants but one bird of each species; a second would be superfluous. To drop metaphor—the Commissioners of Patents, as servants of the State employed to buy the knowledge of new inventions, offer inducements in the shape of letters patent for the earliest and fullest information. They are in darkness as to these new inventions, and they wait for the inventor to come and displace their darkness by his light.

The first comer only can do them this service. Can you, B dispel darkness where no darkness is? Could you go about to enlighten the enlightened? The service you offer has been already performed by A, and is no longer possible to you.

But it is said your priority is of little consequence—your boasted originality is in general mere antiquity—your merit of anticipation is meretricious—the so-called invention over which you make such a cackling lay direct in the "path" of discovery and invention, and was sure to have been hit upon by those who were following hard at your heels. Mr. Lauder, in this discussion, in the instance of thermo-dynamics, to which he could easily have added many others, has given a severe blow to those fallacies. Did time permit, I would aspire to the honor of following in his footsteps, and of giving them the *coup de grace*. It would have been amusing, and perhaps instructive, to survey that wondrous but badly-paved road of discovery—itself, strange to say, quite a recent discovery—where inventions and improvements, great and small, are supposed to be strewn like boulder stones and loose Macadam, where the traveler must tread warily lest he agonize his corns against a wee improvement, or heedlessly stumble over a big invention, to the bruising of his shins and the imminent peril of his nose—that romantic pathway through an enchanted land where, according to our modern argonauts, wild geese, protuberant with golden eggs, waddle lazily along, actually inviting the passenger, with inharmonious voices, to put salt on their tails!

FUR SEAL FISHERY IN ALASKA.

[From Old and New.]

After a possession of two years, and with adequate means of obtaining information, the amount of knowledge of the territory of Alaska, and its resources, evinced in official government reports, is lamentably small; while the great bulk of our people have no ideas in respect to it outside of its name. Such being the case, I think it might not be uninteresting for me to give a short account of the great, and alas, only source of revenue, in Alaska—I mean the fur seal fisheries. It is not only on account of their connection with Alaska, that these fisheries are objects of interest, but from the fact that the habits of the animals are exceedingly peculiar, being wholly unlike those of any other creatures in the world; and also that the furs obtained there are at present in very great demand.

The southwest corner of the main body of Alaska is lengthened out into a long peninsula, and from the end of it the chain of Aleutian Islands extends almost to the opposite shores of Asia. These islands form the southern boundary of Behring Sea, which, for its stormy turbulence, the shallowness of its waters and consequent destructiveness of its waves, and the comparative frequency of shipwrecks that occur upon it, is justly dreaded by sailor, merchant, and insurer.

In this sea, about three hundred miles northwest from the extreme end of the peninsula of Alaska, and entirely isolated from all other bodies of land, are two small islands, named St. Paul and St. George; they are so small, that if looked for on a large map they will be found only represented by mere dots. St. Paul, the larger of the two, is thirty-five miles north of St. George; the former is about fifteen miles long by six broad; the latter ten long, by four broad. They must have been at one time much larger, but being of old volcanic formation, they have gradually worn away, forming by detrition large and dangerous reefs, which, extending several miles into the sea, render it impossible for vessels to stay in their vicinity, except in fine weather; especially as at neither of the islands is there a harbor, and the only protection to be found in a storm is to get if possible on the lee-side of one of them.

From the shore, with perhaps a dozen exceptions on both islands, cliffs rise perpendicularly, varying in hight from fifty to six hundred feet. These are cut at places by the wind and rain into most fantastic shapes, and are the abode of countless myriads of sea fowl. The interiors of these islands are wild and desolate in the extreme, but are greatly diversified by hill and valley. The upper part is of rough, jagged, uncovered rock; so uneven is it that it is almost impossible to pass over certain portions of it without suffering greatly from laceration of feet. In the valleys the rock is covered by a thin layer of earth, which supports mosses, a few running vines, and in low damp spots a coarse grass: as for timber, there is not so much as a twig; the natives are therefore obliged to collect all that drifts to their shores to supply themselves with fuel and building material. These bleak cliffs and barren valleys are shrouded three fourths of the time in thick fog; for without this great dampness—as I will hereafter explain—it would be impossible for the seals to remain there during the season. Add to this, storms of such violence and duration as to render landing or departure from the shores an impossibility in winter, and in summer only practicable on an average two days in a week, and one may form some idea of the natural attractions of this part of our newly acquired possession.

There are eight beaches at St. Paul's, and four at St. George's, which, instead of ending abruptly at the foot of tall cliffs, rise gradually up into low hills. On these beaches, in the early part of May, the seals begin to assemble; first, a few "seacutchers," or old male seals, arrive; and taking upon themselves the office of scouts to the advancing army, go over all the ground. If much interrupted in their proceedings, they have been known to prevent the landing of seals on that beach during the ensuing summer; and for this reason they are permitted to wander at will. As time progresses, more arrive, both old and young, but almost entirely male, until the beaches fairly swarm with them; and the young and middle-aged are urged, from want of room, and by the ferocity of the "seacutchers"—who keep the water line wholly to themselves—back upon the adjoining hill sides. From the middle of May to the first of June, there is a constant influx of female seals, who, as fast as they arrive, are seized by the "seacutcher" upon whose feet of territory chance has brought them; he driving back, if he be able, any adventurous male seal who may wish to contest his right. If he is not able so to do, he is himself driven up the hill side, and loses not only the new comer, but all former conquests he may have made; for they are quickly absorbed into the victor's already crowded harem. In these struggles for supremacy, the brunt of the battle, as is the case with higher animals, is sometimes borne by the innocent cause of dispute; for a female seal on coming ashore may be pounced upon by two huge "seacutchers," each taking hold of her with their long tusks, and pulling in opposite directions with tremendous force, until they both forfeit the fruits of victory by the death of the poor victim.

When all the seals have come, the "seacutchers" that have held "possession" of the beaches, have succeeded in capturing from three to ninety females each, of which they take the most jealous care from the time of parturition—which occurs in two or three weeks after their landing—until they prepare to take their departure at about the first of October. During this long space of time—more than four months—though the young male seals frequently revisit the water in warm weather several times during the day, the "seacutchers" and females never do, but remain on the beach in the same place that they first took up their abode. Bright sunshine troubles them, and creates great restlessness among them; so much so that if it were to continue for more than three days, it would necessitate their going into the water, thereby disarranging the family groupings and causing the death of a great portion of the young from desertion and consequent starvation. But by a wise ordinance of Providence for the good health of the seals, but hardly for that of the human beings on the islands, this never occurs; in fact, the duration of the sun's undisputed reign is rarely over six hours in length, while a week will often pass in which he is but "seen through a fog darkly." The power of these animals, not only to exist, but to support their young, without any visible nourishment, is wonderful; they have often been cut open, and nothing found in their stomachs but a few small stones. They lose greatly in weight, however, for when they come in the spring they are replete with fatness; but by the time their young are large enough to go into the water, they are weak and emaciated in the extreme.

The fur seal is an entirely different animal from the common hair seal that is frequently met with in our harbor, not only in regard to generical classification, but also in relative worth; the skin of the former being very valuable, while that of the latter is comparatively worthless.

As the male fur seals grow old, their size increases with such regularity, that one accustomed to see them, can readily tell their ages at sight. When first born they are a foot in length, and covered with fine black hair; they are then entirely useless for commercial purposes; but the next year, the hair changes to a dark gray, and underneath it is a fine yellow fur, which, after being prepared, becomes the "Fur Seal," as generally known; their size has also increased, and seals one year old weigh over one hundred pounds, and are about three feet long. From this time their growth is very rapid; so that a *seacutcher* of fifteen years of age is often more than eight feet in length, and in weight over two thousand pounds. The females, however, never attain the size of the males, their growth ceasing at the third year.

In order to more fully describe the manner in which these animals are killed, I will give an account of one of the many "drives" in which I participated during a six months' residence on the Island of St. George.

At two A. M. I was awakened by the "Nirachic" (the native foreman) coming into my room; he came to tell me, that two men had just arrived from the "Starrie Artiel," a beach three miles from the village, with reports that great numbers of young seal had come ashore, were very well spread over the hill-side, and that the wind was blowing in from the sea, so that there would be no danger of their scenting our approach. On getting up, and finding that the weather was damp enough for our purpose, I gave orders to wake the people of the village, and prepare for a drive. In ten minutes, the driving party, consisting of twenty men, were assembled near my house, armed with long, heavy clubs, which are the only weapons needed in encounters of this kind.

It was a northern summer sunrise; but a rising gale swept in fitful gusts great banks of thick, wet fog over the island. For a few minutes it would be clear, so that points at a mile's distance could easily be seen; and then again, rushing over, mingled with the wail of the wind, the fog covered everything, in a cloud so dense as to render objects only a few feet removed wholly invisible. We started in Indian file, with the "Nirachic" leading, at a half run, along a narrow rocky path, over the cliffs to the seal beach; now skirting their edges, so that we could hear, hundreds of feet below, the wild dash of the waves against their base; and now plunging into deep, narrow valleys, which, retaining the mist, were almost wholly obscured in darkness. The natives leaped from one wet and slippery rock to another, with the agility and certainty of a chamois among the Alpine hights; the fear of slipping being entirely obviated by the use of leather made from the flippers of the Sea Lion, for the soles of their boots—this leather possessing an adhesive power almost equal to that of a fly's foot. A half-hour's run brought us to the hills overlooking the beach. It was wholly obscured from sight, but up from the abyss rose the moaning and bellowing of thousands upon thousands of seals; the wild surroundings made it seem like the cry of lost souls in Pandemonium. The "Nirachic," followed by his men, crept softly to that point where the low, wide beach began to slope up into the hills; then suddenly, starting up with a shout, and waving their clubs in the air, they ran, following each other at a hundred or more feet apart, along the line made by the base of the hills; the seals, scattering in all directions, were either driven down on to the beach, or up the hill-side, between which and the beach a cordon of men was soon formed. The line of men then began to advance up the hill-side; the poor seals leaping or rolling along, but still making their way with considerable rapidity, were urged farther and farther from their refuge, the water. When they had been driven about a quarter of a mile, this huge drove, which must have contained over six thousand, was divided into ten smaller ones; two men were assigned to each of these, with orders to drive in different directions to the village. The reasons for this were, that in order to drive seals any considerable time, or distance, the earth has to be very damp; and, as they absorb much of the moisture out of the ground over which they pass, in a very large drove, those in the rear would have to go on dry ground; but, by being so separated, they all have nearly an equal chance.

Having been fully started, these droves were easily managed. The seals were allowed to rest after every two hundred feet of distance made; they never moved except when urged by means of shouts, and waving of clubs, and then in exactly an opposite direction from their drivers. It took about three hours to bring them to the settlement, so that it was six o'clock when they arrived there; and all the inhabitants of the village came out to meet them; partly to estimate from the number of seals what their individual gains were to be, and partly also to relieve the drivers, and allow them to get breakfast, before the killing commenced.

The spot chosen for the killing was a little valley, near the storehouse. Here the various droves were united, and the drivers, having refreshed themselves, by breakfasting on some of the young ones that they had killed at the beach and brought in on their backs, now prepared for action. Some two hundred seals were divided from the main body; and having completely surrounded them, the men contracted the circle, driving the seals as they did so into the center.

Then began the work of destruction. The seals were heaped one on the other, in their eagerness to escape from the death that threatened them on all sides; while the men struck at their heads with long clubs, and at almost every blow a seal would leap into the air, with a painful moan, fall to the ground, convulsed in agony, and quickly die.

So much actual strength had they, however, that sometimes a seal would seize one of the clubs with his teeth, and wrenching it from the hands of the man who held it, toss it, by a turn of his head, more than thirty feet. In a few minutes, all those under three years of age were killed, and those over that age driven off to find their way to the water as best they might. All the men, women, and children then came; and each, taking a seal, worked with such rapidity, that soon the skins had all been taken from those that had been killed. In this way another and another portion were taken from the great main body, until in the evening it was all exhausted, and the ground for over two acres was covered with bare white bodies, which, in the dim, stormy twilight, reminded one of a field of battle after a day's combat.

The skins were brought to the storehouse, counted, and each head of a family accredited with the amount that he and his household had taken. The next morning the skins were salted, and having remained in pickle five days, were taken out, rolled in bundles of two each, and were then ready for shipment.

The ground being so rocky, it was impossible to bury the seals' bodies, and to throw them into the sea would cause all the living seals to forever abandon the island; so they were allowed to remain, the natives only taking off enough of fat to supply them with oil, for food and light. At the end of the season, there were many acres of putrefied carcasses, which "reeking up to heaven," brought dire vengeance upon their destroyers, as the list of mortality all too clearly showed. Yet if the seals cause the death of the Aleuts, they are also absolutely necessary for their subsistence, as the islands produce no vegetables whatever; and the inhabitants are obliged to depend entirely on what is brought there for trading purposes. For meat, they use the seal, fresh in summer, salted in winter; varied perhaps, now and then, by a gull or loon; but the means of supplying themselves with the latter are so very inconstant, that were the former frightened away by any mismanagement—which has frequently been the case at other localities—the Aleuts would be also obliged to desert the islands, leaving them as barren and isolated as they were fifty years ago, when the Russian first brought men to reside there.

The number of seals killed on these two islands has averaged, for the ten years preceding 1868, a little less than one hundred thousand annually; and with proper management, this could probably be continued indefinitely, as the yearly increase far exceeds that amount. During the summer of 1868, or the first year that the country came under American rule, there were over two hundred and sixty thousand killed. Last year, although there was an act of Congress forbidding any one even to land on the islands, except by permission from Government, there were nevertheless, more than thirty thousand seals destroyed; the law being enforced and evaded in a manner that is peculiar to America, and which calls loudly for a Civil Service reform.

There are several bills now before Congress, each advocating a separate theory, but all uniting in the wish to preserve the fisheries. The one most feasible, and which will probably be adopted, is that of leasing out both islands, for a term of years, to responsible parties; allowing them to kill a certain number annually; obliging them to take paternal care of the

Aleutian inhabitants; and holding them accountable for any infringement of its provisions. In this way, the Government may derive a revenue, varying from one hundred thousand to three hundred thousand dollars annually.

The great market for these skins is London, to which place they are all shipped, via San Francisco, or the Hawaiian Islands; the price varying, according to demand, from fifteen to twenty-eight shillings each. In order to reduce them to the state in which they are usually seen, they have to undergo a long process of cleaning, cutting, and dyeing, which is to American furriers—if their claim that it was formerly done here be a true one—a "lost art;" for certain it is that nowhere outside of England is it understood; and even there it is held as a monopoly by a half-dozen business houses. The skill required to remove the long hair that covers the fur, is only obtained after years of practice, the operation being an extremely delicate one. The skins are placed on frames, and the inner surface pared off, until the roots of the hair are completely severed; while the roots of the fur remain untouched, on account of their nearness to the outside surface. The hair is then very easily removed, and the light yellow fur made ready for dyeing, either to a more golden yellow, a dark purple, or black; and is afterwards brought to the general fur market.

[For the Scientific American.]

DEFORMED FEET AND SHOES.

BY DUFF CHILD, M.D.

Were any person to assert that at the present day our enlightened people are addicted to producing a deformed condition of the feet in both sexes to a more culpable extent than are the Chinese in the feet of their women alone, the declaration would no doubt be pronounced utterly untrue; yet the averment is certainly susceptible of proof, as the writer hopes to be able to show clearly.

Chinamen of the wealthier classes, it is well known, bring the feet of females to a size and form to correspond with their ideas of beauty by confining these members in an unyielding shoe, the dimensions of which are not allowed to be increased from early childhood to adult age. Our people, although they increase the size of the shoes worn, as their children advance in years, shape the foot covering after a form very far differing from the natural outline of the human foot, and thus drive it from its proper form, entailing suffering and deformity upon the mature years of their offspring. If what has just been written can be proved to be true, then my proposition at starting is correct—the Chinaman is less culpable for his efforts to render his child more beautiful, in his eyes, than we are, who deform our children's feet through ignorance, thoughtlessness, or neglect.

To begin the proof of assertions made, some description of the malformations which exist in the feet of our people may be given. Every adult in our country has noticed in others, or been painfully conscious in his or her own person that a troublesome and ugly protrusion or knob has appeared at the joint where the great toe joins the body of the foot, when the age of twenty-five has been attained, and frequently at a much earlier period in life. It is, furthermore, equally apparent that with persons of mature age the little toe has become a dwarf—is a mere rudimentary appendage of the foot—while the remaining toes are crooked, and thickly studded with the callosities called corns. Particularly, though, at the main joint of the great toe is the acquired deformity plainest to be seen. This joint is invariably found in a condition called *hypertrophied* by medical men, and is, very commonly the seat of a painful and troublesome affection, the bunion.

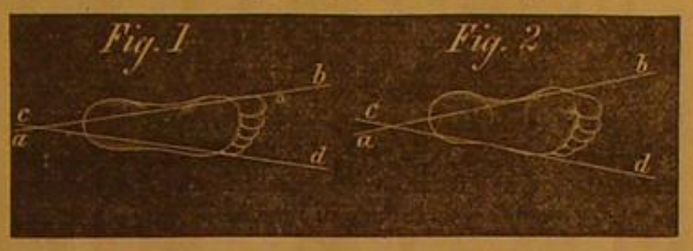
The writer assumes—and slight examination will show his assumption to be warrantable—that the natural form of the human foot is met with, in white people of the United States, only in children whose feet have not been much accustomed to the restraint of shoes; and the departure from this normal state is rendered strikingly evident when the foot of an adult is placed side by side with the feet of such children. Probably in no grown up white person in our country could an example of this normal foot be found; but in Indians, where little or no restraint has been applied to the member in wearing the soft moccasin or deer skin covering, the same typical outline that prevails in the undeformed feet of young white children is seen. A good illustration of the truth of this statement is to be met with in the remains of the tribe of Choctaw Indians living in the forests and around the towns and cities of Southern Alabama and Mississippi, who still adhere, for the most part, to their national style of foot covering.

Two figures are given in order to furnish the reader with a clear idea of the difference between the form of feet invariably seen in white adults, and what that form ought to be, as we find it exemplified in the feet of Indians, and of children of two or three years of age. The first cut represents what is claimed to be the proper normal shape of the human pedestal, the second plainly shows the commonly seen departure from that form. By the foregoing figures it is hoped that the remarkable and unwarrantable difference between the form of feet of children and adults has been clearly demonstated.

We next come to showing the cause of deformity which exists, and whether or not the change in the feet of adults would take place naturally through use and progressive development, even though the restraint of shoes had not been applied from childhood; and the question naturally suggests itself—Is this malformation due to a faulty fashioning of the shoes commonly worn by our people? Now, the fact that with grown up, and even aged Indians, who have not adopted the customs of the white race, as well as with children, no deformities, such as have been described, are to be found, ought to be conclusive evidence that the peculiarities in the feet of our men and women are not from natural causes. That the wearing of shoes should the great deformity met with in the feet of the entire American people be attributed, and not merely to the wearing of too tight or too unyielding shoes, but to their being wrongly shaped—too pointed—is the trouble or ugliness due.

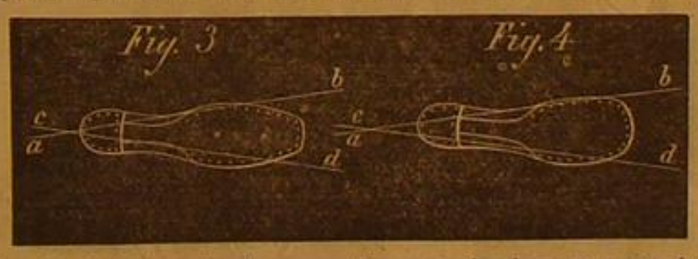
An attempt will now be made to show that the fault in the shape of all shoes manufactured in this country lies in the toe extremity alone. By comparing the two figures given below it will readily be seen how different a relation the lines, *a b* and *d c*, have to the points of the great and little toe in the respective cuts. Further, it will be seen that, in Fig. 1, the straight line, *a b*, passes through a point near the middle of the heel, over the internal margin of the joint where the great toe joins the body of the foot, and touches the inner side of the great toe for its entire length. Now, this line, *a b*, can be drawn through the same points on the sole of any undeformed foot; but the same will not be the result if an effort be made to describe it upon the sole of the foot of any adult white, or upon the sole of any shoe made after the style worn at the present day. The same remarks will apply to the second line, *c d*, in Fig. 1. This demonstation will serve to show that the soles of shoes, and consequently the upper leathers, are not fashioned in accordance with the natural outline of that portion of the body they are designed to cover—that they are too much drawn in or curved to a point where the toes must rest, particularly on the inner margin; they, therefore, must necessarily produce the deformities, which have been mentioned—must cramp the toes, give rise to disease in those members, and to a lack of freedom or ease in walking.

That these facts may be made more evident, a representation of the sole of what the shoemaker would probably term, a well shaped and roomy shoe, as shown in Fig. 3.



It will be seen that the lines, *a b* and *c d*, miss the points where the ends of the great and the little toes rest; therefore, in the wearing of such a shaped shoe it is quite plain that these two toes must be forced towards each other—must crowd the intervening toes and allow no room for their spreading apart, as they have a natural tendency to do, when extended or bent backward, as they are at the completion of each step.

A shoe, such as will allow sufficient room and proper freedom of motion to the foot, and will not give rise to deformity, must, it is contended, be shaped on the bottom, its most important part, like that in Fig. 4, which represents the shoe



for the left foot; furthermore, the upper leather must not, in making the shoe, be drawn so tightly across the toe of a thin last, as is the usual custom.

It is hoped that those who read this article will be convinced that the manner in which shoes are fashioned is a matter of importance not only to themselves and their children, but to the public at large. The writer has no private end in view in calling attention to the subject. His object is attained if he has placed the evils resulting from the wearing of carelessly and improperly shaped shoes in such a light as to attract attention; thus insuring the discontinuance of a barbarous custom now in vogue amongst our people. The subject is of importance, not only in relation to our health and the comfort in which we can discharge daily duties requiring constant use of our lower limbs, but it affects also the sale of shoes manufactured for traders in this class of clothing. The opportunity for selling thousands of pairs of boots and shoes is lost annually through a want of attention on the part of manufacturers to some points mentioned in this article. A large amount of the shoes now manufactured will fit, or can be worn by no one past the age of thirty years, no matter how careless he or she may be of appearances or comfort.

The subject has, in one sense, even a political bearing which has been recognized to a certain extent by our Government and those of other countries. To illustrate what is meant by the last remark, the writer will state that during the late civil war he saw a large portion of an entire brigade of soldiers rendered unable to keep up with their command on a rapid march, owing to their feet having been bruised and excoriated by their attempting to wear some very pointed shoes of English manufacture, which had been issued to the troops a few days previous to the beginning of the march. These sufferers, however, missed, through this accident, participation in a fearful battle which was impending, and their absence, no doubt, greatly influenced the result of that conflict. So the matter of ill fitting shoes concerns not only the private citizen and tradesman, but the warrior and statesman likewise.

Vignetting Glass.

A very easy way of making vignetting glasses photographically, and better, we think, than that suggested by Mr. Henderson, is, to place at a window a piece of dark paper of any suitable size, with an oval, pear-shaped, or other outlined hole in it, In front of that, and at a distance, to give a proper shading of light, hang, or secure in any convenient way, a piece of white tissue paper. Now set up your camera, and take a picture of this shaded light spot. To secure very great softness of shading, the tissue paper may be moved backward and forward between the lens and the hole in the paper. You will thus obtain a negative from which you can make any number of vignetting glasses. These could probably be printed so as to be most efficient on dry plates.—*Anthony's Photographic Bulletin.*

[For the Scientific American.]

COMPARISON OF THE REFRIGERATIVE EFFECTS OF THE CARRE APPARATUS AND COMMON ICE.

By referring to the following tables, the immense economy realized in producing cold "dry" air by artificial refrigeration, over low, "humid" temperatures, obtained by the melting of ice, is most forcibly illustrated.

A No. 3 "Carré apparatus," the producing capacity of which is 5 lbs. of ice per minute, constructed by Messrs. I. P. Morris & Co., at the Port Richmond Iron Works, Philadelphia, yielded the following wonderful results, a short time ago, in presence of Professors Morton, Booth, Tilghman, and other scientific men, who had been invited to witness its operations.

The temperature of a closed room, measuring 3,375 cubic feet was raised to 80° Fahrenheit by means of a stationary steam heater placed in it. A blower commenced to force cold air into this room from the refrigerating apparatus

TIME.				
At 1'30	when the thermometer stood at	80°	Fahrenheit.
" 1'21	"	"	"	76°	"
" 1'22	"	"	"	66°	"
" 1'23	"	"	"	58°	"
" 1'24	"	"	"	53°	"
" 1'25	"	"	"	50½°	"
" 1'26	"	"	"	48°	"
" 1'27	"	"	"	46°	"
" 1'28	"	"	"	45°	"
" 1'29	"	"	"	44°	"
" 1'30	"	"	"	43°	"
" 1'31	"	"	"	42°	"
" 1'32	"	"	"	41°	"
" 1'33	"	"	"	40°	"
" 1'35	"	"	"	39°	"
" 1'37	"	"	"	38°	"
" 1'40	"	"	"	37°	"
" 1'44	"	"	"	36°	"
" 1'47	"	"	"	35°	"
" 1'56	"	"	"	34°	"
" 2'05	"	"	"	32°	"

During the trial, two glasses, one containing cold, and the other hot water, were placed at the opening of the inlet which conveyed the cold air into the room; the content of the first was frozen to three eighths of an inch thick in 12 minutes, while it required but 23 minutes to effect the same result with the latter, which had originally been at 140° Fahrenheit.

At the close of the operation, the thermometers of the cooling box indicated fully as low temperatures as at the commencement, proving conclusively that the apparatus could indefinitely produce the same results. It is worthy of note, that the steam heater was likewise cooled down to the temperature of the room.

The total amount of steam employed to supply heat, motive power, and water for the operation, was equivalent to less than 5-horse power.

On the following day the same room was heated to 80° Fahrenheit, and the temperature then lowered to 46° Fahrenheit by melting Portland ice.

The results obtained were as follows:

TIME.				Fah.
At 2'31	when 1,054 lbs. of ice were on the scales the temperature was	80°
" 2'36	" 1,045	"	"	74°
" 2'38	" 1,038	"	"	70°
" 2'39	" 1,029	"	"	67°
" 2'43	" 1,034	"	"	62°
" 2'46	" 1,013	"	"	59°
" 2'51	" 1,012	"	"	56°
" 2'53	" 960	"	"	52°
" 3'05	" 918	"	"	49°
" 3'15	" 935	"	"	48°
" 3'22	" 920	"	"	48°
" 3'25	" 907	"	"	47½°
" 3'30	" 900	"	"	47°
" 3'46	" 880	"	"	46½°
" 3'55	" 888	"	"	46½°
" 4'32	" 815	"	"	46½°
" 4'58	" 760	"	"	46¼°
" 5'00	" 754	"	"	46°

At this last point, it would have required such an increased quantity of ice to lower the temperature that the experiment was abandoned.

This last trial shows a loss of 300 lbs. of natural ice to reduce the temperature of a room from 80° to 46° Fahrenheit in 2 hours and 26 minutes, which effect in the first trial had been obtained by Carré's apparatus in 7 minutes, with the same quantity of cold required to form 35 lbs. of ice; thereby showing that eight times as much ice were consumed to produce the same quantity of cold air as was supplied by the apparatus.

In both instances the room was placed under identical conditions for the comparative tests, the outside temperature having been perfectly excluded.

It is, therefore, evident that Carré's process, properly applied to industry, must entirely supersede the old system heretofore employed of melting ice, which only produces humid air, in such establishments as breweries, packing houses, oil, paraffine, salt and chemical works, and in other industries too numerous to mention.

From the above data, it may be safely calculated that *Carré's large and medium-sized apparatus can yield for from twenty cents to thirty cents the same quantity of "dry" cold air as is given out by melting one ton of natural ice.*

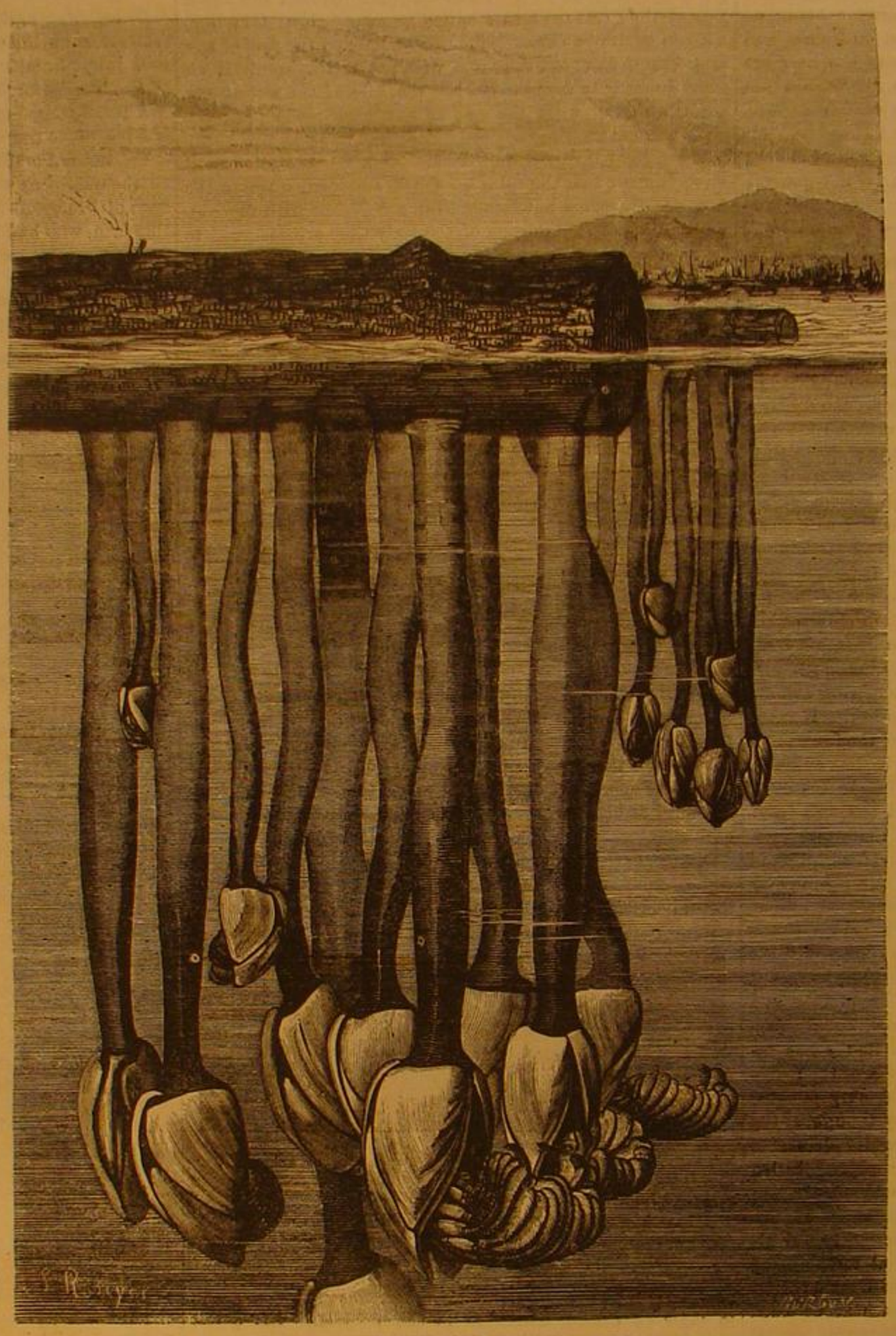
The Carré system being based on the chemical action of affinities does away with the intervention of immense exhausting and compressing gas pumps, which necessitate the aid of powerful steam engines and boilers. Moreover, the introduction of Carré's apparatus into industrial establishments, can in no manner vitiate the policies of insurance, the frigorific agent employed, *aqua ammonia* being a "fire extinguisher," they can be worked with as little pressure and as great safety as steam machinery.

M. J. BUJAC, Agent for Carré Ice Machines,
No. 17 Broad street, New York city.

BARNACLES.

We give this week an engraving of a group of barnacles —a most accurate representation.

It requires a good deal of faith to believe that barnacles are related to crabs, for they are not the least alike, and the first is fixed like a shell-fish on to pieces of timber floating about in the sea, or to the rocks washed by the tide; while the last has legs, claws, eyes, and the power of moving and swimming. Yet it is quite true that the barnacle belongs to the same class of animals that includes the crabs, shrimps, and lobsters. If a piece of rock is put into a large glass full of sea water, many things may be seen on it which are of a white color, and whose shape is something like that of a thimble with the top battered in. If they are examined it becomes evident that the conical outside is formed of several little bits of hard shell joined together very carefully, and that the top has a valve in it. When the water is quite clear and quiet, a small flapper is forked out through the valve, and is moved to and fro with a motion like that of opening and shutting the fingers. The flapper has some long bristles attached to it, and they are beautiful, feathery-looking things, when examined under a microscope. The movement goes on for hours, and ceases upon the least alarm. Then the flappers are withdrawn, the valve closes, and the barnacle—for such is the creature—looks again like a conical piece of stone. The flappers are the lungs as well as the hands of the barnacle, and minute living creatures are entangled by them and passed by a current of water into the mouth which is within the shell. When the barnacle produces its eggs, it ejects them with a stream of water, and they float about in the sea, being very minute things. They soon become hatched, and then it is that the reason becomes clear why barnacles and crabs are placed by zoologists in the same class. The young barnacle is just like a shrimp, with a long body, many long legs close to its head, and a large tail; it has eyes, and swims about most vigorously. It appears to be constantly in movement, and although actively employed in swimming and in crawling, it does not care to seek for food. After a while the young free-swimming creature rests upon a piece of rock, or wood, or even on the back of a fish, and then a wonderful alteration takes place. The long legs and feelers near the head grasp the substance on which the creature is to live for the future, and a gummy substance comes from a gland which has been growing for some time close to the head. The gum sticks the legs and the feelers to the substance, the eyes diminish in size and are no longer seen, the tail and the hind legs grow into the feathery flappers already noticed, and the shell of many pieces incloses all. The barnacle is then fixed for life, head downward, and it loses its organs of sight, and receives a mouth and stomach, which it had not before, when in the free-swimming state. All barnacles do not undergo this change, for the males of some kinds live inside the conical house which holds the female, and never have houses of their own, for they remain in the free-swimming state. All the animals of the crab class have to undergo a change of form before arriving at maturity, and the common shore crab, when it is first hatched, is a long thing with a great head, and legs fitted for swimming, and not for crawling. As it grows the body shortens by curling the tail end underneath, and the legs and claws grow out of the swimming apparatus. Some of the barnacles that live on coral reefs are very beautiful, and their shells are ornamented in imitation of the flower-like polypes of the stony madrepores.



FORMATION OF BARNACLES.

The accompanying illustration will give the reader a good idea of the appearance which a family of barnacles presents, clinging to the under surface of a floating log.

The Australian Gum Tree in America.

A plantation of the Australian gum tree, Eucalyptus, is growing finely in Castro valley, Alameda county, California. It covers fifty acres of ground; the trees are planted in rows eight feet apart each way, making a forest grove of 39,000 trees set this season with one-year old seedlings of the blue gum and iron bark, the most vigorous and tall-growing varieties of the Eucalyptus.

The largest of these trees are but five years old, erect, straight, vigorous growth, and fifty feet high. They are elegant ornamental trees, somewhat resembling the laurel, but more majestic and massive in figure and foliage. They are hardy throughout the lower hill and valley country of California, and are the most popular street-shade and ornamental trees cultivated there.

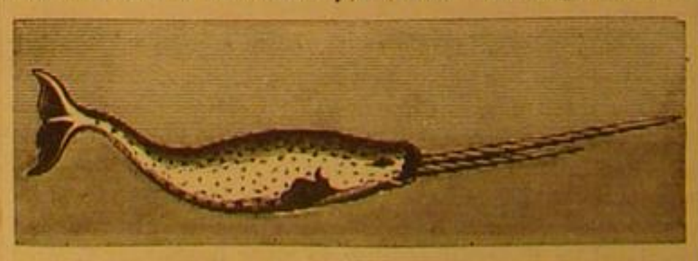
The wood of the Eucalyptus is hard, and the timber useful for many purposes. Their peculiar flavor and fragrance being disagreeable to animals, keep them from being eaten or gnawed. Hence the gum trees can safely be set where other sorts of trees would be destroyed. The past winter has been severely frosty, but not one of the tender little trees in this grove has been killed.

A great variety of Australian shade trees of exquisite foliage have been cultivated in California with entire success. They are very hardy, and might be safely introduced in Central Park.

THE NARWHAL OR SEA UNICORN.

Mr. William Bradford, the well-known artist of arctic scenery, on his return from his last voyage, brought with him several horns of the narwhal. Upon a recent visit to his studio in Tenth street, this city, we were shown several specimens, and we herewith give an engraving of one of these curious creatures.

The narwhal, or sea unicorn, an inhabitant of the arctic seas, is a huge cetacea, bold and active, armed with a powerful and terrible instrument of attack. It grows to a length of from twenty to thirty feet, and has projecting from its snout a sort of great halberd, a long sword of ivory, spirally drawn to a point. This enormous tusk springs from a socket in the maxillary bone of the upper jaw, and measures often six feet from the end of the snout. This weapon used formerly to be called the unicorn's horn. There are two preserved in the Museum of the Faculty, in Paris—the larger is six or



seven feet long, and at the base measures twenty inches in circumference. These tusks were formerly part of the treasure in the Abbey of St. Dennis. With what object these unicorns horns were preserved by the abbots we are not informed.

The corresponding tusk in the lower jaw is never so much developed and frequently remains hidden in the jaw.

The narwhal is of grayish white color with white spots, which seem to penetrate the skin. In the stomach of one the arm of a cuttle fish was discovered and also pieces of flounder. Scoresby relates that during his voyage to Greenland he met with great numbers of these animals, which swam near the vessel in troops of fifteen or twenty. Most of them were males; they seemed very lively, and often lifted their weapons above the water as if "presenting arms." They produced a most extraordinary noise, resembling the gurgling of water in the throat.

Most of the troop followed the ship, and seemed led by curiosity. The water being transparent, they could be seen dipping down as low as the ship's keel and playing with the rudder.

The Rule of the Road.

As the sinking of the United States corvette *Oneida*, by the Peninsular and Oriental steamship *Bombay*, has reopened the vexed question about "The Rule of the Road," which means how to handle ships when a collision is imminent, it may be interesting, says the *Shipping and Commercial List*, to know the import of the lawful regulations which govern in such cases. By consulting the "Regulations for the Government of the United States Navy," issued under the authority of the Secretary of the Navy in 1865, we find this rule laid down in Article I. of Section 2:—"In the following rules, every steamship which is under sail, and not under steam, is to be considered a sailing ship; and every steamship which is under steam, whether under sail or not, is to be considered a ship under steam." And Article 13, "If two ships under steam are meeting end on, or nearly end on, so as to involve risk of collision, the helms of both shall be put to port, so that each may pass on the port side of the other." The next section reads: "If two ships under steam are crossing so as to involve risk of collision, the ship which has the other on her own starboard side shall keep out of the way of the other." According to the testimony elicited on the trial of Captain Eyre, at Yokohoma, these last two rules cover the case of the *Bombay* and *Oneida*, and it would seem that they were obeyed by the British ship and not by the American; although that is no excuse for the criminal desertion by the captain of the former of the drowning officers and crew of the latter. The same rules are recognized in the English, French, German, and probably other marines; but it would seem that they are not always infallible. Thus, a correspondent of the London *Shipping Gazette*, who has spent a long life at sea, says experience shows that the adoption of the imperative rule of port helm for the safety of ships meeting in opposite courses is only a "theoretical problem," and "too often fraught with great danger;" that, "as the direction of the wind and sea acting upon the hulls, canvas and spars, differs so widely, and can rarely, if ever, affect both ships alike, and as the rudder power so much depends upon these ever-varying circumstances, it is not possible for any such arbitrary rules to apply with more than problematical success." The writer maintains that "ships too often deviate from their courses, under the pressure of law, to court collision, when ordinary intelligence would have avoided it." He says, furthermore, that he "is prepared to show how two ships of different caliber, and in various positions of each other, one under low canvas and making slow way, the other going eight or ten knots, and, by both porting, collision shall ensue." If this be true, it would seem that a modification or revision of the Rule of the Road is an imperative necessity. While ingenuity has been almost exhausted in devising means for saving life when cast upon the waves, no reliable mothod has yet been devised to prevent the disastrous results of collisions of vessels sailing or steaming in opposite directions.

An Old English Patent.—It is said that the following is the first patent ever granted in England, for the preservation of food:—"A. D. 1691, Oct. 7, No. 278. Porter Thomas, and White John.—A grant unto them of the sole use, exercise, and benefit of their new invencon of keeping and preserving by liquors *or otherwise* all sorts of flesh, fowle, and fish, and many other things, either in pieces or in whole bodyes, at a cheaper rate, for many years in all clymates, without changing the nature, quality, taste, smell, or color thereof, as good, palatable, and wholesome, to be eaten and made use of for any intent and purpose whatsoever, as when first killed or put into such liquor; to hold and enjoy the same for 14 years, according to the statute." Can any modern patent beat this?

Wanted, a Durable Wash for Out-door Surfaces.—Mr. R. B. Carter, of Burlington, N. J., suggests that a cheap and durable wash for fences and out-buildings would meet with a ready sale, and find great favor with the agricultural public. Will somebody solve this seemingly simple problem and put money in his pocket?

SCIENTIFIC INTELLIGENCE.

RECOVERY OF SILVER FROM PHOTOGRAPHIC BATHS.

The *British Journal of Photography* recommends a very good method founded on the action of oxalic acid. Dissolve oxalic acid in water and render the solution alkaline by carbonate of soda; make the silver bath also alkaline in the same way and add to it oxalate of soda as long as any precipitate is formed; collect the oxalate of silver thus thrown down upon a filter, dry, and mix it with equal weight of bicarbonate of soda in a Hessian crucible, and expose to strong heat in a furnace. The reduction takes place easily, and the silver will be found as a brilliant regulus in breaking the crucible.

PHENYL PAPER.

This article would be useful for packing meat and other substances liable to decay. It can be prepared by fusing five parts stearic acid at a gentle heat, mixing well with two parts carbolic acid and five parts melted paraffine, and stirring until the whole has become solid, and applying the same manner as wax paper is made.

ACTION OF ARTIFICIAL LIGHT ON THE GROWTH OF PLANTS.

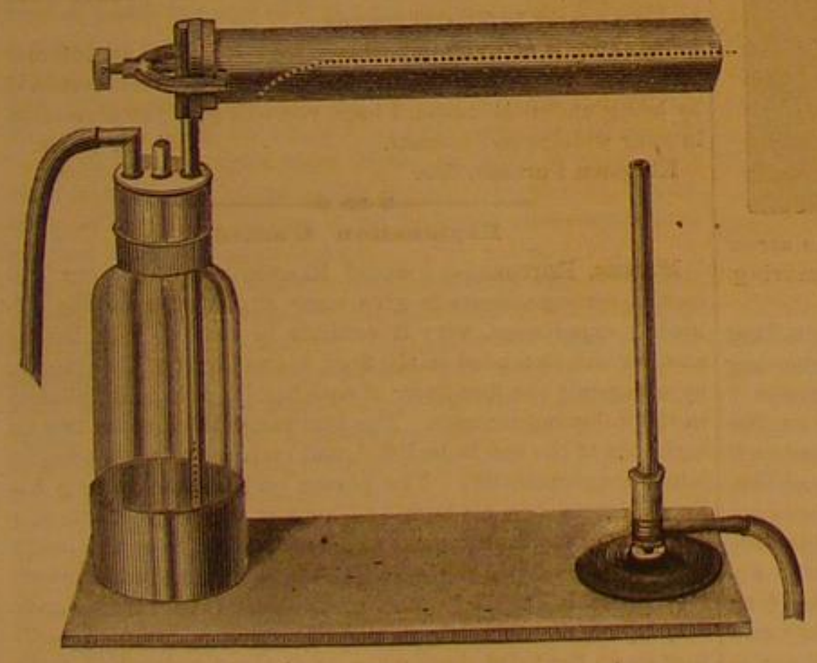
That plants would remain green in artificial light has long been known, but the action of this light upon the evolution of oxygen by plants has been less studied. Some experiments have recently been tried in France by exposing a plant immersed in water saturated with carbonic acid, to the direct sun light until eight or nine bubbles of oxygen gas were given off every minute. The vessel was thus brought into a dark room, and the plant was illuminated by the light produced by a magneto-electric machine; in the second instance seven or eight bubbles of oxygen also came off. The Drummond oxy-hydrogen light produced a similar effect.

TEST FOR COPPER AND IRON.

It is stated, in the *College Courant*, that an alcoholic tincture of logwood furnishes a test for copper and iron, of extraordinary delicacy; the hæmatoxylin combining with either metal, producing a pure blue color. By this test an appreciable result is obtained in water having only one per cent of iron or copper in twenty millions; and it will give an indication when galls or prussiate of potassa fail. When the water has been thus rendered blue, the coloring matter will precipitate in light flocks after several days, a deposit being thrown down when the water contains only one part of metal in five million parts of water.

OXYGEN GAS AS A REMEDY IN DISEASE.

Dr. Andrew H. Smith, of New York city, has recently published a pamphlet on this subject, from which we learn that oxygen gas is very largely employed in New York and elsewhere as a remedy for numerous diseases; and what adds very much to the value of the paper is that it contains the results of original investigations never before published. Dr. Smith first gives the history of previous researches, and then enters upon a description of the apparatus for the ready preparation and administration of oxygen. He prefers a mixture of chlorate of potash and black oxide of manganese for the evolution of the gas, as each ounce of the chlorate gives off 500 cubic inches of gas at a tolerably low heat. Dr. Smith has invented an ingenious portable apparatus to enable physicians or



nurses to prepare oxygen in the sick room in proportion as it is wanted. This consists, essentially, of a brass retort in the form of a cylinder, nine inches long and one and a quarter inches in diameter, resembling in shape a very large test tube. To the open extremity of this retort is fitted a cover of cast iron, held in place by a clamp which catches upon a projecting flange surrounding the mouth of the retort. This clamp is tightened by means of a screw. The accompanying diagram will give a better idea of the apparatus than any description.

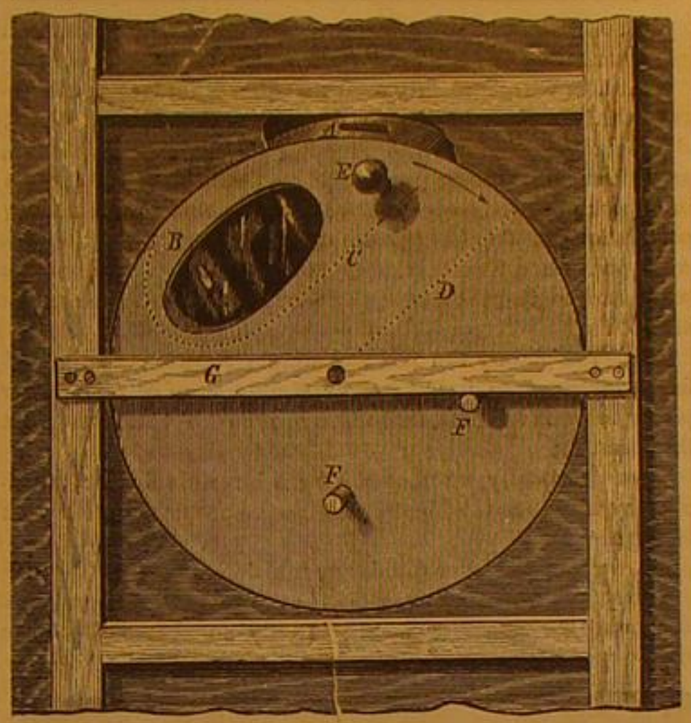
The retort is but half filled with the mixture of chlorate of potash and peroxide of manganese, and this quantity is distributed along its whole length to within an inch of the cover, thus leaving nearly one half of the diameter of the retort free for the passage of the gas. The heat of a Bunsen burner or of a powerful spirit lamp is employed, beginning first at the closed extremity of the retort, and moving it along as the material becomes exhausted. The wash-bottle is half filled with a solution of caustic potash.

An apparatus of this kind is not only adapted to use in the sick room, but, on a larger scale, would be better than a retort for making considerable quantities of oxygen. It would be less liable to explode, and the chlorate being exhausted from the further extremity, the liberation of the gas can be carried on gradually and under perfect control.

Dr. Smith details a large series of experiments, conducted to ascertain the physiological action of the gas. The subject belongs more particularly to medical journals, but we can give a recapitulation of the principal cases where benefit was derived from treatment with oxygen: Poisoning with charcoal gas and chloroform, dyspepsia, diabetes, headache, paralysis, consumption, asthma, chlorosis, cholera, and many other instances. The amount of oxygen that a patent can respire is a matter of astonishment, and its effect is to fatten, and to restore the bloom of health. There is a wide field for investigation in the use of oxygen, and Dr. Smith is entitled to great credit for the perseverance and skill he has displayed in prosecuting and publishing his researches. We trust that his example will be followed by others.

WORMOOD'S REVOLVING PAY BOX.

This is an apparatus for receiving the fares of passengers on street cars and omnibuses, in which the passengers themselves deposit their fares, in such a manner that the conductor can see whether the right fare is deposited or not; but cannot have access to the money or tickets deposited.



Such a device would compel honesty in the dealings of conductors with their employers, and if cheap and effective, and free from objections in practice, would be likely to be generally adopted by such corporations, as it is now known that large sums are constantly being lost through the peculations of the collectors of fares.

On refering to our engraving it will be seen that the general form of the box is that of a cylinder, and that it may be placed in any convenient position for the collection of fares, and the ready inspection of the same by the collector.

A is a small aperture through which the fares are put into the box. C is a curved shelf for receiving and temporarily holding the fare until inspected. This shelf is so arranged in the box as to prevent the escape of the fares into the space below except at one end, and the box must be turned on its axis one fourth around for the fare to slide on the shelf, D. When the box resumes its proper position the fare drops to the space below. B is a glass plate through which the collector can see what ticket or money has been deposited.

F F are stops on the box, which, striking the stop bar, G, arrest the movement of the box each way at the proper points. E is the knob for turning it.

It would seem that this is a convenient, simple, and efficient device for the purpose intended, and one likely to attract the attention of those interested in obtaining a check upon collectors of fares.

Patented, through the Scientific American Patent Agency, Feb. 8, 1870, by W. W. Wormood, of Dubuque, Iowa, who may be addressed for car and road rights.

Correspondence.

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

Cheap Oxygen.

MESSRS. EDITORS:—The process of obtaining oxygen from minerals is comparatively expensive; and as a way of obtaining it cheap is desirable, many persons have endeavored to discover a way by which it might be extracted from the air, one of whom, in an article entitled "Absorption of Oxygen by Charcoal," in No. 12, current volume, has hinted at an idea of his own (?) for procuring it by means of the unequal absorption of gases by charcoal. But our philosophical friend has communicated his discovery to us too late, as it has been practiced for nearly a year by M. M. Montmagnon and Delaire.

The method of obtaining it is by exposing charcoal to the air, and then saturating it with water. 100 liters of charcoal will absorb 925 liters of oxygen, but only 705 liters of nitrogen. On saturating it with water all of the nitrogen escapes, save 55 liters; while 575 liters of oxygen remain. The residual gas is collected by means of an air pump.

The gas thus obtained is comparatively pure oxygen; but if it is desired to make it free from all nitrogen it may be subjected to the same operation again, until the whole of the nitrogen has escaped. Oxygen, in large quantities, is prepared in this way very cheap; all that is required is the apparatus. The charcoal may be used in subsequent treatments, as it does not lose its virtue by the operation.

There are many other substances which absorb oxygen from the air; among which the most prominent are blood, phosphate and carbonate of sodium. These absorb about ten per cent more oxygen than nitrogen, and may be treated in the same way as charcoal.

Pittsburgh, Penn. CLARENCE H. DUPONT.

Organ-Blowing Machine Wanted.

MESSRS. EDITORS:—I wish, through your paper, to call the attention of inventors to a much-needed invention; namely, an apparatus for supplying wind to church organs so as to do away with the present inconvenient and vexatious mode of supplying wind, which is by manual power.

Machinery for this purpose has been invented and in few places is now in use, but the power used is objectionable. Fire is dangerous, inconvenient, and expensive; water is inconvenient and expensive: and as the force needed is very small, my thought is, that it may be provided in a clock movement of the lever kind, the power needed being less than one sixteenth horse-power; and as the working time of such machinery would not be required longer than from three to five hours, I think some such power may be provided as to meet every requirement.

I think some simple machine for this purpose "would pay" the inventor well, as the providing a "blower" is a constant annoyance to organists, of which there are some thousands in this country; besides which a really simple and efficacious adaptation of machinery for this purpose would be very valuable all over Europe.

Whoever thinks of this had better at once discard all thoughts of fire, water, or electricity, as the device must be cheap in its first cost (say, not more than about $200), and inexpensive in its working, as the salary of a blower does not average $80 per annum. W. H. FENNEY,

Organist of the Church of the Epiphany.

Philadelphia, Pa.

VERTICAL MULTIPLIER,

OR INCREASED MOTION OF WHEELS ON A SINGLE SHAFT, WITHOUT REGARD TO THE SIZE OF THE WHEELS, OR NUMBER OF THE COGS, AND WITHOUT THE USUAL LOSS OF LEVERAGE.

BY L. S. FITHIAN.

MESSRS. EDITORS:—I send you a perspective view of my machine in its simplest form, with diagrams illustrative of its operations. The machine was constructed to show the principle and fact, that the increased motion was not due to the size of the wheels, or the number of the cogs; each wheel in this model has seventy-six cogs; when A is turned once, D will turn three times, which is caused as follows: A and A 2d are fast upon the shaft, and the motion is of course the same one to one up to the center of *a*. All the rest are loose upon their centers; consequently *a* has two distinct motions, viz., one bodily around the shaft, and one rotary upon its own center.

The bodily motion of *a* would carry D around once; then if C were held at rest, this would cause *a* to revolve on its center once, which would be communicated to D making twice; then if C were permitted to revolve once in the re

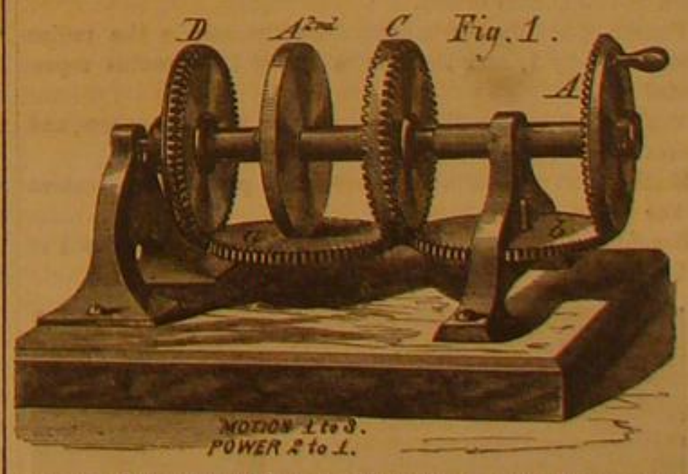


Fig. 1.

verse by the action of *b*, *a* would make a second revolution upon its own center, which would be communicated to D, making three, viz.: one by the pin or bodily motion of *a*, one by the inertia of C, and one by the reverse of C, making three, which may be decreased or increased as desired, this being the unit of the machine and its simplest form.

The claims of this machine are plainly and simply stated. That there may be no mistake, it is fully admitted, that they strike at and deny all of what are now known as the "laws of motion in mechanics."

The objections are all of one character, viz: that motion in mechanics is a governing cause of the loss of power, quoting the most concise and condensed expression of the "law of motion," "What you gain in speed you lose in power. 1 to 3—⅓ 1 to 4—¼," etc.

It has been before many of the most acute minds. There have been many to confidently repeat the old historic words "can't," and "impossible;" but these are not arguments or proofs, and have in fact been buried so often in the history of science, that they have a clear right to rest in peace, without a resurrection by intelligent men.

Only a few have ventured upon a demonstration, and not one of these has been willing to stand by his demonstration when examined.

For an objection as a last resource, the cry of perpetual motion has been raised by so many, that it might almost be said that this was the only real objection that could be brought against the claim of one half resultant power in this machine.

We propose to examine what there is in these objections.

It it admitted by all, that the only real valid objection to perpetual motion, is sharp and decisive, and may be stated in a single sentence, viz: "It is an effort to get an effect without a cause."

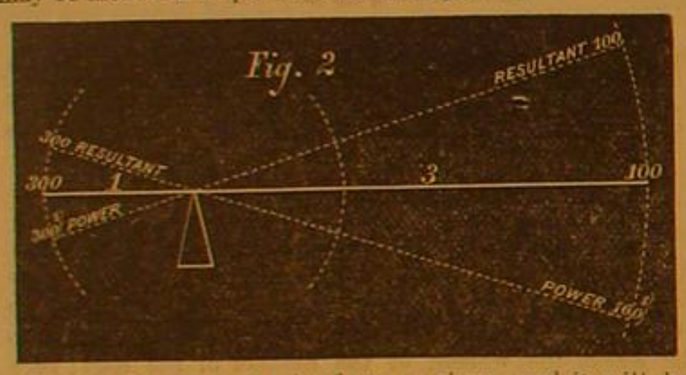
This being so, it follows, that the man must be *luny* or crazy, who makes levers or any mechanical device to get perpetual motion; they are all causes, and a cause is not needed. Then as every proposition must have its reverse which will be equally true with itself, what must be said of the person who starts the objection of perpetual motion when examining the claims of a machine that has levers and cause for all that it claims?

It would seem that an apology is needed for much that is written below. Each proposition is so simple in itself, as to be self-evident; and our only excuse is, that we find that terms and maxims that are in general use amongst men, which we supposed were used in the same way in which we use the terms "the sun rises," "the sun sets," not that we really mean that it rises or sets, but only appears to do so, are used as arguments, as though the very things were just as the language denotes. For instance, "What you gain in speed you lose in power," is an absolute truth or law with levers of the second order; but it has yet to be shown that it has the least standing room outside of, and away from uneven length levers, and still it is used as absolute law in any and every case. The "laws of motion" are quoted, as though there could be such a thing as law attached to a thing or condition which is always and in all cases a resultant or effect.

It has been said by some that even if motion is not a governing cause of the loss of power, it must be seen that motion is an absorbent of power.

This must be admitted by all, and as all altered speed or motion in mechanics is caused by levers or wheels, we propose to examine to what extent motion is an absorbent of power in mechanics.

Practically, force and resistance are the same thing, and may be measured in pounds and called powers.



Here is a lever, or wheels of one to three, and it will be plainly seen

First. That the 300 and the 100 are not the cause of motion; but on the contrary they are the cause of balance or rest.

Second. That any excess, however small, placed upon either end, is the cause of motion, and then that end becomes the power and the other the resultant.

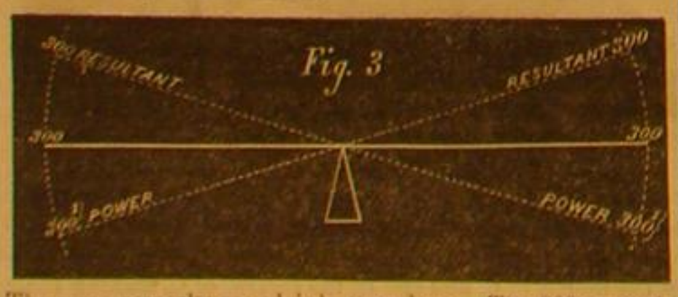
Third. That the excess remains upon the end upon which it is placed, and moves in the radius of that arm of the lever. For the purpose of illustration let us assume one, and place upon the short arm or 300.

Fourth. Then the 300 is carried by the one in the radius represented by 1, and the 100 is moved in a radius represented by 3

Fifth. That motion always commences with the excess, and ceases when it it removed.

Sixth. That motion is an absorbent of power to the extent of the excess and no more.

Seventh. That this would be equally true of levers of 1 to 4, 1 to 5, or any other number.



The same remarks are plainly true here. The 300 on each end of the lever are not the cause of motion, but are the cause of balance or rest; and any excess on either end makes them alternately the power and resultant.

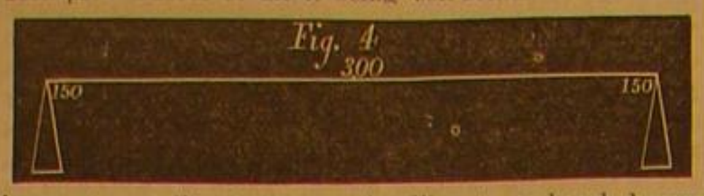
This is the plain intermediate of mechanics, and shows plainly that the mechanical maxim "that plain intermediates do not either increase or decrease power," is absolute law. Their simple function being to practically remove power from one point to another, and reverse motion, and may be used for either purpose alone, in which case the other is incidental and cannot be avoided.

An even length lever with a fixed stationary center or fulcrum, simply reversing motion, is always and in all cases a plain intermediate, and cannot in any way be made to gain or lose power.

But an even length lever can be, and is constantly used in a different manner, and to perform different functions: viz: a divisor or multiplier of power. It is given in the succeeding cut.

This is its most simple form. The power 300 is on the center, which it divides, and places one half upon each fulcrum or end, and it will be plain

First. That if the fulcrums be represented by hands upholding them with a power of 150 each, then it becomes an adder, and adds the two ends into the center. This is the best proved lever of all it being self-evident to the most



ignorant as well as to the most intelligent; and each knows with the most absolute certainty that he is lifting one half the power applied at the center.

Second. That if one of the fulcrums is left, and the hand applied to the other end, then with 150 down on the end and 300 upon the center, it is a divisor or multiplier of power by two, and is in balance thus:

And that the center and end become alternately power and resultant, as excess is placed upon either.

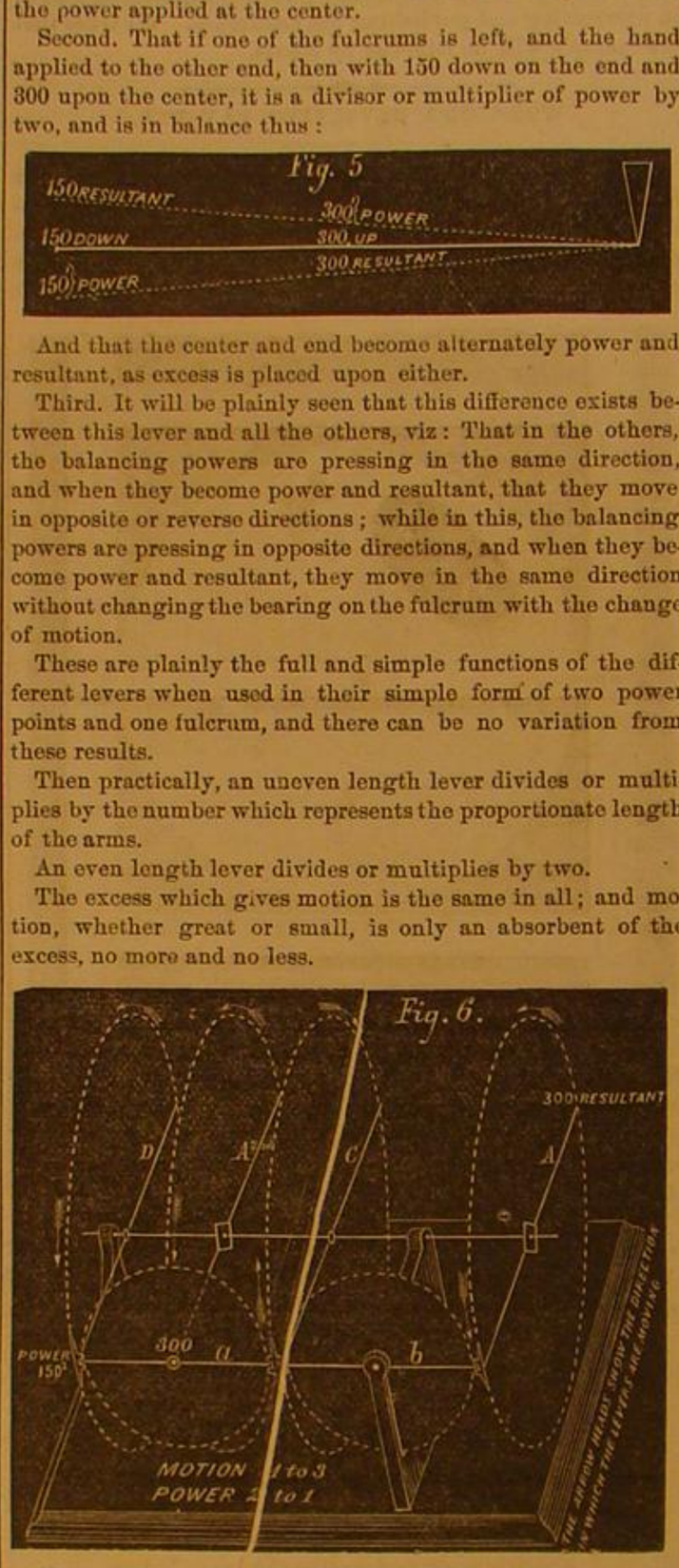
Third. It will be plainly seen that this difference exists between this lever and all the others, viz: That in the others, the balancing powers are pressing in the same direction, and when they become power and resultant, that they move in opposite or reverse directions; while in this, the balancing powers are pressing in opposite directions, and when they become power and resultant, they move in the same direction without changing the bearing on the fulcrum with the change of motion.

These are plainly the full and simple functions of the different levers when used in their simple form of two power points and one fulcrum, and there can be no variation from these results.

Then practically, an uneven length lever divides or multiplies by the number which represents the proportionate length of the arms.

An even length lever divides or multiplies by two.

The excess which gives motion is the same in all; and motion, whether great or small, is only an absorbent of the excess, no more and no less.



Above is a diagram of the "Vertical Multiplier;" the arrow heads show the direction in which the levers are moving And it will be plain

First. That the lever *b* is a plain intermediate with a fixed stationary center or fulcrum, simply permitting or reversing motion, which never is, or can be a gainer or loser of power.

Second. That the lever *a* is used with the power on the center up, and on the outer end down, and the other end on C is the fulcrum, which makes *a* a divisor or multiplier of two.

Third. That by the construction of this machine, no power can be applied to the center of *a*, but from the opposite side of the shaft or main fulcrum at A; and that none can be applied on the outer end of *a* but through D; and therefore when we call the center and outer end of *a* the balancing, and alternately, as any excess is placed upon either, the power and resultant points, it is equivalent to saying that D and A on opposite sides of the shaft are the balancing, and alternately, the power and resultant points of the machine.

Fourth. An examination of the bearings of the levers *a* and *b* on C, will plainly show that it is absolutely certain that no portion of the power applied to this machine ever reaches the fulcrum C through *b*, but only and alone through *a*; and that the amount applied through *a* when in balance, is always exactly one half the power applied on the center of *a* (or the opposite side of the shaft at A), and this one half (which is lost in the fulcrum or deadwood in other machines) by being applied to the movable fulcrum C, is the sole cause of the third revolution of D, and this must be a saving of that power lost, or a gain of one revolution in the three made.

Fifth. That balance and motion alone is controlled by and communicated through the lever *b*, and it has already been plainly shown that motion is not the result of the power applied, but of the excess alone which never leaves the lever upon which it is placed.

Sixth. That with 150 down on the outer end and 300 upon the center of *a*, the machine is in balance, and motion will commence with any excess upon either.

Seventh. That without the reverse of C, the motion of this machine would be one to two, and the power one half, the other half being lost in the stationary fulcrum C or dead wood. Then as C is reversed by this lost half and thereby a third revolution is gained, this is a clear saving of the half power lost, or a clear gain of one revolution by using that which is lost or thrown away in other machines.

Eighth. That if a machine is made with knife edged bearings, so as to do away with all friction, and does not balance with 300 and 150, then it is false or untrue in some particular. It cannot differ from its levers; these are its only causes; and we prove the truth and accuracy of balances with known tried weights.

This machine has been patented in the United States and in Europe by Messrs. Munn & Co. It has been put into practical use, and is now being applied to mowers and reapers. For further information apply to the owners,

Southmayd, & Co., 194 Broadway, N. Y.

Yield of Lead from the Missouri Mines.

Messrs. Editors:—Being a subscriber to the Scientific American, I beg leave to correct a statement in regard to the annual yield of lead by the Missouri mines, made on page 185 of your current volume, estimating it at *less* than 2,000,000 pounds per annum.

In 1819, Henry R. Schoolcraft visited this lead region, in the interest of the United States Government, then owning the mineral lands, and allowing them to be worked on pay ment of certain rents, to collect which cost far more than the amount collected. He estimated the annual yield at 3,000,000 pounds, and recommended a tariff duty of four cents per pound, on imported lead, to encourage mining and increase the production.

In 1855, Dr. Litton published in the first and only report made on the geology of Missouri, carefully collected statistics of the amount of lead made in the three counties of Franklin, St. Francois, and Washington, from 1841 to 1854, inclusive, showing the annual yield to have been 3,833,121 pounds per annum.

In 1854, Prof. J. D. Whitney, in his "Metallic Wealth of the United States," makes the following summary in regard to the Missouri lead mines: "Formerly more extensively worked than at present; not now of much importance." And in regard to mine La Motte, he says the "Granite is everywhere near the surface," and therefore intimates that the mines there are about exhausted.

Now for facts: Mine La Motte is yielding, and has been yielding, for years, constantly and largely increasing amounts of ore, and interests in the property have lately sold at a very high figure, and new energy and capital are being applied to the development of mining there.

The total yield of the Missouri lead mines for the year 1869 fell but little, if any, short of 12,000,000 pounds. Returns from a portion only of the furnaces of this (Washington) county alone show a production of some 3,000,000 pounds for 1869. This furnace started in August, 1866, and its annual production for 1868–9 has averaged nearly 600,000 pounds per annum.

In the very article in which the annual yield is estimated at 2,000,000 pounds, the receipts of Missouri lead are stated at 172,538 *pigs*, which pigs will average 65 to 70 pounds each, making nearly 12,000,000 pounds.

Thinking it of some importance that so large an interest as the lead production of Missouri should not be undervalued by being under-estimated, I hope you will give the correction in your widely-read journal. N. W. Bliss.

Kingston Furnace, Mo.

Explanation Wanted.

Messrs. Editors:— I would like some one of your numerous correspondents to give some explanation of the following experiment, viz: It consists in four persons lifting another one, extended on the floor, to the hight of their heads, by using only the *fore finger* of each hand. It is accomplished in the following manner. The four range themselves two on each side of the one to be lifted, and each with his *fore fingers* joined longitudinally. The person on the floor folding his hands, *extended* on his body and his feet crossed. Then at a given word the four persons expel all the air from the lungs through the mouth, at the same time stooping simultaneously, with their fingers extended for lifting, then rising again they inhale as much air as possible; this is repeated until they stoop the third time, when with the air expelled from the lungs they place the fore fingers under the body of the person, that is at the shoulders and knees and with the very slightest effort, he can be raised as high as their hands will reach, the person on the floor must also expel and inhale, but contrary to the others, that is, when they inflate the lungs, he expels the air from his, so that when they lift, his lungs are inflated as highly as possible, while theirs are comparatively empty. The heaviest of men may be raised in this manner by very weak persons naturally. A small close room is better for this feat, as it prevents disturbance of the air which is fatal to the accomplishment of the experiment.

C. H. Ladomus.

Chester Pa.

The True Meaning of Inertia.

Messrs. Editors:—There has been lately some discussion in your columns in regard to the term—inertia. Many writers upon mechanism make a wrong use of it, as it seems to me, and thereby confuse the ideas of the reader. Thus they will define it to mean "deadness," "want of power," "that perfect indifference which matter has to the state it may be in, whether of rest or motion;" and declare it to be an *essential* property of matter. After giving this correct definition they

will perhaps when speaking of motion, use such phrases as "overcoming the inertia of a body" when we apply force to it, or "the resistance offered by the inertia of a body."

Now the poverty of language may permit us to speak of "white black birds," and to say that "green black-berries are red," but we ought not to talk of *overcoming an essential property of matter.*

Would not a clearer view be given by presenting the subject something like this. Bodies may or may not have motion as a bucket or tank may or may not have water in it. In either case it is a matter of indifference, and as the tank offers no resistence to the reception of a few or of many drops of water, so a body will take without the least resistance a small or large amount of motion, and as a tank retains the liquid until something takes it away, so a body retains all the motion given it until it is transferred to some other body.

Then amplifying and illustrating the subject as far as necessary after this fashion, would not the learner get clear ideas of the whole subject of motion and force?

Terre Haute, Ind. R. S. BOSWORTH.

SCREW PILES.

It is a fact worthy of notice that although screw piles have been in use in England and the transatlantic continent for nearly forty years, they have scarcely been employed in France on any scale that warrants a description. This is the more difficult to understand since the value of the principle is universally recognized, and in many situations it would be impossible, in an engineering point of view, to obtain a foundation without them. It is, in fact, only since their introduction and the establishment of their advantages that certain structures, lighthouses for example, have been successfully erected on shifting sands, and other kinds of foundations, upon which, by the ordinary methods in use, no superstructure could have ever been erected. On the Bombay, Baroda, and Central India railway screw piles were employed as the means of obtaining a foundation in the numerous rivers crossed by that line. They were screwed down, sometimes by capstan power, at others by yoking native cattle to the end of a long lever, until they came to a firm substratum. Several of these properly braced together, formed the piers upon which the iron girders were placed, which were nearly all of a uniform span of sixty feet. Unquestionably one of the chief merits of the screw pile is its great suitability for rapid rivers, which sometimes during a severe drought are nearly dry, and which in flood time, roll down their waters with all the impetuosity of a mountain torrent. The screw pile not merely fastens itself firmly into the ground, but its comparatively small sectional area offers but little impediment to the motion of the stream. At the same time, it must not be forgotten that there are certain descriptions of substrata for which the screw pile is not adapted, and where it becomes necessary to seek a foundation by the employment of other means. We shall allude to this presently. The first application of the screw pile principle was made by the inventor, Mr. Alexander Mitchell, in the harbor of his native town, Belfast, where some buoys were successfully anchored in that manner. The light-houses at Fleetwood and the Maplin sands demonstrated a few years afterwards that the invention was likely to prove of great utility to engineers. The former of these was carried away bodily about a month ago by a schooner which ran into it. It was only the superstructure which fell, the piles remaining in their place. A large number of dock walls, jetties, breakwaters, and other engineering works have been erected solely upon foundations secured through the agency of these piles. A brief description of their advantages and suitability for the purposes of foundations will prove of interest to not only our professional readers, but to the amateurs as well.

A screw pile only differs from an ordinary one of timber, or cast or wrought iron, by being furnished at the lower extremity with a screw or spiral. The screw is of particular construction, as it is provided with only two or three turns, or more correctly blades, which are of different diameter. The upper of these has the greatest resistance to contend with, and is therefore of a larger diameter than the others, sometimes reaching the dimension of four feet. The pile being adjusted in either a vertical or inclined plane as required, a movement of rotation is imparted to the upper extremity, and the penetration commences. One of the chief merits in thus obtaining a foundation is that the pile does not dislodge the earth near and round about it, but bores its own way, so to speak, without disturbing the neighboring layers. Thus fixed in position, the pile can be used either as a mooring post, or as a portion of a pier upon which to erect a bridge, jetty, or other analogous superstructure. The screws are either cylindrical or conical, of cast or wrought iron, and the piles may be also of either material, or of timber. The employment of the latter in connection with the screw end is rare. According to the nature and consistency of the ground to be penetrated, so must the shape and size of the screw be proportioned. If the earth be of a loose, friable, easily penetrable character, a cylindrically formed screw will answer for the purpose; but if it be of a compact, tenacious description, it becomes necessary to use a screw in the shape of a cone. No screw, whatever may be its form and powers of boring, will penetrate into absolute rock; but the principle has been successfully applied in instances where the foundation was a bed of coral. It is manifest that the power required to get the pile down will depend altogether upon the nature of the ground to be penetrated As a rule, a capstan worked by manual labor is found sufficient. One of these machines with eight bars about twenty feet in length, each manned by five or six laborers, has been found capable of getting down a pile four feet in diameter, to a depth of fifteen feet in an hour and a half, in ground composed of sand, clay, and loose rock of a schistose nature. The conditions being the same, a period of two hours was sufficient to sink a screw pile to a depth of twenty-one feet. In cases where it is not possible to employ the leverage of capstan bars, that is where room cannot be obtained for erecting a platform, the head of the capstan is furnished with a wheel which can be worked by an endless rope or chain set in motion by a gang of men. Where the earth is very dry, screw piles can often be "got down" by very simple means. It sometimes suffices to fix to the upper end of the pile a rod with an eye in it to attach a short iron lever, and screw the pile down. This arrangement will only be available for short depths.

The especial advantages of screw piles are considered generally to have more relation to bridge foundations, than any other engineering works; but there is another very important application of the principle which we have as yet only touched upon. It relates to the anchorage of buoys, and mooring posts for vessels. Obviously the desideratum in this particular class of works is, that the hold or grip of the anchor should be a maximum. In other words, what kind of anchor will give the greatest resistance to a tensile strain, tending to cause it to drag, the anchor itself being of the least weight? It is a simple question of a combination of maximum hold with minimum weight. About twenty years ago some highly interesting and instructive experiments were undertaken with a view to the practical elucidation of this important point. Some of the best-made anchors, weighing two hundred weight, were dragged along the ground, by a force which produced no effect upon a screwed mooring, inserted to a depth of three feet, and weighing only eight pounds. Others weighing seventeen pounds resisted hauling better than anchors having a weight of nearly five hundred weight. The value of screw piles and moorings for lighthouse, jetties, breakwaters, and floating signals, and all structures exposed to violent hurricanes and sudden impactive forces, can scarcely be over-estimated. On this account they would be found very useful in stormy latitudes, for securely fixing telegraph posts, as it is the commonest occurrence in the world to hear of the telegraphic communication being interrupted in consequence of the posts being blown down. There is one more point relating to screw piles that deserves mention, although probably it is seldom brought into notice. It is the facility with which they can be "drawn." All that is necessary to accomplish this task, which with piles of a different description is a very tedious and laborious one, is to reverse the operation of getting them down—in a word, to unscrew them. It might be stated that when a pile is once down, it is not intended ever to come up again. This assertion is not quite correct, even for permanent works, and certainly incorrect when temporary works are considered. Piles are sometimes required to be drawn in situations when it has been thought that they were down "for good." In works of a temporary nature, where the piles are of timber, they are seldom permitted to be drawn, as the operation would disturb the foundations of the permanent structure, but are cut off near the ground level. If screw piles were employed in temporary dams and such like work, they might be drawn, as the unscrewing would scarcely affect the ground in any sense, and their comparatively small sectional area would still more lessen the chance of any danger. The piles might thus be used over and over again, and constitute a regular item of the contractor's plant. Perhaps the only description of ground that would be unsuitable to the use of these piles would be a stiff clay. The screw would get clogged and the labor of getting it down would be more than would compensate the other advantages. Hollow cylinders would be the proper substitute in such a case.—*Building News.*

What is Wanted in Modern Art.

If the Arts are to flourish among us, says John Ruskin in one of his Oxford lectures, we must recover for the mass of the nation three requisites which they at present want: 1. Wholesomeness of food. We must no longer allow them to eat and drink poison instead of food; everything provided for their daily sustenance must be good and pure as well as plentiful. 2. Wholesomeness and decency in dress. It must be such as becomes their rank — serviceable and good, and, at the same time, becoming and in good taste. 3. We must improve the lodgings. All ecclesiastical architecture is developed for civil and domestic building, and its highest achievement may be said to be a "glorified roof." Now, in this our modern architects are strangely at fault; they seem hardly to know what to do with a roof. Roofs ought never to be built of iron, but always of wood or stone. And we must remember that the little roofs must be built before the large ones. We must see that the poor have houses suited to them, built as strongly as possible, and daintily decorated.

All arts are founded on agriculture by the hand, and on the feeding, dressing, and lodging of the people. Christian art was only possible where kings and knights were compelled to care for their people, and it disappeared when kings became tyrants, devourers of the people. The health of art depends on its reference to industrial uses. It is from this use that it first arises. In order to eat and drink, we must have the cup and platter, and especially the cup. In order that we may use this cup conveniently, it must have a handle. To fill the cup, we must have a pitcher of some sort; this pitcher, if it is to be carried safely, must have two handles. Now in these same articles of use have been developed the most beautiful lines and types of severe composition that have ever been attained to in art.

We can not have any right architectural art, or morality, or happiness in cities such as now deface our country. They are not built, they are rather dotted and coagulated in shapeless, hideous blotches over the land which they consume. We must, if we would have art, have beautiful cities, not overgrown in size, encircled with gardens and shaded with trees; we must banish far from us all the manufactures which need the aid of huge furnaces of fire; or at least, we must reduce them to the smallest possible limit. At present England triumphs in her commerce; she is deaf with spinning-wheels, yet her children have not clothes to wear; she is black with fuel, yet they cry aloud for food; she has sold her soul for gold, yet they die of hunger.

Religious art cannot be used amiss if we remember that God inhabits cottages as well as churches, and that in the former as well as in the latter He ought to be well lodged. Put the Arts to universal use, and we shall find in them a universal inspiration and benediction; let everything be equally sacred, equally divine — Art will be divine wherever it is truly fair and serviceable. God has made everything beautiful in its kind.

Are Scraped Surfaces Indispensable?

In stating this question as broadly as we have done, we disclaim at the outset any intention of dispensing utterly with scraped surfaces, or of erasing from the vocabulary of mechanical technicalities this detail of the workshop. The doubt has arisen in our mind whether much of the time and elaboration expended on scraping iron surfaces might not, without injury to the work itself, be omitted. The value of a positively correct face on a valve seat or on the V-shaped ribs of a slide lathe or planer, is undoubtedly great when it is well done, but when poorly executed, the utility of it is, to say the least, questionable. We make the unqualified assertion that not one man in twenty is competent to finish a truly scraped surface. Scraping iron down to a perfect face is an art by itself, and comparatively little attention, so to speak, has been given to the subject in this country. The common method in use is to take an old file of any kind (except round or square), flatten its end out like a chisel, grind it up square on the stone, and then "grub" away on the iron wherever the workman sees fit. The chances are that previous experience has not fitted the operative for this branch of his business, and he mistakes a shade on the iron for a bearing and makes a depression still deeper by misapprehending the "situation." Of course the fallacy of attempting to make a true face in this way is manifest to every one familiar with the subject. It would have been far better to have saved the time wasted in such attempts, and trust to good planing and attendance in future to rectify inaccuracies.

The better way to make a scraper is to form it like a Venetian stiletto, or, more familiarly, after the model of the section of a beech nut; that is, to have the blade triangular in section, and approaching concavity. With such an instrument, properly tempered, ground, and sharpened, the finest work can be produced. A flat-faced scraper is an abomination, and only fit to dig holes or to rough out work for the triangular scraper; it is apt to make "chatters" in the surface; and when these occur we may bid a long farewell to any fine work without filing them out—a very pretty task to undertake after something like accuracy has been attained. Most scraped surfaces are nothing but a combination of scratches, shining blotches, and untruth; and while they are a waste of time to execute, they add nothing to the mechanical value of the work. We may fairly question whether valve seats up to 180 square inches of area, say 15 inches by 12 inches, are benefited by scraping. In some locomotive shops in this country it is the practice to plane the valve-seat so that the tool-marks on it run in one direction, and place the valve so that similar marks in it cross the seat at right angles, and to set the valves running in this way without further adjustment. The results observed are that in a few days the valve has made a seat for itself that is far more durable than if it had been badly scraped. We do not go so far as some persons, and assert that a scraped valve seat is a positive injury, insomuch that the pores of the iron are filled with an impalpable dust that works out to the detriment of the engine in future. This theory is very finely drawn, although it may be partly sustained by facts. A finely-finished mirror-like surface on a valve-seat or lathe shears is indubitably of great value, and we must, in common justice, give credit to English workmen for great skill in this particular; in general they far excel our own workmen.

There is no reason whatever to interfere with the execution of a finely elaborated scraped surface in our own shops; but our observation convinces us that time spent in doing such work as we have seen, might be better employed in some other way.—*Modern Practice of American Machinists and Engineers.*

THE largest photographic portrait lens ever made in England is one of 10¼ inches diameter, recently completed and now in the possession of Mr. Mayall, of Regent street. It is an achromatic lens, and will take portraits of any size, from the smallest miniature up to very nearly life size. It is made of glass of the whitest description, and its size admits so large a volume of light that photographs covering a space of 10 inches by 12 inches may be done in eight seconds. In the open air, groups of 15 to 20 persons (each face about the size of a sovereign, and the whole picture 24 inches by 24 inches) can be taken with an exposure of 10 seconds. The cost of manufacturing the lens was upwards of £200.

HOW TO CLEAR LAND FROM LARGE LOGS.—J. S. Stone, of Belvidere, Ohio, in reply to an inquiry recently made for a log-roller to clear new land from logs, states that the best way to get rid of large logs is to blast them with powder. It takes but little powder, he says, and the logs can then be easily handled and put in piles for burning.

Novelty in Steam Engines and Boilers.

The inventor claims for this device, 1st, that the primary cylinder being within the boiler permits no loss of force from cooling and condensation of its contained steam; 2d, that the cylinder being beneath the water and lubricated thereby, its inner surface being washed at every stroke of the piston, steam, or the products of combustion, can be used therein at a very high temperature.

He also claims that the form of boiler employed secures the following advantages; namely, the utilization of the products of combustion, security against the evils of overheating, circulation of water without loss of power, impossibility of the collapse of flues, and economy of water as well as of fuel.

He also claims that by the combination of the primary or internal cylinder with the external or atmospheric cylinder, he secures economy in piston rods, as the pistons of the interior and exterior cylinders, and that of the air pump which supplies air to the furnace, can all be arranged on the same piston rod.

Fig. 1 is a view of the boiler and interior and exterior cylinders with their attachments, and Fig. 2 is a section of the boiler, showing its internal construction.

A, Fig. 1, is the outer shell of the boiler in which is placed the fire-box, B, made of cast iron, in the form shown. The fuel is put in at the door, C, which closes hermetically, and air to support combustion enters through a draft hole when the fire is first kindled, the gases of combustion escaping at first through the pipe, E, and into a chimney in the ordinary way.

As soon as the pressure of steam becomes sufficient to drive an air pump, not shown in the engraving, artificial is substituted for natural draft, by turning the two-way cock, D, a rod for this purpose passing out through the side of the boiler from this cock through a stuffing box. The gases of combustion then pass through the pipe, F, and the pipe, G, Fig. 2, from which descend a large number of open-mouthed small tubes, H, through which the gases of combustion are forced into the water, where they rise and mingle with the steam above the water level.

The operation of the cylinders is as follows: The valve, K,

Fig. 2.

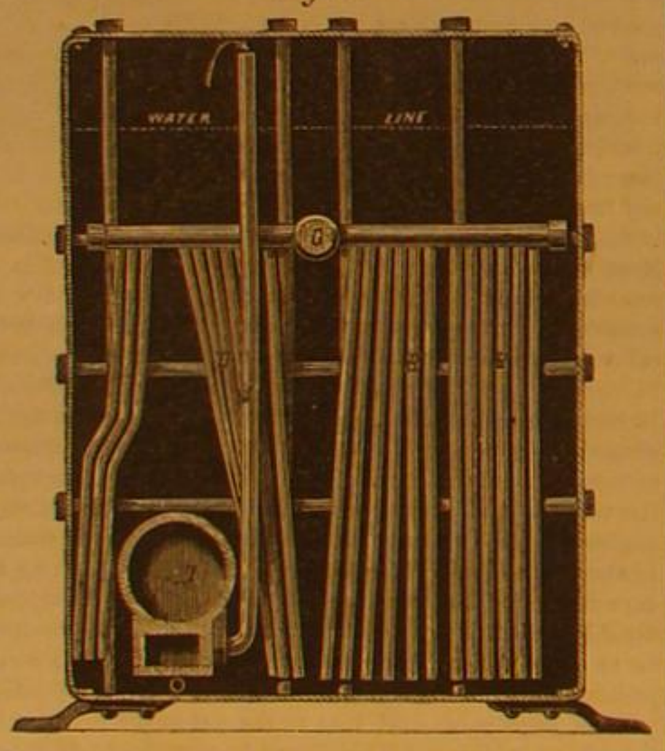


Fig. 1, being in the position shown, allows the contents of the cylinder, I, contained between the piston and the head of the cylinder to exhaust through the pipe, L, into the interior chamber of the exterior cylinder, M, where the expansive force of the mixed steam and gas counterbalances the pressure upon the outside of the piston, through the outer end of M, which is always open, as shown. The pressure of the steam now acting upon the surface of the water in the boiler forces the water into the open end of the interior cylinder, I, forcing the piston outward. As soon as the piston has completed its stroke in this direction, the valve, K, cuts off the exhaust and admits steam to the cylinder, I, through the pipe, J. At the same time the steam in the exterior cylinder, M, which has expanded down to atmospheric pressure is exhausted through the pipe, N, and condensed in the usual manner, the condenser not being shown in the engraving. The pressure of the steam on the side of the piston in I next the valve now balances the pressure of the water on the other side; and the pressure of the atmosphere on the outside of the piston in the exterior cylinder, M (a more or less perfect vacuum being produced on the inner side by condensation), makes the return stroke, and so on indefinitely, the area of the piston in the external cylinder being made as many times larger than the internal one, as the number of atmospheres pressure maintained in the boiler.

Patented, in the United States (Feb. 15, 1870), and in Europe, through the Scientific American Patent Agency, by Dr. J. E. Culver, Hudson City, N. J.

At the Union Pacific Foundery, Omaha, cast iron of excellent quality has been made with Wyoming coal.

Sir Joseph Whitworth upon Machinery.

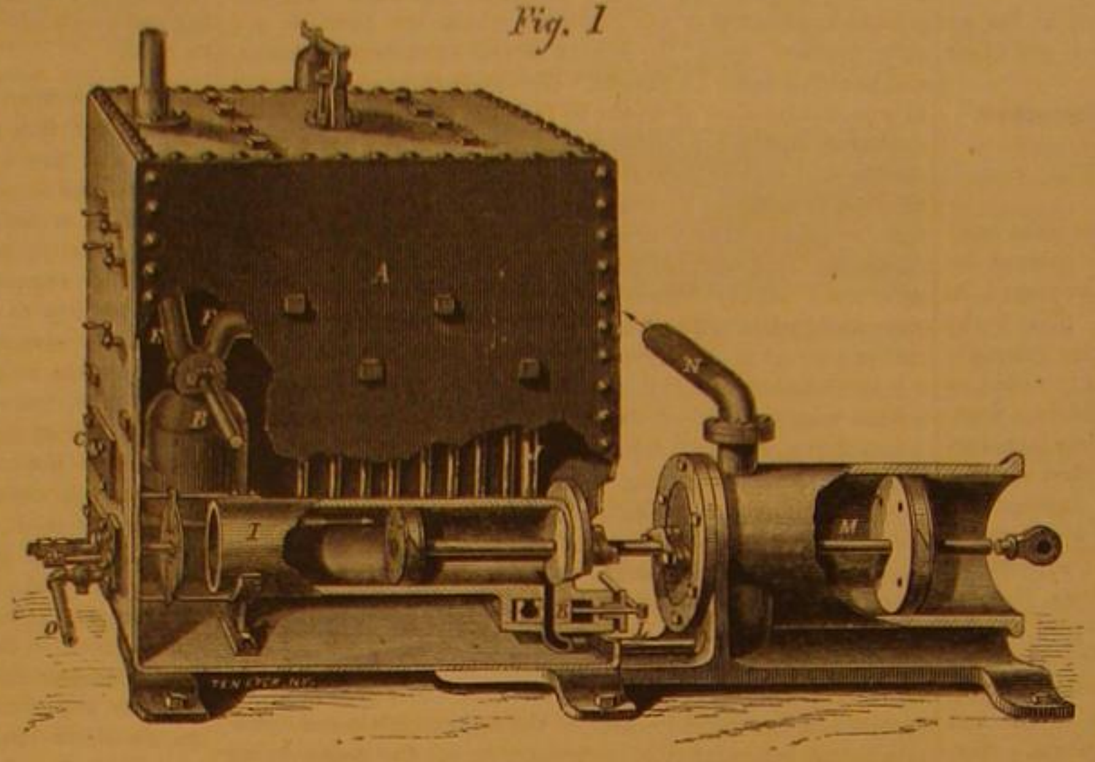
At a dinner of the Foremen Engineers recently, Sir J. Whitworth made the following observations: The prosperity of England depends, not only on the produce of her soil and mines, but also greatly on the number of self-acting machines she keeps at work. In proportion to the increase of the latter has been her increase in wealth and power. Our ancestors had very rude implements to work with, but since the introduction of the steam engine the machinists and engineers of England have gone on applying new machines to every kind of industry, until we have arrived at a time when we have an enormous wealth-producing power at our command. The produce of our mines of coal and iron is so abundant that we can convert the raw material we obtain from other countries into an almost endless variety of things, which add to the comforts of all. The wealth derivable from our mines and self-acting machinery goes on without interruption. The produce of the soil everywhere greatly depends on the seasons. Hence the desirableness of having the most extended area for the exchange of our manufactures. The progress that has been made by engineers during the last forty years has been very remarkable, particularly in constructing and making self-acting machinery. Twelve shillings per foot were then paid for the labor of chipping and filing surfaces of iron, which is now frequently done on the planing-machine for 1d. By Mr. Bessemer's admirable process, the cost of manufacturing some kinds of steel has recently been reduced to one half, and in some cases to one third what it used to be. The consumption of coal for manufactures has been reduced more than one half; the saving last year on the English railways by locomotive engineers burning coal instead of coke was £1,200,000 sterling. Mechanical and civil engineers, chemists and scientific men are continually finding out new modes of producing wealth, and the owners of self-acting machinery generally go on improving and increasing their productions, from which those who have fixed incomes derive great advantage.

Looking to the immediate future, we may congratulate ourselves on the great opportunities that are arising for the development of engineering enterprise. The cultivation of the land by steam power is greatly on the increase, landed proprietors now seeing the importance of so clearing and improving their estates as to admit of this. The use of horse tramways is being urgently pressed forward, and a large outlay is contemplated. In my opinion they are not suited to the present times, and mechanical engineers have a right to enter their protest, considering the many obstructions there have been for many years past to the employment of road locomotives. If toll gates were abolished, and each county had an organized staff for making and keeping the roads in good order, using the steam roller, steam sweeping machine, and other necessary appliances, where there is large traffic, mechanical engineers would then, I have no doubt, soon produce a small light locomotive that would do its work quietly and most effectively; at the same time, pedestrians and those who ride and drive would have the great enjoyment of good and clean roads, instead of the present badly paved and rough Macadam roads. The broken stones of the latter are now left for the horses' feet and narrow wheels to consolidate, in a way which it is quite distressing to see. The consumption of fuel for horse-power is now so small that road locomotives could be employed at far less expense than the overworked and ill-conditioned horses we now see; while pedestrians, and those who keep animals for pleasure would have good roads, and many gentlemen, no doubt, would have their well-made locomotives. Under any circumstances, good, clean roads are the most profitable when everything is taken into account; but, unfortunately, those who make and repair them generally consider only one side of the question.

Envelopes Made of "Greenbacks."

The Treasury Department annually uses many thousands of envelopes of a peculiar greenish tint, which are rarely seen outside of Government offices. No one, on examining them, would suspect of what they are manufactured. They are strong, smooth, and business-like in appearance, and have the letter "T" stamped through the fiber. Old greenbacks form the material of which they are made. The Treasury Department saves up all the bits and remnants of paper used in the manufacture of our currency, with old stamps and bills and all the mutilated greenbacks which have come back to it, and, instead of destroying this mass of rubbish, as was formerly done, the Departments turn it over to the papermakers, who return it in the shape of serviceable envelopes. Many dollars are annually saved to the Government by this means. These envelopes are used extensively in the Custom Houses, the Post Office, Sub-Treasury, and other Government offices.

Fig. 1



CULVER'S IMPROVED STEAM ENGINE AND BOILER.

Cost of Telegraphy--Europe and America.

In Switzerland the telegraphs are worked under government auspices, and the charges are less than elsewhere in Europe. But it appears that our system is the cheapest.

In Switzerland the proportion of miles of line to the population is 1 to 940; of wire 1 to 448; of offices 1 to 6,000; and of internal messages 1 to $3\frac{1}{16}$.

In the United States the proportion of miles of line to population is 1 to 420; of wire 1 to 238; of offices 1 to 6,000, and of internal messages 1 to 3.

Thus the United States, as compared with the most favored country in Europe, has in proportion to its inhabitants more than twice as many miles of line; nearly twice as many miles of wire; an equal number of offices, and sends annually a larger per centage of internal messages. And in spite of the increased cost of the service from competition; in spite of the high price of labor, which is more than twice as much on a specie basis as in Europe; and finally, in spite of the high rates of taxation to which telegraph property is subjected in this country, messages are now transmitted throughout the United States in currency at a lower average rate per mile, than in any country of Europe.—*Journal of the Telegraph.*

CONKLIN'S DETACHABLE LIP FOR BOWLS, BASINS, ETC.

Our engraving exhibits one of the legion of applications to which india-rubber has been put in modern times. We judge there are many branches of business, as that of the druggist, dyer, etc., in which, as well as in domestic use, this device will be found serviceable.

Every one knows how difficult it is to pour liquids or semi-fluids from an ordinary bowl or dish without spilling, and thereby wasting the contents and soiling other articles, as table covers, carpets, clothes, etc. To prevent this waste and annoyance, and enable children and careless servants, as well as the trained hand of the druggist, to pour with the certainty of not spilling a drop, this device is intended.



As will be seen, it consists of a rubber lip or nose, which is clasped upon the bowl or other vessel by an elastic band, with sufficient rigidity to prevent the passage of any fluid between the lip and the bowl. The elasticity of both the lip and the band renders the application to different sizes of vessels perfectly easy and secure.

A slight shoulder on the inner side of the lip rests upon the upper edge of the vessel, so that an almost continuous surface from the interior of the bowl to the point of the lip is secured while pouring out the liquid.

Patented, May 12, 1868, by George Raymond, Fitchburgh, Mass. For purchase of State or county rights, or other information, address the patentee, or O. P. Conklin, Worcester, Mass.

Prof. Johnson of the Maine College says; "That the labor system is a benefit to the students is very apparent. Aside from the amount earned, the labor performed keeps up industrious habits, promotes health, is to a certain extent a source of instruction to the student, and prevents that wide disseverance from manual labor and distaste for it which is so observable in the graduates of our old colleges. Besides, we think it plainly observable that a few hours of labor each day makes the student more quiet and studious during the hours devoted to study. The time spent in labor would in most cases be devoted to idle talk and to various kinds of recreation, perhaps of dissipation. Labor is the 'safety valve' for the overflowing of animal spirits. There has been a remarkable willingness on the part of the students to engage in all the kinds of work required to be done."

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Contents:

(Illustrated articles are marked with an asterisk.)

*Combined Safety Valve and Low-Water Alarm....247
Patent Right and Copyright....247
Fur Seal Fishery in Alaska....248
*Deformed Feet and Shoes....249
Comparison of the Refrigerative Effect of the Carre Apparatus and Common Ice....249
*Barnacles....250
The Australian Gum Tree in America....250
The Narwhal, or Sea Unicorn....250
The Rule of the Road....250
Scientific Intelligence....251
*Wormwood's Revolving Pay Box....251
Cheap Oxygen....251
Organ Blowing Machine Wanted....251
Vertical Multiplier....251
Yield of Lead from the Missouri mines....252
Explanation Wanted....252
True Meaning of Inertia....252
Screw Piles....253
Are Scraped Surfaces Indispensable....253
How to Clear Land from Large Logs....253
*Novelty in Steam Engines and Boilers....253
What is Wanted in Modern Art....253
Sir Joseph Whitworth upon Machinery....254
Envelopes made of Greenbacks....254
Cost of Telegraphy—Europe and America....254
*Conklin's Detachable Lip for Bowls, etc....254
International Exhibition of 1871, in London....255
Power and Efficiency of screws....255
Telo-Dynamic Cables....255
Boiler Explosions....255
Charlatans and Charlatanism....256
Experimental Test of the Laws of the Deflection of Beams....256
Report of the N. Y. Commissioners of Fisheries....256
Editorial Summary....257
U. S. Circuit Court at New Orleans....257
Patent Office Decision....257
New Books and Publications....257
Inventions Patented in England by Americans....258
Answers to Correspondents....258
Recent American and Foreign Patents....258
List of Patents....259

Special Notice to Advertisers.

The circulation of the SCIENTIFIC AMERICAN has become so large that we are compelled to put it to press one day earlier in the week. Advertisements must be handed in before Friday noon, to insure their publication in the issue of the succeeding week.

INTERNATIONAL EXHIBITION OF 1871, IN LONDON.

The English Government, profiting by the experience of the past twenty years, have decided to adopt a new system of exhibitions, and instead of holding them every ten years, and making them universal, they propose to have annual exhibitions, confined to a limited number of articles. The past increase of manufactures, and the multiplicity of applications of science to the arts, render a universal show of them at one time, and in one building, next to impossible. The last Paris exhibition building covered nearly forty acres of ground, and the park outside embraced eighty acres more. The number of exhibitors was fifty thousand, and of separate articles there were several millions. The visitors to the palace were counted not by thousands, but literally by millions. It was noticed that the English Commissioners should have been appalled by the prospect in store for them if they were to undertake another World's Fair, in 1871. Nothing short of a building covering a hundred acres, and a park with a hundred more would suffice for the purpose, and then must follow the vast expenditure of money to put things in order at the appointed time, ready for the inroads of exhibitors, who would naturally apply for space. The thing was manifestly not to be thought of, and the Commissioners have wisely decided to hold annual exhibitions open to people of all countries, but confined each year to specified articles. They have asked the co-operation of our Government, and as a preliminary to opening a correspondence with the English Government, the Secretary of State has appointed Mr. N. M. Beckwith United States Commissioner.

Mr. Fish could not have found a better man for the position in this country. Without the energetic and able management of Mr. Beckwith during the Paris Exhibition of 1867, our country would not have been represented at all. He has well earned a recognition of services rendered at that critical period, by this appointment to superintend the proposed co-operation of the United States in the new scheme of annual exhibitions, and if any one can work out the problem practically, it is Mr. Beckwith.

Her Majesty's Commissioners announce that the first of a series of annual international exhibitions of selected works of fine and industrial art will be opened in London, at South Kensington, on Monday, the 1st of May, 1871, and be closed on Saturday, the 30th of September, 1871. The exhibition will take place in permanent buildings, about to be erected, adjoining the arcade of the Royal Horticultural Gardens. The productions of all nations will be admitted, subject to obtaining the certificate of competent judges that they are of sufficient excellence to be worthy of exhibition. The objects in the first exhibition will consist of the following classes, for each of which will be appointed a reporter and separate committee.

1. Fine arts: paintings, sculpture, engravings, architectural models, tapestry, decorative designs, copies of ancient pictures.

2. Scientific inventions and new discoveries of all kinds.

3. Manufactures: pottery, earthenware, wool and worsted, educational manufactures and belongings, such as school buildings, books, maps, toys, and games for physical training, illustrations of modes of teaching fine art, natural history, and physical science.

4. Horticulture: The Royal Horticultural Society will exhibit new and rare plants, showing specialties of cultivation.

One third of the whole available space will be assigned to foreign exhibitors, who must obtain certificates for the admission of their objects from their respective governments. The objects must be delivered free of charge and unpacked at the building, but all expenses of show cases, installation, etc., excepting machinery, will be borne by the Commissioners. It is desirable to have prices and full descriptive labels attached to all articles. Foreign countries appoint their own judges and reporters. There will be no prizes, as the certificate of having obtained the distinction of admission to the exhibition, will be decreed sufficient to reward the exhibitor for his trouble. The arrangement of articles will be in classes, without regard to nationalities, and thus be better placed for study and examination.

Mr. Beckwith, in a recent letter to the Secretary of State, thus speaks of this modified plan of international exhibitions:

"The method proposed will obviously diminish the cost of the exhibition; small exhibitions being less expensive, in proportion, than large ones. The personal expenses of exhibitors and visitors will also be diminished; less numerous bodies being supplied with transport and living, better and cheaper, in proportion, than multitudes, which are often in excess of the means provided. The educational effects are more important. Discoveries and inventions spring up continually in numerous and widely separated localities and countries, and in like manner new applications of science and art are constantly made in the productive industries. But the knowledge of such inventions and improvements spreads slowly. The rapid diffusion of this knowledge by bringing together for study from all countries, their best products, which are the practical expressions of the most advanced sciences, inventions, arts, and industries, is the leading object of international exhibitions.

"The vast accumulations and bewildering varieties of products hitherto collected, and the confusion and excitement incident to great but transient assemblies of persons, renewed daily by departures and fresh arrivals, are unfavorable to study."

Mr. Beckwith estimates the necessary expenses for clerk hire, advertising, stationery, office rent, storage, and reporter, at from ten to fifteen thousand dollars. This is a small sum for so important a matter, and no doubt will be readily appropriated by Congress.

POWER AND EFFICIENCY OF SCREWS.

The screw is a very ancient device, and the fact that in modern mechanism it still holds so prominent a position is proof enough of its essential value. It is true that the hydrostatic press of Bramah has made great inroads upon the domain formerly held by the screw in mechanics; but the probability is that so long as man retains his present ascendency over the forces of nature, it will continue to be one of the chief instruments of his power.

The weight which can be raised by a screw is generally estimated by multiplying together the force applied to the end of the lever, the length of the circumference, through which this force travels, dividing the product by the pitch expressed in the same denomination as the circumference through which the power applied to the lever travels, and subtracting the loss caused by friction. Friction is, however, so variable on different screws, and so dependent upon the materials of which they are composed, their proportions, and the quality of the lubricators employed, that it may be said to be almost a controlling element in the question of power and efficiency.

We have only in view such screws as are intended to raise and sustain, without other appliances, the load they are intended to bear, and shall therefore leave out of the discussion those of abrupt pitch used on die presses, etc.

It is evident that in proportioning a screw to bear a given load the following points must be considered: first, the size of its thread, and that of the nut with which it engages to bear the proposed load; second, the axial pitch, or the distance the screw will advance for each revolution of the lever; third, the abruptness of the incline, or what amounts to the same thing, the normal pitch, or the distance from either the upper or lower side of the thread to the corresponding side of the adjacent coil, measured on the shortest distance between the sides; or to use a term not strictly correct, at right angles with the thread.

The length of a coil of a screw measured on the interior, may be found by squaring the circumference of the cylinder about which it winds, adding to the result the square of the pitch in the same denomination, and extracting the square root of the sum. The result will be the length of the coil in the same denomination as is used to express the circumference of the cylinder.

If a base line of indefinite length be drawn, and the pitch of the screw be laid off from the base line, and perpendicular to it, and an arc be described from the point on the perpendicular where the pitch terminates with a radius equal to the length of the coil, as above calculated, it will cut the base line at a point which, joined to the point taken as the center of the arc described, will complete a right angled triangle, the angle of which opposite to the side which equals the pitch, is equal to the angle formed by a horizontal line tangent to the cylinder and any part of the face of the thread, in a vertical screw of the given dimensions.

This angle diminishes when with the same pitch the diameter of the cylinder increases. When it is subtracted from ninety degrees, the remainder is the angle formed by any part of the upper surface of the thread, and a line erected thereon parallel to the vertical axis of the screw. Friction will increase or diminish with the increase or diminution of the latter angle, the smaller it is the greater the friction, and *vice versa*. As the angle depends for its acuteness on the diameter of the cylinder, it follows that the less the diameter is the more acute will be the angle and the greater will be the friction under a given load.

In other words the power applied to rotate the screw, and the resistance to its motion, act to press together the faces of the coils in the nut and the coils on the cylinder, but the power acts at right angles to the faces, and the resistance in the direction of the axis of the screw. The resultant friction for each revolution may be obtained by multiplying together the coefficient of friction for the material of which the screw and nut is constructed, the diameter of the cylinder plus the width of thread, the resistance, and the decimal 3·1416, and adding to the product the continued product of the pitch, the power applied to the lever, and the length of the leverage, like denominations being used for measurements, and also for weights during the operation.

In the case of a wrought iron screw with a brass nut the coefficent of friction is 0·103, where tallow is used as an unguent; with sperm or lard oil it would be 0·075. With a screw of wrought iron in a cast iron nut it would be about the same. With wrought iron screw and nut, 0·081 would be the coefficent of friction, with sperm oil as a lubricant.

The securing the greatest strength with least friction has been studied, and there is no doubt that the thread is best made so that its vertical section in a vertical screw is a square, and its depth one sixth the diameter of the newel or cylinder upon which it winds.

TELO-DYNAMIC CABLES.

The method of transmitting mechanical power through long distances, by means of wire cables, is daily extending; and there can be no doubt that for more than ordinary distances the plan is a very economical one, in all the particulars of first cost, subsequent expenses for repairs, and working efficiency.

For a long time the question of the best means for transmitting power to great distances has been one of the first importance; and a great number of methods have been essayed to accomplished the desired end, many of which have been at sundry times discussed in these columns.

Experience has shown however that none of these methods can approach in economy the telo-dynamic cable. We have our doubts whether the invention of this method is justly ascribed to M. Hirn, but there is no doubt that to his labors and experiments the development and demonstration of the great advantages of the system are largely due.

At the great French Exposition, M. Hirn exhibited his telo-dynamic apparatus, and it attracted much attention. The secret of its economical application is the transmission of power at high speed, so that both a light cable and light pulleys may be used. In this way a very large working power may be accomplished by a small cable, and although some loss will be sustained from friction in speeding down to the required velocity, the gain in the transmission will more than compensate for all such losses.

Transmission at high speed is not so essential when a small power is to be transmitted through a comparatively short distance, but where the distance is great it cannot be dispensed with. The resistance of the air is also a formidable absorbent of power at high speeds and long distances, and it is probable that a slower motion of the transmitting pulleys, with a larger cable than recommended by M. Hirn, will be found the best practice for distances of less than five hundred feet. Our opinion is that the speed should increase and the size of the cable diminish as the distance and the amount of power to be transmitted increase, according to some ratio which we do not consider as yet fully determined. The velocity of the cable recommended by M. Hirn is nearly a mile per minute, the cable being 0·39 of an inch in diameter.

In the mines of Falun in Sweden one hundred-horse power has been thus transmitted to a distance of nearly three miles, and it is estimated that for much larger distances the loss from all sources in transmission need not exceed twenty-five per cent.

A number of these cables are now working over short distances in this country. Among the ones recently put up is a cable at Lockport, New York, by which twenty-five horse-power is transmitted over a distance of 700 feet, with perfect success, and, we are informed, with remarkable economy. The total length of the cable is 1,484 feet. It is operated with frictioned gears. The cable pulleys are five feet in diameter, and the cable is 15-32 of an inch in diameter.

We regard the introduction of this system as marking an era in mechanics, and opening the way to the utilization of of immense natural water powers, hitherto neglected on account of inaccessibility or other adverse circumstances.

BOILER EXPLOSIONS.

The report of the Midland Steam Boiler Inspection and Assurance Company, for 1869, contains, among much other very interesting and instructive matter, the following paragraph, which we commend to the earnest attention of those who believe in the "inexplicable power" of steam.

"It is observed with regret that boiler explosions are still attributed by those who have given little attention to the facts of the cases to mysterious causes, such as electricity, decomposition of water, explosive gases, etc., and it is believed nothing will better convince those responsible for boilers of the simple causes which lead to explosion, and the easy means of preventing them by due care or inspection, than accurate records of those boilers which have exploded."

Now what is the record. From corrosions 16 out of 59 boilers reported exploded. From *over repairs, patch upon patch*, 12 went up. Low water caused the destruction of 8. Weak tubes without strengthening rings brought 8 more to grief. Want of stays caused the ruin of 4. Weak manhole

without strengthening rings brought to an untimely end 3 more. One only is reported as having blown up from extraneous causes, and 7 are reported as bursting from unknown causes, or from causes of which no trustworthy particulars could be obtained.

We once heard of an individual of limited education who, when in reading he chanced to stumble upon a long word, escaped the difficulties of pronouncing it by calling it "sundries." So it has got to be the fashion among those who are always ready to philosophize upon what they really know little or nothing about, to charge the explosions of all boilers, of which the causes are unascertained, to an inexplicable force, which covers ignorance of real or probable causes.

There seems a tendency in the human mind to look for supernatural rather than for natural causes of events, and this tendency only diminishes as people become educated to analyze complex occurrences and trace effects to causes. But even with those who are thus educated, there seems to be a charm in a search for some hidden, though it may be natural cause for a phenomenon, so that in their endeavor to detect the remote, they overlook immediate causes altogether.

Now if instead of looking so far for occult forces, owners of steam engines would look for defects in boilers, and not content themselves with once looking, but continue on the lookout for defects that are constantly liable to occur, they would show far more wisdom and suffer less damage.

The appendix to the report alluded to states that the most prevailing evil has been that of "seam ripping where cracks extend from rivet to rivet, until too little sound seam is left to retain the boiler whole. About thirty very dangerous seam rips have been discovered, besides many others where the mischief had commenced." Bad iron, bad workmanship in not matching rivet holes, so that the strain of expansion and contraction has caused rupture, concentration of fierce heat on too small area, deposit of scale, and imperfect circulation consequent upon accumulation of mud, are the causes of this seam ripping.

The practice of expending money in patching and re-patching, and putting patch upon patch, instead of renewing the boiler, is deprecated in strong terms.

The chief cause of corrosion appears to be small leaks, especially where the flues are difficult to enter, or where the boilers are so covered that the leaks do not show.

CHARLATANS AND CHARLATANISM.

Quackery finds its way into all professions. Medicine has been popularly believed to have given birth to more quacks than any other calling; and it is certain that the diseases of mankind, and the intense longing with which the sick yearn for restored health, afford most favorable opportunities for the practice of deception by those who assume knowledge they do not possess.

We have, however, a shrewd suspicion that law, theology, art, literature, and science are not very much more free from pretenders than medicine. We can certainly speak from knowledge as to the great number of quacks who infest the country, and live by palming off upon credulous dupes that they are in possession of some wonderful secret by which they can make enormous savings in various processes; that they have made some wonderful mechanical discovery or invention, which only wants money to develop it into a very mine of gold.

Our experience has brought us into contact with many of these charlatans, and we have got to know them at sight. They generally want us to publish in the interests of science (always in the interests of science) the interesting fact, that they have, by accident, or by long and arduous study, or have had communicated to them by some remote savage, the secret of doing something or other very much better than any one else ever did it before; but when asked how they do it, they decline to give any information. They also generally express the profoundest confidence that their secret is absolutely unfathomable by any living man whatever, and that all attempts to learn the mystery without paying for it, would be as absurd as to attempt a voyage to Jupiter, or to pump melted gold from the crater of Vesuvius.

Now when a man talks about being able to practice publicly an art, the secret of which is impenetrable to anybody, you may set that man down as either an ignoramus or an unprincipled humbug. Or when a man professes to have made a discovery in physical science, which, from its nature, can be only an inference, from a supposition of his own, he is either a self-deceived individual or worse.

Such an individual it was our ill fortune to encounter about six months since, who claimed to have made the discovery that sound is a substance, which permeates all bodies, solid, fluid, or gaseous; and that in order to free this material which its learned discovered called *Sigule*, all that is required is to knock on one end of a beam or wire, and sigule will ooze out of the other end. By means of a peculiar apparatus this charlatan performed an experiment familiar to all scientists, namely, the reinforcement of sound, so that a sound too feeble to be heard without reinforcement is rendered audible.

This man had succeeded in convincing one or two dupes that he had made a grand discovery, and that he could lay a wire across the bottom of the Atlantic, and that by thumping at either end squeeze out *sigule* at the other, and thus supersede the electric telegraph, make untold millions of dollars, and immortalize the names of his patrons.

How, when we are called upon to answer for our sins, we shall be able to justify ourselves for not giving this fellow a fulsome puff—as did more than one prominent journal—is a question which, if we are to believe him, will render our death-bed a scene of horror and despair. Of this sort are the men who profess to be able to make a pound of butter from a quart of milk; who vend soldering fluids of unheard-of virtues, and of hitherto unknown materials; who sell recipes for preventing the cracking of steel in tempering; who search out some simple-minded and ignorant man possessing money, and seek to convince him that with the aid of a few hundred dollars from his purse, they can produce the long-sought perpetual motion; who work upon the ignorance and avarice of others by professing to discover by some chance the place of deposit of hidden treasure; and so on to the end of the chapter.

Many of them profess to have obtained high honors and degrees from some—always remote—institution of learning, and by pompous manner and high-sounding language seek to impose upon the credulous the seeming of wisdom.

The "cheek" of some of these fellows is really little short of the sublime. They will quote you by the hour passages from authors who never existed, and misquote those who have; and we have not unfrequently seen a man of solid attainments completely brow-beaten and cowed by one of these voluble scoundrels.

Apart from consummate brass, and the professed desire to benefit the world by their great discoveries, their chief characteristic is mystery. Whenever you meet a man with a secret by which he expects and hopes to bless the world, and which no one can possibly penetrate, beware! he has designs on your pocket.

EXPERIMENTAL TEST OF THE LAWS OF THE DEFLECTION OF BEAMS.

We are in receipt of an important and interesting paper read at the Eighteenth Meeting of the "American Association for the Advancement of Science," by Professor W. A. Norton, of New Haven, entitled "The Laws of the Deflection of Beams Exposed to a Transverse Strain Tested by Experiment." The laws of deflection are of such fundamental importance in mechanical construction, that our knowledge of them can neither be too full nor too accurate. While, therefore, we cannot make room for the whole of Professor Norton's paper, we will endeavor to give an idea of the experiments from which he derives his conclusions, and a summary of the conclusions themselves.

The experiments were made upon sticks of white pine of various lengths from two to six feet; and various breadths and depths from one inch to four inches. The details of the apparatus are unimportant, save that they should be such as to secure accuracy in the experiments. On this head we will say that so far as we can discern from the minute account given, the apparatus was without any defect that could lead to possible error.

The strain was applied by a screw, the pressure of which was measured by a Fairbanks' spring dynamometer, and the results obtained were confirmed by repetition with a second set of sticks.

Professor Norton starting with the received theoretical formula for the deflection of beams of a rectangular cross section of uniform dimensions, $f = m\frac{Pl^3}{Ebd^3}$, in which m is a constant, P the power applied, E the modulus of elasticity, l the length, b the breadth, and d the depth of the stick, deduces therefrom a formula for the case of a beam resting freely on two supports and loaded in the middle, to which the experiments were entirely confined, *i. e.*, $f = \frac{Pl^3}{4Ebd^3}$ If this formula be correct, then the following laws must be true:

1. The deflection is directly proportional to the pressure.
2. It is inversely proportional to the breadth.
3. It is inverstly proportional to the cube of the depth.
4. It is directly proportional to the cube of the length.

He then gives tables of experimental results which show first, that the deflection is only approximately proportional to the pressure, strictly speaking increasing according to a less rapid law. He suggests as the probable explanation of this descrepancy between theory and fact, "that as the force of pressure increases the neutral axis of the cross section of the stick shifts its position, and its distance from the center of gravity of the cross section augments as the pressure becomes greater. From this cause the moment of the resistance to flexure increases indirectly with the pressure, at the same time that it increases directly from the augmented strains of the fibers. The increased moment of resistance to flexure resulting from this shifting of the neutral axis, should be attended with a diminished increment of deflection for the same increment of pressure."

The second law was verified by the tests, if we except such errors as may reasonably be ascribed to differences in the moduli of elasticity of the different sticks, the shifting of the neutral axis in the case of sticks most strained, and possible errors in observation.

In testing the third law the calculated were all less than the observed deflections; but the errors became smaller as the sticks were increased in length. Professor Norton therefore concludes that "the deflection decreases according to a less rapid law than the inverse cube of the depth."

He also concludes from the results obtained in testing the fourth law, that the deflection increases according to a less rapid law than the cube of the length.

Following these conclusions by a train of reasoning as to the true theory of deflection, which we pass as too abstract for the general reader, he arrives at the formula—

$$f = \frac{Pl^3}{4Ebd^3}\left(4EC\frac{d^2}{l^2}+1\right).$$

in which f represents the flexure, l length in feet, b breadth in inches, d depth in inches, P pressure, C and E constants which must be determined by experiment. This formula is not easily translated into common language, so as to be understood by the general reader. The engineer accustomed to regard the laws of flexure as settled, will, however, regard it with interest.

REPORT OF THE NEW YORK COMMISSIONERS OF FISHERIES.

The Commissioners of Fisheries, appointed under chapter 275, of the Laws of 1868, entitled "An act to appoint Commissioners of Fisheries for the State of New York," passed April 22, 1868, have made report for the year 1869, being their second report to the Legislature.

They regret that the act for the protection of the fisheries, prepared by them for the last Legislature, failed to pass. That act provided for a "restriction upon the destruction of the shad in the Hudson river; the size of the meshes of nets would have been limited, and a weekly close-time established, that would have enabled the spawning fish to reach the head waters where they are compelled by nature to deposit their ova." They think that without some such restrictions the restoration of our shad fisheries will be a work of time, on account of the impossibility of getting sufficient mature males and females in proper condition for artificial impregnation.

The Commissioners obtained the services of Mr. Seth Green, the eminent pisciculturist. That gentleman began his operations at Mull's fishery, near Coeymans, on the Hudson; his work was mainly done at night. He would commence drawing the seine for spawners at about eight o'clock, depositing the spawn and melt as he obtained them in pans in his boat, and would stop at about midnight. The impregnated spawn was at once placed in the hatching boxes, each holding ten thousand or more eggs, and left in the current until it was hatched. At every change of tide during the slack water, it was found necessary to shake the boxes to prevent the spawn settling at the bottom and getting smothered. The boxes, which were Mr. Green's patented invention, were one foot by eighteen inches, and were fastened one behind another by ropes attached to floats. They worked, as they have always worked when properly managed, to perfection. The operations were continued until July 13, 1869, when the weather became too warm and the breeding fish so scarce that the enterprise had to be abandoned. Only 15,000,000 of shad were hatched in place of 300,000,000, as could doubtless have been done, had the proper legislation been had. It is possible that these will produce some beneficial effect on the fisheries, but it will not be what it should and could have been, and what it is hoped that it will be this year.

The Commissioners state that the local fishermen have been induced to favor the enterprise rather than to oppose them, as was done on the Connecticut river, and recommend that they be provided with breeding boxes by the State, and be allowed the privilege of using their nets after the commencement of the close season, provided they would hatch the spawn.

The Commissioners have prepared a law to meet the necessities of the case, and ask for its enactment.

The Commissioners state that on the 11th day of November, Mr. Seth Green was dispatched to Detroit to procure the spawn of white-fish, as it was considered that it would be the best locality to obtain them. This conclusion was justified by the result, as millions of eggs could have been obtained when the nets used in catching the mature fish were brought to shore. The first spawn was obtained on the 13th of November; it was impregnated at once, and then packed in moss for immediate transportation, as your Commissioners did not feel justified in erecting a hatching-house for its propagation. Advertisements were put in the New York papers that the spawn would be delivered to all persons desiring it who had facilities for hatching it; and it was rapidly distributed to numerous applicants. However, so much of it was obtained that some was left over, and it was placed in the troughs used by Mr. Seth Green for raising trout at Caledonia. There it throve well, and the fry were soon abundant. Some discoveries were made by the better opportunities thus offered for studying the subject. It was found that the eggs would hatch in sixty-five days, in a temperature of forty-five degrees; that the fry carried the umbilical sack for eleven or twelve days, and that thereafter they lived on precisely the same food as young trout. They did well on lobbered milk, liver, or pulverized meat, and such other nutriment as is usually given to trout fry. It has been generally supposed, heretofore, that white-fish obtained at least a part, if not all, their sustenance from *algæ*, marine plants, grasses, or moss; but the observations of Mr. Green proved this supposition to be incorrect. By careful investigation he satisfied himself that the fish fed on small worms which they found on the plants, and that if they swallowed the plant itself, they did so by accident. These worms are extremely abundant, and the fry would commence devouring them as soon as the umbilical sack was absorbed. The larger fish lived not only on the same worms, but also on fresh water snails, caddies, insects, and other similar nourishment, and were extremely fond of their own spawn. This discovery is sustained by further experiments, and is very valuable, as it determines conclusively how white-fish are to be nourished in their infancy; a matter of great importance to all those engaged in fish culture. Of the results of the efforts of the parties to whom the impregnated spawn was sent, little has been heard at the time this report is made out. The Commissioners remark somewhat severely, "it is found that persons who are anxious to obtain a favor will promptly answer all inquiries, but that when their wishes are gratified they become more careless in their correspondence." Some packages of spawn were transmitted to England, to Mr.

Buckland, the superintendent of salmon fisheries. They arrived safe, and were thus mentioned in *Land and Water*, the journal edited by Mr. Buckland.

The observations of Mr. Green also led to another important discovery. He noticed that the young fry were often taken in a delicate web that some creature appeared to spin in the water, a web similar in general appearance to that which the spider weaves, but composed of more delicate threads. This, he ascertained, was the work of a worm which attaches it at the necessary number of points, and then passing back and forth completes it with remarkable rapidity, and of a size larger than a spider could make it in one night. It is very fatal, holding the fry securely if they happen to touch it, and killing larger fish, by sticking to their sides and gills. The fry have been seen to touch it with their heads, which would then remain fast, their efforts to escape would soon entangle their tails, and then they would be entirely helpless and destined to immediate death. This web is probably often mistaken for *byssus;* when seen on full grown trout, it is delicate, resembling the threads of frog spawn. It seems to be more common in still water, a current interfering with the proceedings of the worm. No young fish that enters the web ever escapes from it or can be taken from it, and it cannot be removed from the gills or sides of those of larger growth. The worm is a native of most of our ponds and lakes, and can be suspended by its web like the measuring worm hanging from the limbs of a tree. It has somewhat the appearance of a measuring worm and moves in the same way. It has two legs on the back part of its body but none forward, and is usually about half an inch long. The Commissioners consider this a most important subject of consideration for all pisciculturists, and desire to call the attention of naturalists to it.

It is recommended that a fish pass be made at the dam above Troy, so that the waters of the upper Hudson may become stocked with shad, as was the case before the dam was built. They report $7,873·83 still unexpended out of the $11,000 originally appropriated, and estimate that $10,000 additional, would enable the Commissioners to carry on their work effectually, and probably to build the needed fish-pass at Troy, if they should be authorized to undertake that work.

Painting Plastered Walls.

Painting plastered walls is often botched. According to a writer in the *American Builder*, the following is the proper way to proceed. White lead ground into a thick paste, is reduced by mixing it with linseed oil to the consistency of cream, adding as a dryer a little litharge ground in oil, and also a little coloring matter. This is called the priming, or first coat of paint. If, on applying this, the plaster is found to be absorbent, so that in passing the brush over it in spreading out the priming, the oil is so quickly absorbed as to leave the white lead rough and dry upon the surface, more oil should be added to the mixture, in order that the plaster may be deeply saturated, as the more the oil sinks in the better.

There is a practice among painters which in some cities, where prices of work are much reduced, prevails to a great extent, which is as follows: They wash over the plaster and wood-work with a weak solution of glue called size, before the application of the first coat of paint. This prevents the absorption of the oil, and causes the paint to spread over a much larger surface than it would do without this preparation. This practice is much to be deprecated, as it is very injurious to the work, especially to the plaster, by depriving it of that hardness which the absorption of linseed oil produces. We will suppose, then, the priming to have been properly mixed and applied; a few days must then be given it to dry before the second is applied. The second coat should be made thicker than the first, but its particular degree must depend upon the degree of absorption that has taken place in the first coat. Sometimes a great portion of it bears out—that is, dries out with a gloss—in which case the second coat ought to have a good body of white lead in it; if not, then the second coat ought to be kept rather thin, as it is of the first importance to have the plaster thoroughly saturated with the oil. Before applying this coat, the work ought to be well rubbed with fine sand paper. If the second coat bears out properly when dry, the third coat will form the ground work for the finishing process; but, should it not bear out properly, the work will require to have five coats, and, therefore, another coat of oil paint must be applied.

The ground work for finishing upon is composed of white lead, diluted with equal parts of linseed oil and spirits of turpentine, the thinness of the latter enabling a much greater body of white lead to be held in solution, and thus increasing the density of the paint. Into this, such ground colors are put as will alter the white paint to a tint of the color in which the work is to be finished, along with a little sugar of lead as a dryer. This tint should be made a little deeper than that intended for the finishing coat, by which means the solidity and durability of the color is increased. The thicker this coat is made, and the more it is spread out with the brush, the more durable will be the work, and the finer will be its surface. This ground color is generally dry enough on the second day after it is applied, and should not stand above a few days, as, if it becomes too dry, it prevents that incorporation of these coats, so essential to equality in the opacity or deadness of the surface, and to the solidity of the tint.

The finishing coat is white lead, in a state of thick paste already described, but diluted with spirits of turpentine only, and mixed with such colors as will produce the required tint, to which is added a little dryer. This species of paint, when of a light tint, is of great density, and from the volatility of the spirits of turpentine, it soon thickens after leaving the brush. Great precision and dispatch must be employed in applying it; the process is called flattening. This is the only coat that meets the eye in the finished work, and the spectator cannot, by looking at it, have any idea of those that are underneath, and upon which the durability of the work principally depends. This under-work may be worth two dollars a square, or it may be worth six, and the surface of the finishing coat look equally well. This, as well as the quality of the pigments used, sufficiently accounts for the variable durability of paint-work—some houses requiring to be re-painted in four or five years, while others require little more than washing for twenty-five or thirty years.

In almost all that kind of work, improperly called cheap painting, as in all cases where the painter agrees to furnish work on three coats of paint, a coat of size is introduced between the second and third coats. This is not so destructive to the character of the work as the application of size before the first coat; but it is bad enough, and is a practice that ought not to be resorted to. It is this practice that so frequently, in re-painting a house, causes the necessity of removing the old paint entirely, because if this be not done, the coats of the old paint separate where these sizings have taken place, and come chipping off with the new painting which has been put above them. Thus, a heavy extra expense is incurred, when a considerable saving ought to have been effected; for good old painting, when properly polished down, forms the best ground work for new painting. Another very bad custom is prevalent, namely, that of laying flat paint upon flat paint, without an intermediate coat of oil paint. This is frequently done to save a coat of paint when a house is re-painted. Work so treated will chip and blister until the whole is removed.

Editorial Summary.

SOUR LAKE is the name of a water area of about five acres in Hardin county, Texas. This lake, according to the *American Exchange and Review*, derives its name from the acidity of its waters, which issue from springs both at its bottom and the adjacent shore. The acidulous properties of Sour Lake are derived from decomposition of the underlying aluminous and pyritiferous shales, by which sulphuric acid is set free, and becomes mingled, along with other mineral ingredients, with the water which percolates the strata. The astringent taste of some of the springs is due to the alum they contain. Petroleum is also present; its source may be found in the decomposition of lignite beds and bituminous shales. On the southern shore, near the lake margin, are a number of acid springs or wells, which, although separated from each other by intervals of only a few feet, present considerable diversity, both in temperature and relative proportion of mineral ingredients.

A SUBSTITUTE FOR PLATE-CLEANING.—Dr. Arno Grimm states that "all cleaning of plates in photography is unnecessary if a small quantity of castor oil be added to the collodion; the latter will then adhere uniformly over the surface of the dry and dust-free glass plate, without the risk of any so-called cleaning stains being formed. The amount of castor oil to be added is regulated according to the consistence of the collodion, but no particular care in measuring or weighing is necessary in the matter; as a general rule a teaspoonful of castor oil will be sufficient for a pound of iodized collodion." The use of castor oil in collodion is quite old. It is employed to toughen the film, and assist its removal in transferring processes. We doubt its utility for the purposes suggested above.

FIRING SHOT FROM ROCK-CUT MORTARS.—A recent experiment was tried at Pembroke Camp, Malta, of firing a large stone shot from a mortar excavated for the purpose in the hard limestone rock. The shot was 67 inches in diameter, and was ejected to a distance of upwards of 400 yards, rising so high in the air as to look no larger than a cricket ball. It was intended to fire off another shot of the same description, and a second mortar had been prepared with that object; but it being cut too near the first one, the force of the explosion split the intervening rock, and prevented any further experiments of the kind that day. These stone mortars remind us of the gigantic ones made by the Knights of St. John, and intended to throw a shower of stones or *mitraile* on the heads of an enemy attempting a landing on the coast. Some are still to be seen in the creeks and bays of the island, and are well worth a passing inspection.

LIQUID GLUE.—To 1 oz. of borax in a pint of boiling water add 2 ozs. of shellac, and boil till the shellac is dissolved. Another—Dissolve 8 ozs. of the best glue in half a pint of water; that being done, add slowly, and keep stirring, 2½ ozs. strong aquafortis. Keep well corked ready for use. Another—A useful glue for fastening papers together only by being wetted by the tongue is made as follows: Dissolve 1 pound of glue or gelatine in water, and half a pound of brown sugar, and boil them together. Make into cakes by pouring into shapes. It becomes solid when cold.

ANTI-RUST VARNISH, OR VARNISH FOR IRON AND STEEL RODS.—Take the following ingredients, 1, 2, 3, in a pounded condition, and digest them by a regular heat till melted, then add the turpentine very gradually, stirring all the while: 1. Resin, 120 parts. 2. Sandarac, 180 parts. 3. Gum lac, 60 parts. 4. Essence of turpentine, 120 parts. The mixture should be digested until dissolution; then add—Rectified alcohol, 180 parts. Filter through fine cloth, or thick bibulous papers, and preserve in well-stoppered bottles or cases. It will be found very effective in preserving things from rust.

THE great ports of the Mediterranean—Genoa, Venice Marseilles, and Trieste—with Odessa in the Black Sea—and no doubt all the little ports along with these—have been touched with new life by the Suez canal and the prospects of a large cotton trade between Bombay and the old European west. Genoa has already ordered a magnificent steamer to be built at Jarrow, in England, for that trade.

TEXAS STATE FAIR.—The grand State Fair of the Agricultural, Mechanical, and Blood Stock Association, of Texas, will commence on Tuesday, May 17th, 1870, and continue four days. It will be held at the Magnolia Fire-Proof Warehouse and adjoining grounds, in the city of Houston. Mr. E. L. Massie is the Secretary and Treasurer.

DURING the month of March there were eighty-nine fires in New York, causing an aggregate loss of $382,241, on which there were $2,017,600 in insurances.

NEW BOOKS AND PUBLICATIONS.

LONG-SPAN RAILWAY BRIDGES. Comprising Investigations of the Comparative, Theoretical, and Practical Advantages of the Various Adopted or Proposed Type Systems of Construction, with numerous Formulas and Tables, giving the Weight of Iron and Steel required in Bridges, from 300 feet to the Limiting Spans. By B. Baker. Illustrated by Plates. Reprinted from Engineering. The whole carefully Revised and Extended. Philadelphia: Henry Carey Baird, Industrial Publisher, No. 406 Walnut street. Price, by mail, free of postage $2·00.

The aim of the author of this treatise has been to make a comprehensive rather than an elaborate inquiry into the various elements which should govern the construction of large spans. He defines a long span to be one which is more than three hundred feet. The types discussed are those known as Box girders, Bowstring girders, Straight-Link girders, Lattice girders, Cantilever, Cantilever Varying Depth, Continuous, Arched-Rib, Suspension with Stiffening girder, Suspended girder, etc. The discussion is followed by tables, and a summary of results. This work is one of sterling merit, and is a valuable contribution to engineering literature.

WONDERS OF GLASS MAKING IN ALL AGES. By A. Sauzay. Illustrated with Sixty-three Engravings on Wood. New York: Scribner & Co.

This is an entertaining and popular description of glass making and working in all its departments. It gives a description of some of the most wonderful structures ever made of glass, with some very handsome engravings of glass work. The work cannot be said to be in any sense scientific, but it will serve to give a tolerably correct outline of the subject to readers of all classes, and without technical acquirements. This being the aim of the work, we can say that we think it well calculated to subserve its purpose.

WE are in receipt of the "Miner's Journal" for 1870, containing the coal statistics for the year 1869. Together with an article on the causes of high prices of anthracite coal in 1868 and in 1869. A tabular statement of the coal trade from its commencement, statistics of the iron trade, etc. Price, twenty-five cents. Published at the Miner's Journal Office, Pottsville, Pa. Sold in New York by D. Van Nostrand, 23 Murray street.

PATENT OFFICE DECISION.

In the matter of the application of Isaac A. Sheppard for letters patent for a design for a stove ornament.—This case is referred to me by the Primary Examiner upon the following statement:

"In this application for patent for design of Isaac A. Sheppard, filed February 24, 1870, are found two claims—one for the central figure (which constitutes the gist of the case), when cast on and forming a part of a stove plate, and the other for the central figure and surrounding ornaments.

"In dealing with this case, the Examiner finds that it has not been the usual practice of the Office to allow more than one claim in an application for a patent for a design.

"The reasons generally given to sustain this course of action are, that a design is a complete and individual device or ornament, and as such must be exact and perfect in every form, line, or configuration, the slightest deviation from what is represented operating to make a new design.

"The law evidently makes no such inflexible rule of official practice. In the Bartholomew case (Commissioner's Decisions, 1868, p. 111), it is observed that a certain reasonable and proper latitude is given in judging what does and what does not breathe the spirit of the invention in any given case, and that mere colorable variation is to receive no more countenance or favor in an application for a patent for a design than it would in an application for a mechanical device.

"But while the Examiner is impressed with these views, he is unwilling in his first decisions, in applications of the present character, to overrule, so far as falls within his jurisdiction, the generally-settled custom and rule of the Office in the above particular. He desires, therefore, to refer the whole matter to the personal consideration of the Commissioner, as a question of Office practice, for his decision or direction.

"L. DEANE, Examiner."

I agree with the Examiner that there is no provision in, or fair construction of, the acts relating to letters patent for designs, which forbids the union of two or more claims or clauses of claim in a single patent. I am at a loss to know upon what ground such a construction can be asserted or maintained. If the design contains features which are new, singly, and in combination, no reason is known to me why they may not be so claimed.

But, the practice of the Office has not been so uniformly adverse to the granting of double claims, as seems to have been supposed. On the contrary, letters patent for designs containing more than one claim were granted in the years 1855, '57, '58, '59, '60, and '62, and doubtless in the succeeding years, if time had permitted a further examination. Among these, special reference is made to the patent granted to Apollos Richmond, in 1859, which contains one claim for the configuration of a stove plate and another for the ornament upon the same plate; and to the patent granted to Isaac B. Woodruff, in 1862, for a design for a clock case, which contains one claim for the configuration of the whole case, and another for a gilt frame, forming a subordinate part of the same whole.

These cases fully justify the claims presented in the present application, which may therefore be allowed, both upon reason and precedent.

(Signed) SAMUEL S. FISHER, Commissioner.

March 8, 1870.

UNITED STATES CIRCUIT COURT AT NEW ORLEANS.

A. C. Twining vs. *Bujac and Girardey.*—This is a suit brought by Prof. Twining, of Yale College, New Haven, Conn., against Bujac and Girardey, of this city, claiming damages to the amount of $250,000 for making and using machines substantially according to letters patent granted to the plaintiff, for an improvement in the manufacture of ice; and for further damages claimed to amount to $100,000 for profits unlawfully realized by them by vending to others for use the process and invention described in said letters patent.

Defendants' answer sets forth that plaintiff was not the original and first inventor of said process, and denies the novelty of the invention secured by the letters patent referred to.

The trial of this case has commenced, and develops already very many points of chemical and mechanical interest. The defendants have manufactured and sold machines under the French patents of Carré and Mignon & Rouart, and have vended to others the rights of using those patents.

The plaintiff introduced evidence to show that defendants have already realized large sums from their alleged infringement, and also the evidence of Prof. St. John, of the College of Physicians and Surgeons of New York city, and that of President Barnard, of Columbia College, of New York, tending to show that the last-named patents (Carré and Mignon & Rouart), of 1860 and 1865, in this country, are obvious infringements of the plaintiff's American patent of 1853. The plaintiff's individual testimony concerning the origination and development of his own plan; that of Prof. St. John, who saw its working at Cleveland, Ohio, where the first results were produced under it; and that President Barnard who speaks of the relative working of the principles of plaintiff's and defendants' inventions, after having seen the latter in full and successful operation at the late Paris Exposition—are peculiarly interesting to all scientific persons, as well as to residents of our city, where the daily use of manufactured ice has become a necessity of existence.

Yesterday the plaintiff examined in open court D. Pochelu and H. C. Millaudon, of the Louisiana Ice Manufactory, and the defendant Girardey, as to the amount realized by the alleged infringements; and Dr. J. Albrecht, of New Orleans, as an expert upon the various points of infringement. The defendants introduced the testimony of witnesses examined at Cleveland, Ohio, and Brooklyn, N. Y., as to the practical operation of various machines constructed by the plaintiff. Here, for the closing of testimony and argument, the case was adjourned to some day to be fixed by the court.

A. R. Long and Billings & Hughes attorneys for plaintiff, and Johnson & Denis, of this city, and Geo. Harding of Philadelphia, represent the defendants.—*New Orleans Times.*

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

478.—INSTRUMENT FOR DETERMINING THE ALTITUDE AND ZENITH DISTANCE OF CELESTIAL BODIES.—H. Colby, New York city. February 17, 1870.

511.—PNEUMATIC ENGINE.—J. S. Morton, Philadelphia, Pa. February 21, 1870.

517.—TREATING IRON.—Wm. Fields, Wilmington, Del., and J. M. Roberts, Burlington, N. J. February 8, 1870.

493.—APPARATUS FOR FRINGING WOOLEN FABRICS.—N. Wheeler, Bridgeport, Conn. February 10, 1870.

491.—LOOM.—J. A. Bassett, and J. R. Norfolk, Salem, Mass. February 10, 1870.

497.—SPRING SEATS AND BED BOTTOMS.—J. L. Whipple, Detroit, Mich. February 11, 1870.

489.—VEGETABLE PARCHMENT.—C. Campbell, Buffalo, N. Y. February 16, 1870.

533.—SPRINGS FOR CARRIAGES, ETC.—A. J. Dexter, North Foster, R. I. February 23, 1870.

570.—PADDLE WHEEL.—A. Wingard, San Francisco, Cal. February 26, 1870.

Business and Personal.

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

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin. $4·00 a year. Advertisements 10c. a line.

An experienced mechanical and railway engineer wishes a position as Master of Machinery, or Manager. Address "Engineer," Station "G," Philadelphia, Pa., Postoffice.

Manufacturers of washing machines are requested to send illustrated description to Postoffice Box, 3322.

Broughton's Oil Cups, patented Jan. 3, 1865, are the best for lubricating engines and shafting. Beware of infringements on the above Address H. Moore, 41 Center street, for particulars.

Bartlett's Street Gas Lighter. Office, 569 Broadway, N. Y.

A good business for a machine shop.—The right to manufacture, on royalty or otherwise, a first-class article already introduced; demand unlimited. Address Wm. Johnson, Lambertville, N. J.

The Pew Hat Rack.—E. S. Blake, Pittsburgh, Pa.

For description of the best lath and blind slat sawing machine in use, address W. B. Noyes, Gen'l Ag't, P. O. Box 553, Manchester, N. H.

Important advance on the draft and easement of carriage. See Jackson's Patent Oscillating Wagon, with tests of draft, models, etc., No. 149 High st., Newark, Essex Co., N. J. See Scientific American, Sept. 25, 1869.

Photographs.—Rockwood & Co., 839 Broadway, for five dollars, make 8x10 photographs of machinery or views within the city.

1250 lbs. portable platform scales, $25; hay scales, 4-tun, $75. Send for free price list, No. 373. Edward F. Jones, Binghamton, N. Y.

American Boiler Powder.—A safe, sure, and cheap remedy for scale. Send for circular to Am. B. P. Co., P. O. Box 315, Pittsburgh, Pa.

Kidder's Pastilles.—A sure relief for Asthma. Price 40 cents by mail. Stowell & Co., Charlestown, Mass.

Needles for all sewing machines at Bartlett's, 569 Broadway, N. Y.

Pat. paper for buildings, inside & out, C. J. Fay, Camden, N. J.

If you don't use the Patent Lacing made J. Sweetman, Utica, N. Y., you miss it.

For Sale—An old established Malleable and Gray Iron Foundery, doing a large trade in hardware. Cause of selling, failure of health of the proprietor. Address "Malleable Iron," Newark, N. J.

A. C. Carey, Box 43, Malden, Mass., wishes to communicate with twine makers

I want a second-hand 30 to 50-horse power engine and boiler. George Gale, Derby Line, Vt.

Manufacturers of Calf and Lamb Roller Skins, Roller and Cleaver Cloths. Please send address to P. O. Box 3,756, Boston.

To Manufacturers and Patent Right Dealers.—The entire Patent, except one State, for sale. Price, $500. Address Lock Box 99 Pontiac, Mich.

General Agency for the Sale of Patented Articles. Address H. Turner, 10 Larned street, Detroit, Mich.

Brick-Making Machine Wanted. Address A. G. Hunter, Jackson, Mich.

Machinery Depot of Chas. Place & Co., 60 Vesey st., N. Y. Apply for printed lists, 2d-hand Iron and Wood working Machinery.

Situation Wanted—Is a competent bookkeeper, and fully experienced in mechanical drawing and designing. Best reference. Address "Draughtsman," Washington, D. C.

Brick and Tile Drain Machine—First Premium in Ohio, Indiana, and Missouri; also Fair of American Institute, New York. Address Thos. L. Cornell, Derby, Conn.

Asbestos—Wanted by J. N. Clarke, 126 Dearborn st., Chicago, Ill.

Wanted—Managers of all the Rinks and Velocipede Halls to send for circular to Thos. L. Luders, "Pedespeed Works," Olney, Ill.

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

For first-quality new 14, 17, and 20-in. screw lathes, milling machines, and one-spindle drills, at small advance from cost, apply to Geo. S. Lincoln & Co., Hartford, Conn.

Hackle, Gill Pins, etc., at Bartlett's, 569 Broadway, New York.

Portable Pumping or Hoisting Machinery to Hire for Coffer Dams, Wells, Sewers, etc. Wm. D. Andrews & Bro., 414 Water st., N. Y.

Keuffel & Esser, 71 Nassau st., N. Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves

For tinmans' tools, presses, etc., apply to Mays & Bliss, Brooklyn, N. Y

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

Two 60-Horse Locomotive Boilers, used 5 mos., $1,300 each. The machinery of two 500-tun iron propellers, in good order, for sale by Wm. D. Andrews & Bro., 414 Water st., New York.

Prang's Chromos, celebrated for their close resemblance to oil paintings. Sold in all Art Stores.

To ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's manufacturing news of the United States. Terms $4·00 a year.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

Facts for the Ladies.

I can inform any one interested of hundreds of Wheeler & Wilson Machines of twelve years' wear, that to-day *are in better working condition than one entirely new.* I have often driven one of them at a speed of eleven hundred stitches a minute. I have repaired fifteen different kinds of Sewing Machines, and I have found yours to wear better than any others. With ten years' experience in Sewing Machines of different kinds, yours has stood the most and the severest test for durability and simplicity.

GEO. L. CLARK.

Lyndenville, N. Y.

The Advertisers Gazette,

Issued by G. P. Rowell & Co., Advertising Agents, No. 40 Park Row, New York, contains much information not to be obtained elsewhere. Every advertiser should read it. Sample copies by mail for 15 cents.

Answers to Correspondents.

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

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

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

R. L. A., of N. C.—According to the modern theory, heat is produced in combustion by the conversion into heat motion of the molecular forces pre-existing in the substances which, by the energy of their chemical combination, produce the phenomena which together characterize what we call combustion. The material idea of heat is one of the oldest notions entertained in regard to it. This theory gradually gave place to the theory that heat was a force, which in its turn has given way to the theory accepted by most of the leading physicists of the present age, that heat is merely a mode of molecular motion. To use the words of Helmholtz, "heat is a shivering motion of the ultimate particles of bodies." This motion throws the particles under certain circumstances so widely asunder as to counteract the action of cohesive attraction, and convert solids into fluids or gases, or fluids into gases. Tyndall's lectures on "Heat as a mode of Motion" will give you all the reasons for supposing this to be the correct theory.

J. R. P., of W. Va.—To determine the size of a Giffard's injector, it is necessary to know the pressure of steam in atmospheres, the diameter of the throat in inches, and the number of gallons required to be delivered per hour. Then divide the number of gallons required to be delivered per hour by the square root of the pressure in atmospheres, and extract the square root of the quotient. 0·0153 of this root will be the diameter of the throat of the injector in inches. To find the delivery, multiply the diameter of the throat in inches by 63·4, square the product, and multiply by the square root of the pressure in atmospheres. The result will be the delivery in gallons per hour. The injector will not work with feed water above 120° Fahrenheit.

J. A. T., of Mass.—A blower does not draw the air in. It forces the air out of the shell by virtue of the centrifugal force it imparts to it, and the pressure or weight of the external atmosphere forces in air at the center, to supply the partial vacuum thus created. The trial by pressure gages at the late Fair of the American Institute, showed that the pressure generated by the first fan in Clark's Multiplying Pressure Fan Blower was equal to that of a single fan of like dimensions and speed, and the increase of pressure for each subsequent fan was exactly equal to the pressure generated by the first fan. The results stated in our article were correct.

H. C. S., of La.—The process of the manufacture of rubber goods as now conducted, employs neither solvents nor fusion. The crude rubber is kneaded with a proportion of sulphur till it assumes the consistence of dough. It is then molded into the desired forms, and vulcanized by subjecting it to from 250 to 300 degrees of heat, for several hours. You cannot treat it in the manner proposed. Pure rubber may, however, be dissolved in pure oil of turpentine, or benzine, but when it hardens by the evaporation of the solvents, it does not become as hard as before its solution.

U. S., of Ga.—Gas made from naphtha or light petroleum products may be used with as much safety as ordinary illuminating gas, with the proper apparatus. None of these hydrocarbons are explosive in themselves. When explosions occur in their use, it is because of the ignition of explosive mixtures of their vapors with air or oxygen. The mixtures used in machines for making illuminating gas from gasoline, etc., do not have enough air in them to explode. We regard some of these devices as perfectly safe.

P. J. F., of N. Y.—We do not get your meaning clearly. What is to drive the blowers designed to supply air to your boilers? Compressed air can be used as a motor, and obeys the same laws as steam in non-condensing engines. If your question is whether a run of millstones could be driven with compressed air in a twenty-five-horse power engine, we answer Yes.

S. S. G., of Mass.—Your theory of terrestrial magnetism is the accepted one. The fundamental reason why a magnet assumes a position at right angles to an electric current, has not yet been discovered. If a bar or needle is placed parallel with a conducting wire, its opposite sides have opposite polarites.

J. W., of Mass.—A non-expansive steam engine driving 10-horse power will, on the average, consume about one sixth of a cubic foot of water per minute. As you do not state whether the steam is used expansively or otherwise, we cannot give you any more definite answer.

B. B. C., of Mass.—A 16-inch fan will do the work of a 24-inch fan, if the width of the wings of the 16-inch fan are made 2¼ times the width of the 24-inch fan, and the speed of the 16-inch fan be 15 per cent faster than that of the 24-inch fan.

A. P. S., of N. Y.—We think it you wish to run a train of clockwork with a uniform motion, the best regulator is a small fan wheel, like that used on the striking movement of clocks, in music boxes, etc.

L. F. D., of Md.—Oil cups in the cylinders of any but large horizontal engines are unnecessary. In such engines we consider them essential.

M. B. C., of N. Y.—We think you might run your engine up to 120 revolutions with a saving of fuel for the same work.

J. S. B., and others, of N. J.—You will find your query answered to D. B. S., of Mass., in No. 15, current volume.

Caveats are desirable if an inventor is not fully prepared to apply for a patent. A Caveat affords protection for one year against the issue of a patent to another for the same invention. Patent Office fee on filing a Caveat, $10. Agency charge for preparing and filing the documents from $10 to $12. Address MUNN & CO., 37 Park Row, New York.

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Recent American and Foreign Patents.

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

WOOD TURNING LATHE.—J. J. Urmston, Rahway, N. J.—The invention consists in the combination with an ordinary lathe of a large, slowly revolving drum or cylinder parallel with the spindles of the lathe, and carrying cutters, against which the block in the lathe is revolved at great rapidity, and reduced to the required form. Each of the said cutters being arranged for its special part of the work, which it accomplishes wholly at one operation, and only one tool is in operation at a time, one moving up to the work as the preceding tool passes away. The said tools are adjustable on the cylinder for turning different articles, and the lathe is adjustable to or from the cylinder; it is also provided with sliding tools for cutting off the ends of the work.

WATERPROOF COMPOSITION FOR HARNESS LEATHER, AND OTHER PURPOSES.—John Herold, Omaha, Neb.—This invention relates to a new and useful improvement in a composition for leather, and for all the purposes for which it is adapted.

DEVICE FOR LIGHTING GAS BY ELECTRICITY.—W. J. Morris and Wm. J Reid, New York city.—The object of this invention is to light a suitable number of gas jets with a battery, which is but little more powerful than would be required to light one and overcome the resistance of the main conductor.

CARRIAGE PROP.—Leonard Sawyer, South Amesbury, Mass.—This invention has for its object to so construct a carriage prop that the nut at its end for holding the stays or rods in place cannot be worked loose by the swinging of the same or the prop, during the expanding and folding together of the carriage tops.

WASHING MACHINE.—J. K. Derby, Jamestown, N. Y.—The object of this invention is to provide a cheap, durable, and effective machine for washing clothes by the rubbing process, and it consists in operating a rubber plate of wood, or other suitable material, on a bed composed of rollers, by means of levers and jointed arms or rods.

BRICK MACHINE.—F. L. Clarke, Oakland, Ill.—This invention relates to improvements in brick machines, whereby it is designed to provide a simple and efficient arrangement for delivering the ground clay to the molds, and pressing it therein, and for applying and removing the said molds.

BUTTER WORKER.—O. L. Dow, Hancock, N. H.—This invention relates to improvements in apparatus for working butter, and consists in the application to a table standing lower at one corner than the others, and having gutters along the two sides converging at the said lowest corner, of a horizontal turning butter board, and a butter working hand lever, having a fulcrum adjustable as to hight, and connected to the fulcrum in a way to prevent turning, also so that it may be held up above the butter when refined by the said connection.

LEATHER SCOURING AND SETTING MACHINE.—A. W. Reid, Schenectady, N. Y.—This invention relates to a new machine for "scouring" and "setting" leather with greater rapidity, and on a more economical plan than was heretofore in use. The invention consists in securing the scouring or setting tools, whether they be made of metal, stone, glass, or other suitable materials to arms that project from the rim or edge of a wheel or disk.

RAILROAD STATION INDICATOR.—Edward Conley, Cincinnati, Ohio.—This invention relates to improvements in railroad station and distance indicators, and consists in an arrangement of an endless belt whereon the names of the stations and the distances are placed on a system of rollers, adapted for working belts of great length within a small space, and arranged, for regulating the tension and for adjusting the belt relatively to the opening through the case, so as to bring the names on the belt properly before it. The invention also comprises a double acting pawl and ratchet, an arrangement by which the belt may be moved back and forth according to the movement of the car on the road.

CARRIAGE CLIP.—Leonard A. Johnson, Candor, N. Y.—This invention relates to improvements in clips for the attachment of shafts and poles of light carriages to the axles, and consists in an improved arrangement of open boxes or bearings in the ears of the clip, for the trunnions or journals of the shaft or pole, a detachable cap, and a spring for holding them in place. It also consists in an arrangement of the detachable plate which connects the two ends of the yoke below the axle, to prevent it from falling off in case the nuts on the screw-threaded ends of the yoke work off.

BISCUIT PANS.—J. C. Milligan, Brooklyn, N. Y.—This invention relates to improvements in connecting small biscuit pans together in clusters, and consists in attaching them in rows, in straight, zigzag, curved, or diagonal lines, by connecting them by riveting to narrow strips or bars of metal placed on the bottom, and connecting the edges of the tops which are so placed as to touch, by riveting through the sides, or by strips riveted or otherwise connected to the edges or sides of the pans, or, in some cases connecting them at the tops only, dispensing with the strips at the bottom, or, the strips only may be used as the means of connection, without connecting the edges at the top.

POLISH FOR CLEANING PLATE AND GLASS.—Hermann Teats, Ann Arbor, Mich.—This invention consists of an improved composition of matter for cleaning and polishing metal and glass wares.

WATER WHEEL.—John Buzby, Moorestown, N. J.—This invention consists in the combination of a series of direct-acting vertical buckets on the outside of a water wheel with a concentric series of reacting inclined buckets next within extending below the direct-acting buckets, and independent of the outer series, by which arrangement the inventor is enabled to employ a larger number of vertical buckets than as though they formed part of the same series with the inclined buckets, and thus extract more power out of a given amount of water, and, at the same time, secure it an ample vent between the buckets of the inner series.

HORSE COLLAR.—George Horter, New Orleans, La.—This invention consists of a horse collar formed of a seamless envelope of some textile fabric inclosing a suitable stuffing.

ELECTICAL ATTACHMENT TO BOOTS AND SHOES.—Joseph Fanyou, Bridgeport, Conn.—This invention has for its object the production of an electric current between the earth and the foot of an individual wearing a boot provided with the inventor's electrical attachment, for the purpose o preventing such foot from becoming cold.

COMBINED TOOL.—Robert Stout, Matteawan, N. Y.—This invention has for its object to furnish an improved combined tool, designed especially to be carried by those driving horses, for convenience in fastening the shoes or removing stones or other substances that may have lodged in the horses' feet.

WASHING MACHINE.—Joseph Balsley, Bedford, Ind.—This invention has for its object to furnish a simple, strong, durable, and effective washing machine, doing its work quickly and well, and which shall be so constructed that the box or tub may be conveniently tightened to compensate for any shrinking of the timber.

ANIMAL TRAP.—Eder E. Haughwout, New York city.—This invention has for its object to furnish an improved animal trap, simple in construction and effective in operation, and which shall be so constructed that the animal in trying to escape shall fasten itself in a receiving chamber or cage, and, at the same time, set the trap for another animal.

CARRIAGE WHEEL HUB.—Wm. J. Arrington, Louisville, Ga.—This invention consists in having the hub made in two parts provided with tenons and mortises, into and between which the spokes are clamped by bolts passing longitudinally through every third or fourth space intervening between the spokes. Fitted to the hub is an axle box provided at one end with a collar which enters a recess in the inner end of the hub, and at the other end with a screw thread and nut which serve to secure the two parts of the hub together, but not so but that they may be separated to allow of the insertion or removal of one or more spokes without unrimming the wheel.

FINISHING CULTIVATOR.—Benjamin Johnston, New Iberia, La.—This invention has for its object to furnish a simple and convenient machine by means of which plants planted in hills, or drills may be "laid by," or finished, and which will do its work rapidly, uniformly, and well.

HARROWS.—Wm. Tuttle, Fayette, Miss.—This invention consists in the combination with that class of harrows which are made to rotate horizontally on the connection with the draft apparatus of a horizontal shaft, traversing the axis of the harrow, carrying with it a rapidly rotating spiked pulverizing apparatus.

COTTON HARVESTER.—Davis & Scott, Greensboro, N. C.—This invention relates to improvements in machines for gathering cotton, and consists in a receiving case, mounted on a truck, above the row of plants with two downward projecting plates, flaring outward at the front to gather the branches together, as the machine passes along, and hold them, and an air blowing apparatus, operated by the driving wheels or otherwise, which diffuses one or more strong blasts of air among the plants, at or near the bottom, in an upward direction, and detaches the ripe and loose cotton, and forces it into the receiver above, where it is retained by bars or grates which permit the escape of the air, but retain the fiber. The invention also consists in imparting a special direction to the blasts of air, as they leave the blast nozzles, whereby the detaching effect on the boles is intensified.

HEATING STOVES.—H. Besse, Delaware, Ohio.—This invention relates to improvements in heating stoves, open grates, and the like, and consists in the arrangement therewith on the bottom, one or more sides or parts thereof, and the top or double walls, forming heating chambers; and in providing in connection therewith cold air pipes, leading from the exterior of the building, under the floor or otherwise, to the said heating chambers, to supply fresh, cool air to be heated and discharged into the room, whereby it is designed to utilize a greater proportion of the heat developed than can be done by the present arrangement of stoves to give off the heat by radiation alone.

PEAT MACHINE.—Charles Luxton, Hudson City, N. J.—This invention relates to a new and useful improvement in machines for working peat and preparing it for fuel, and consists in operating a series of revolving cutters, or knives, in combination with a stationary bed, and in combination therewith conveyer wings for carrying the peat to and from the cutters; the whole inclosed in a suitably constructed cylindrical casing.

FLASK GUIDE.—Thomas S. Brown, Poughkeepsie, N. Y.—This invention relates to a new and useful improvement in the mode of guiding the parts ("cope" and "nowel") of a foundery flask together, and consists in a triangular or polygonal guide pin, tapering on one side, and acted upon by a spring, so that the cope may be kept perfectly steady and closed back on the nowel, in the exact position it occupied when the pattern was molded.

FOLDING CONVERTIBLE CHAIR.—William B. Kimball, Peterborough, N. H.—The object of this invention is to construct a chair which may be folded up into a small space, and be converted from an ordinary rigid seated chair to a rocking chair and *vice versa*.

OSCILLATING COUCH SOFA FOR VESSELS.—L. D. Newell, New York city.—This invention relates to improvements in apparatus to be used on vessels at sea, to neutralize the oscillating motion of the vessel, and it consists in providing in the state rooms, saloons, cabins, and other parts of the vessel couches, sofas, and the like, suspended on hangings capable of universal motion, so that they will always maintain a horizontal position, irrespective of that of the ship; the said couches being preferably made round, or circular, and those placed in the state rooms being as large as may be contained within the walls of the rooms, and having circular seats within the shells which form the backs of the seats. The angular spaces in the corners of the square state rooms not occupied by the couches, are designed to be used for clothes closets, wash stands, and the like.

MACHINE FOR FORCING AND SPREADING LIQUIDS.—Wm. Eaton, Benn Ainsworth, and Geo. W. Scott, Blackstone, Mass.—This invention has for its object to construct a machine by means of which liquids can be forced in fine spray with great regularity, and suitable force, the machine being so arranged that the degree of power can be regulated at will. The invention is more particularly applicable to the moistening of wool, preparatory to the carding of the same.

RUFFLER AND PUFFER.—J. L. Eck, Kutztown, Pa.—This invention relates to improvements in ruffling and puffing attachments for sewing machines, and consists in attaching the presser to the arm supporting the same so as to form a yoke above the presser, and introducing therein a flat spring connected to the arm, and provided with an adjusting screw, all so arranged that the ruffling will pass through the said yoke under the spring, which may be adjusted for action upon thick or thin material, while the cloth passes under the presser in the usual way.

HOOP LOCK CUTTER.—Theodore Conklin, Fond du Lac, Wis.—This invention consists of an adjustable clamp for holding the hoop, guide springs for regulating the position before the hoop is clamped, an inclined sliding crotched knife for cutting the straight part of the lock, a swinging knife for cutting the curved angular wall of the notch, and an adjustable spring for governing the clampers at the side of the straight wall of the lock; all under such an arrangement that the knife for cutting the straight shoulder of the lock, and the clamper thereat, will be worked to accomplish its cutting, and withdrawn previous to the finishing of the operation of the other knife, by one and the same movement of a hand lever.

FLOUR AND MEAL CHEST.—John M. Dashiell, Decatur, Ill.—The object of this invention is to provide a convenient receptacle for meal, flour, and other articles for domestic use, with facilities for sifting and preparing the flour and meal for use, and it consists in a chest partitioned off into compartments, provided with a sieve and a receiving drawer.

COMBINED SQUARE, PLUMB LEVEL, PROTRACTOR, AND RULER.—J. A. Littlefield, Randolph, Mass.—This invention relates to a new and useful improvement in the combination of several useful and well-known tools or instruments in one.

LAMP WICK FEEDER.—George Cade, Long Branch, N. J.—This invention relates to improvements in apparatus for feeding up the wick to the flame as it burns away, and consists in an arrangement inside the wick tube, which is slotted from the bottom upward a suitable distance, of a toothed carrying plate adapted to engage the wick and force it upward, and in the application to the said plate of a lever for moving it up and down, the said lever being pivoted to a suitable support on the burner, and engaged with the lifting plate so as to be readily detached.

FANNING MILLS.—Jacob L. Runk and B. H. Tharp, Nashville, Ill.—This invention relates to improvements in fanning mills, and consists in the application to the upper feed shoe of an adjustable slide, arranged under the throat of the hopper, for regulating the feed; also, in the application to the said shoe of a rod of wire or other substance, projecting up through the throat for agitating the grain and chaff to prevent clogging, the said rod moving with the shoe. The invention also comprises an arrangement of sieves, and an adjusting valve whereby the grain may be separated, and two grades formed without changing the sieves.

MACHINE FOR MAKING STAPLES.—Charles W. Kennedy, Williamsburgh, N. Y.—This invention has for its object to furnish a simple, convenient, and effective machine for forming staples, which shall be so constructed as to feed the wire in and form the staples automatically, and at the same time, rapidly and well.

SELF-FEEDER FOR NAIL MACHINES.—James Nolan, Oxford, N. J.—This invention has for its object to improve the construction of the self-feeders of nail machines to prevent them from being broken should anything get beneath the barrel or get out of order.

FRUIT JAR.—T. C. Purdy, Janesville, Wis.—This invention relates to a new device for sealing fruit cans, and consists in the use of a wire yoke placed around the neck of a can, and provided with loops, to receive the ends of screws that projects from the cover. The latter is thus held down by being screwed to the wire yoke.

REVOLVING SWING.—Almeron Graves, Roscoe, Ill.—This invention is an improvement upon an invention for handling animals for slaughtering patented by same party February 18, 1868. The invention consists of a revolving derrick having radial arms, projecting about midway of its length, the latter being adapted to the support of sails above, and swings below, and capable of being used either with or without the sails, and adapted to discharge, upon occasion, the function of a clothes dryer.

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101,409.—LAMP SHADE SUPPORTER.—J. B. Alexander, Washington, D. C.
101,410.—FAUCET.—John Ashcroft, New York city.
101,411.—ELASTIC GRADUATED SCALE.—R. M. Bache, Philadelphia, Pa.
101,412.—DIE FOR FORGING SHEAR BOWS.—A. R. Bailey, Plantsville, Conn.
101,413.—VAPOR BURNER.—S. D. Baldwin, Chicago, Ill.
101,414.—WASHING MACHINE.—Joseph Balsley, Bedford, Ind.
101,415.—APPARATUS FOR GENERATING CARBONIC ACID.—Benjamin Bates, Baltimore, Md.
101,416.—BRICK KILN.—Oliver Bennett, Boston, Mass. Antedated April 4, 1870.
101,417.—TOBACCO PIPE.—Z. R. Bennett, Williamsburgh, N. Y., assignor to himself and L. F. Reed, New York city.
101,418.—BREECH-LOADING FIRE-ARM.—Hiram Berdan (assignor to The Berdan Fire-Arms Manufacturing Company), New York city. Antedated March 21, 1870.
101,419.—CHAMBER VESSEL.—C. H. Berry, East Somerville, Mass.
101,420.—HEATING STOVE.—H. Besse, Delaware, Ohio.
101,421.—LOCK NUT.—Amos G. Binns, Pittsburgh, Pa.
101,422.—HOT AIR FURNACE.—Lansing Bonnell, Milwaukee, Wis. Antedated March 19, 1870.
101,423.—FLOUR SIFTER, COLANDER, AND STRAINER.—A. T. Boon and Lucien Mills, Galesburg, Ill.
101,424.—ICE PICK.—Edward Brown, Green Point, N. Y. Antedated March 23, 1870.
101,425.—STOP VALVE.—Silas H. Brown, Troy, N. Y.
101,426.—FLASK GUIDE.—Thomas S. Brown, Poughkeepsie, N. Y.
101,427.—LAMP WICK FEEDER.—George Cade, Long Branch, N. J.
101,428.—STOVE LEG.—Edward Card, Providence, R. I. Antedated March 21, 1870.
101,429.—WAGON TONGUE.—E. P. Carter, Arcade, N. Y.
101,430.—FASTENING FOR PAILS, CANS, ETC.—J. K. Chace, New York, assignor to himself and S. A. Haley, Brooklyn, N. Y.
101,431.—MACHINE FOR GRINDING SCREWS.—Edwin Chambers and Cyrus Chambers, Jr., Philadelphia, Pa. Antedated March 24 1870.
101,432.—BRICK MACHINE.—Frederic L. Clarke, Oakland, Ill.
101,433.—STEAM GENERATOR.—Jonathan M. Clark, New York city.
101,434.—STEAM GENERATOR.—Jonathan M. Clark, New York city.
101,435.—SULKY PLOW.—John H. Cole, Vacaville, Cal.
101,436.—MACHINE FOR CUTTING LOCKS IN HOOPS.—Theodore Conklin, Fond Du Lac, Wis.
101,437.—RAILROAD STATION INDICATOR.—Edward Conley, Cincinnati, Ohio.
101,438.—FLOUR AND MEAL CHEST.—J. M. Dashiell, Decatur, Ill.
101,439.—COTTON HARVESTER.—James Davis, Jr., and David Scott, Jr., Greensborough, N. C.
101,440.—WINDOW SHADE FIXTURE.—D. W. De Forest (assignor to Richard Oliver), Brooklyn, N. Y.
101,441.—WASHING MACHINE.—John K. Derby, Jamestown, N. Y.
101,442.—TAPE LINE BOX.—Chas. E. Donnellan, Indianapolis, Ind.
101,443.—CHIMNEY COWL.—Nathan Douglas, Goshen, Ind., assignor to himself and Frank Douglas, Norwich Conn.
101,444.—BUTTER WORKER.—O. L. Dow, Hancock, N. H.
101,445.—HYDRAULIC ENGINE.—William Eaton, Benn Ainsworth, and G. W. Scott, Blackstone, Mass.
101,446.—RUFFLING ATTACHMENT FOR SEWING MACHINE.—J. L. Eck (assignor to himself and S. S. Schmehl), Kutztown, Pa.
101,447.—LATHE FOR TURNING OVALS.—Rudolph Eickemeyer, Yonkers, N. Y.
101,448.—KNIFE, NUT-CRACKER, AND PICKER.—Geo. A. Fairfield, Hartford, Conn.
101,449.—HOT BLAST OVENS OR FURNACES.—E. M. Ferguson, Brady's Bend, Pa.
101,450.—LIFTING JACK.—L. W. Fifield (assignor to Enoch Earle and L. K. Davis), Worcester, Mass.
101,451.—DUMPING PLATFORM.—R. M. Fish, Glenwood, Iowa.
101,452.—MELODY ATTACHMENT.—Carl Fogelberg, Boston, Mass.
101,453.—CHURN.—Albion W. Foster, Millbridge, Me.
101,454.—LIFTING JACK.—L. P. Garcin (assignor to himself and J. D. Hooker), San Francisco, Cal.
101,455.—MACHINERY FOR MAKING PAPER BOXES.—Frederick Gates, Vineland, N. J., assignor to Wm. Gates, Frankfort, N. Y.
101,456.—LASTING MACHINE.—Karl Grassau, Virginia City, Nevada.
101,457.—PENCIL HOLDER.—Annie J. Hall, San Francisco, Cal.
101,458.—DRYER.—Thomas S. Harrison, Philadelphia, Pa. Antedated March 25, 1870.
101,459.—ANIMAL TRAP.—Eder E. Haughwout, New York city.
101,460.—HARVESTER CUTTER.—Ira A. Hebbard (assignor to E. F. Hebbard), Rochester, N. Y.
101,461.—WATER-PROOF COMPOSITION FOR HARNESS, LEATHER, ETC.—John Herold, Omaha, Nebraska.
101,462.—PLANING MACHINE.—Alfred M. Hills, Lowell, Mass.
101,463.—RECLINING CHAIR.—W. C. Hornfager and Edmond A. Warren, Brooklyn, N. Y.
101,464.—CANNON PINION FOR WATCHES.—Elias H. Hull Warren, Ohio.
101,465.—SAW MILL.—Elias H. Hull, Warren, Ohio.
101,466.—HAND DRILLING MACHINE.—James E. Hunter, North Adams, Mass.
101,467.—CARRIAGE CLIP.—Leonard A. Johnson, Candor, N. Y.
101,468.—FINISHING CULTIVATOR.—Benjamin Johnston, New Iberia, La.
101,469.—WELL POINT.—C. C. Jones, Portland, Me.
101,470.—REFLECTOR FOR STREETS.—A. K. Grim and A. D. Moore, San Francisco, Cal.
101,471.—STAPLE MACHINE.—Charles W. Kennedy, Williamsburgh, N. Y.
101,472.—FOLDING CONVERTIBLE CHAIR.—William B. Kimball, Peterborough, N. H.
101,473.—MACHINE FOR THE MANUFACTURE OF FELTED FABRICS FOR ROOFING, ETC.—Samuel Kingan, New York city, administrator of the estate of James Anderson, deceased.
101,474.—POTATO DIGGER.—Melvin W. Knox, Sheridan, N. Y.
101,475.—COUNTER SHOW CASE.—George D. Leonard, New York city. Antedated January 6, 1870.
101,476.—BASE BURNING STOVE.—Dennis G. Littlefield, Albany, N. Y., and Grove H. Johnson, Erie, Pa.
101,477.—COMBINED SQUARE, PROTRACTOR, LEVEL, ETC.—J. A. Littlefield, Randolph, Mass.
101,478.—PEAT MACHINE.—Charles Luxton, Hudson City, N. J.
101,479.—MACHINE FOR SCOURING AND BURNISHING METALS.—James B. Lyons, Milton, Conn.
101,480.—HAND SEED PLANTER.—J. T. Macomber, Grand Isle, Vt.
101,481.—SAW FRAME.—Charles Majer, Williamsburgh, N. Y.
101,482.—SELF-TIGHTENING BUCKLE.—Matthias Marvin, Salem, Oregon.
101,483.—BAIL EAR.—William D. Mason and Arthur T. Rice. Chicago, Ill.
101,484.—WATER ELEVATOR.—Morton S. McAtee, Chester, Ill.
101,485.—PLUNGER FOR GLASS MOLDS.—John McCord (assignor to himself and John Bruce), East Birmingham, Pa.
101,486.—SASH FASTENER.—John S. McGlumphy, Wind Ridge, Pa.
101,487.—GOVERNOR FOR STEAM ENGINE.—Hugh Dunbar McMaster and Abraham Dale, Guilford, Ireland.
101,488.—STEAM HEATING PIPES.—William Mendham (assignor to Cyrus Chambers, Jr., and Edwin Chambers), Philadelphia, Pa. Antedated March 29, 1870.
101,489.—EXTENSION BED.—Frederick Menzer, San Francisco, Cal.
101,490.—BISCUIT PAN.—John C. Milligan, Brooklyn, N. Y.
101,491.—APPARATUS FOR LIGHTING GAS BY ELECTRICITY.—Walter J. Morris and William J. Reid, New York city.
101,492.—SAW HANGING.—Lawrence Morrison and Amos G. Harms, Allegheny City, Pa.
101,493.—WALKING-BEAM AND SUCKER-ROD CONNECTIONS FOR DEEP WELLS.—Marcellus A. Morse, Titusville, Pa.
101,494.—HOP PICKER.—Myron Moses, Malone, N. Y. Antedated April 1, 1870.
101,495.—MARINE FURNITURE.—L. D. Newell, New York city.
101,496.—FEEDING APPARATUS FOR NAIL MACHINES.—Jas. Nolan (assignor to himself and E. T. Henry), Oxford, N. J.
101,497.—MITER MACHINE.—John Nonnenbacher, New York city.
101,498.—HORSE POWER.—George Oerllein, Utica, Minn.
101,499.—POTATO DIGGER.—Oliver Patterson, South Dansville, N. Y.
101,500.—APPARATUS FOR DISINTEGRATING ORES.—Almarin B. Paul, San Francisco, Cal.
101,501.—SEALING APPARATUS FOR PIPE-JOINT COUPLINGS.—Charles Perkes, Philadelphia, Pa.
101,502.—WOOD TURNING LATHE.—Oliver H. Perry, Golconda, Ill.
101,503.—ADJUSTING SLIDE FOR CHAINS.—Robert James Pond, Morrisania, N. Y., assignor to Jahne, Smith & Co., New York city.
101,504.—MOLDING SASH WEIGHTS.—William W. Pullis, St. Louis, Mo.
101,505.—FRUIT JAR.—Thomas C. Purdy, Janesville, Wis.
101,506.—GLOVE.—John H. Putman, Gloversville, N. Y.
101,507.—MODE OF SECURING HORSE POWERS TO THE GROUND.—Francis W. R. Burlington, assignor to I. B. Buell, Union, Mich.
101,508.—MACHINE FOR SCOURING AND SETTING OUT LEATHER.—A. W. Reid (assignor to himself and W. H. Rugg, Schenectady, N. Y.
101,509.—REVOLVING PLOW COLTER.—Merritt Richards, Princeton, Ill.
101,510.—COMPOUND BLOWER.—A. K. Rider (assignor to himself, C. H. De Lamater, and G. H. Reynolds), New York city.
101,511.—WASHING MACHINE.—Wm. Riley, Madison county Miss.
101,512.—GLASS LAMP.—D. C. Ripley, Jr. (assignor to Ripley & Co.), Birmingham, Pa.
101,513.—MACHINE FOR MAKING HORSESHOES.—L. D. Roberts, Cleveland, Ohio.
101,514.—FANNING MILL.—J. L. Runk and B. H. Tharp, Nashville, Ill.
101,515.—HORSE COLLAR.—Henry Sanders, Utica, N. Y.
101,516.—TIN PAIL.—Hugh Sangsters, Buffalo, N. Y.
101,517.—COFFEEPOT.—S. T. Savage (assignor to himself and D. S. Quimby, Jr.), Brooklyn, N. Y.
101,518.—CARRIAGE PROP.—Leonard Sawyer, South Amesbury, Mass.
101,519.—SADIRON HEATER.—William Scarlett, Aurora, Ill.
101,520.—CARRIAGE CUTTER.—John D. Schaub, Birmingham, Pa.
101,521.—CARRIAGE AXLE.—Francis Scherb, New York city.
101,522.—HARROW AND EARTH CUTTER.—John Schroeffel and Wm. Dell, Allegheny City, Pa.
101,523.—SKATE.—G. V. Scobey, Waterloo, assignor to himself and Reuben Wood, Syracuse, N. Y.
101,524.—HORSE HAY FORK.—Elijah U. Scoville, Manlius, N. Y.
101,525.—BRICK AND TILE MACHINE.—George Scott, Philadelphia, Pa., assignor to himself, Charles Melcher, John Melcher, G. W. Melcher, and W. H. Melcher.
101,526.—SPRING BED BOTTOM.—D. N. Sellig, Newburg, N. Y.
101,527.—COVERING FOR STEAM BOILERS, ETC.—J. E. Sharp, Eleazer Ainsworth, and F. A. Sabbaton, Troy, N. Y.
101,528.—PATTERN FOR SHOES.—Elias Shopbell, Ashland, Ohio.
101,529.—DIE FOR MAKING CHORD-BAR HEADS.—F. J. Smith, Chicago, Ill.
101,530.—SEPARATOR.—B. H. Snavely, Penn township, Pa.
101,531.—SAW MILL.—H. F. Snyder and G. S. Snyder, Williamsport, Pa.
101,532.—FRICTION CALENDER ROLLS FOR PAPER.—W. H. Soley and George Stites, Philadelphia, Pa.
101,533.—FAUCET.—Thos. Somerville (assignor to himself and Robert Leitch), Washington, D. C.
101,534.—SODA FOUNTAIN.—S. B. Spring, Geneva, Ohio.
101,535.—ORNAMENTAL SCROLL TYPE.—Henry Stephenson, Wm. Thompson, and W. G. Blake, Sheffield, England, assignors to F. W. Griffith and George P. Byrne, New York city. Antedated March, 18, 1870.
101,536.—CULTIVATOR.—Garland B. St. John, Kalamazoo, Mich. Antedated April 1, 1870.
101,537.—ATTACHMENT TO SEEDING MACHINE.—G. B. St. John, Kalamazoo, Mich.
101,538.—HORSESHOEING TOOL.—Robert Stout, Matteawan, N. Y.
101,539.—GANG PLOW.—J. W. Sursa, San Leandro, Cal.
101,540.—SULKY-HARROW AND SEEDER COMBINED.—A. L. Taveau, Chaptico, Md.
101,541.—NUT LOCK PLATE.—E. D. Taylor (assignor to himself and David Cohn), Hornellsville, N. Y.
101,542.—COUNTER-KNIFE.—John Teed, Reading, Pa.
101,543.—CAR COUPLING.—James Temple (assignor to himself, Wm. Temple, and John Temple), Belle Fonte, Pa.
101,544.—PROCESS AND APPARATUS FOR SUPPLYING PURE WATER TO BUILDINGS.—John A. Thompson, Auburn, assignor to American Water Purifying Company, Buffalo, N. Y. Antedated March 25, 1870.
101,545.—EXTENSION TABLE.—Smilie Tilton, Alton, N. H.
101,546.—PAPER BOX.—John W. Tuttle, Newton Corner, Mass.
101,547.—HARROW.—Wm. Tuttle, Fayette, Miss.
101,548.—WOOD-TURNING LATHE.—J. J. Urmston, Rahway, N. J.
101,549.—SHELF FOR OVENS OF COOKING-STOVES.—S. S. Utter, New York city.
101,550.—FEED FOR IRON PLANERS.—H. B. Weaver (assignor to G. S. Lincoln and C. L. Lincoln), Hartford, Conn.
101,551.—LUBRICATING JOURNALS AND BEARINGS.—Isaac P. Wendell (assignor to himself and Stephen P. M. Tasker), Philadelphia, Pa.
101,552.—MANUFACTURE OF ARTICLES OF COMPRESSED WOOD.—S. P. Wheeler (assignor to himself and S. B. Henry), Bridgeport, Conn.
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101,555.—Combined Distilling Apparatus.—Ludwig Wolff (assignor to himself, D. G. Rush, H. J. Pahlman, and Charles Welsh), Chicago, Ill.

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101,559.—Grinding Machine.—T. H. Worrall, East Blackstone, Mass.

101,560.—Thill Coupling.—Edmund Yeiser, Newmanstown, Pa. Antedated March 23, 1870.

101,561.—Curling Rod for Paper Cigar Lighters.—W. D. Young, South Pittsburgh, Pa.

101,562.—Preparing Tomatoes and other Fruits and Vegetables to be used as Food.—Charles Alden, Newburg, N. Y.

101,563.—Car Spring.—T. F. Allyn, Nyack, N. Y.

101,564.—Door Lock.—W. H. Andrews (assignor to Burton Mallory), New Haven, Conn.

101,565.—Die for Forming Sleeve Buttons.—Henry Ansley, Washington, D. C.

101,566.—Hay Press.—G. H. Aylworth, Brighton, Ill.

101,567.—Tablet for Tombs.—H. F. Bailey, Amsterdam, N. Y.

101,568.—Gun-Sight.—H. B. Barber, Scott, N. Y.

101,569.—Harness.—E. L. Basnet, Morgantown, West Va.

101,570.—Gate.—Aquila Becraft, Jacksonville, Ill.

101,571.—Pruning Shears.—George Bergner, Washington, Mo.

101,572.—Construction of Metallic Cornice.—Joseph M. Blackburn, C. L. Wood, B. K. Price, and Cornelius A. Sheridan, Cleaveland, Ohio.

101,573.—Ironing Machine.—George Boxley, Troy, N. Y.

101,574.—Sulky Plow.—J. G. Boyd (assignor to himself and Allen Bailey), Decatur, Texas.

101,575.—Sewer Grate.—Z. L. Bragdon, Bangor, Me.

101,576.—Portable Swing.—Mary D. Brine, Chicago, Ill.

101,577.—Tinman's Machine.—Charles Brombacher, Tarrytown, N. Y.

101,578.—Thrashing Machine.—William H. Butterworth, Trenton, N. J.

101,579.—Water Wheel.—John Buzbo, Moorestown, N. J.

101,580.—Device for Ringing Street-Car Bells.—Chas. Carr, Boston, Mass. Antedated April 1, 1870.

101,581.—Horseshoe.—Ebenezer Cate, Watertown, Mass.

101,582.—Refrigerator.—A. J. Chase, Boston, Mass.

101,583.—Registering Steam Gage.—Elijah Clark (assignor to United States Steam Gage Company), Louisville, Ky.

101,584.—Lamp.—H. M. Clark (assignor to himself, Elisha J. Barnard, and Charles Blanchard), Meriden, Conn.

101,585.—Lawn Mower.—C. M. Clinton (assignor to himself and A. N. Gregg), Ithaca, N. Y.

101,586.—Wagon Axle.—Thomas M. Cluxton, Rising Sun, Ind.

101,587.—Molding and Clarifying Horn.—E. F. Coffin, Newburyport, Mass.

101,588.—Refrigerator.—E. S. Colton (assignor to the Colton Refrigerator Company), Boston, Mass.

101,589.—Cow Milker.—L. O. Colvin, New York city. Antedated March 24, 1870.

101,590.—Wood Pavement.—Turner Cowing, San Francisco, Cal., assignor to T. E. Brown, Memphis, Tenn.

101,591.—Garment Dummy.—A. M. Davis, Washington, D. C.

101,592.—Washing Machine.—Cyrus Dean, Buffalo, N. Y.

101,593.—Shoe Trimming.—Wm. T. Demarest, Brooklyn, N. Y.

101,594.—Composition Roofing, Paving, etc.—E. J. De Smedt (assignor to New York Improved Anthracite Coal Company), New York city

101,595.—Lifting Clamp for Pumps.—Wm. H. Downing, Pioneer, Pa. Antedated March 29, 1870.

101,596.—Revolving Center Rest for Wood Lathes.—H. J. Durgin (assignor to James Chase), Rochester, N. Y.

101,597.—Fire Kindling.—G. W. Eldridge, South Chatham, Mass.

101,598.—Ticket Punch.—Robert Engels, Philadelphia, Pa.

101,599.—Churn.—T. R. Evans, Blacksburg, Va.

101,600.—Spring Bed Bottom.—Matthew Faloon, Bloomington, Ill.

101,601.—Wire Tightener for Wire Fence.—F. Fanning, Atchinson, Kansas.

101,602.—Galvanic Shoe Sole.—Joseph Fanyou, Bridgeport, Conn.

101,603.—Adjustable Elbow Joints for Water Pipes.—J. D. Field, Watago, Ill. Antedated April 1, 1870.

101,604.—Adhesive Postal and Revenue Stamp.—A. C. Fletcher, New York city. Antedated October 5, 1869.

101,605.—Melody Attachment for Organs, etc.—Carl Fogelberg, New York city.

101,606.—Fastening for Fruit Jars.—Wm. Galloway, Philadelphia, Pa.

101,607.—Padlock.—C. T. Gibson (assignor to himself and S. E. Kirk), Baltimore, Md. Antedated March 29, 1870.

101,608.—Brick Mold.—M. T. Glimsdal, Rockford, Ill.

101,609.—Revolving Swing.—Almeron Graves, Roscoe, Ill.

101,610.—Cotton Gin.—Richard R. Gwathmey (assignor to himself and C. W. Matthews), Philadelphia, Pa.

101,611.—Railway Rail.—J. C. Hagan, Nashville, Tenn.

101,612.—Steam Heater.—F. P. Hallberg, Gottenburg, Sweden.

101,613.—Ice-Cutting Machine.—V. H. Halleck, Queens, N. Y., assignor to himself, Curtis Stanton, and James R. Dixon, New York city.

101,614.—Self-feeding Drill.—J. H. Hanes, Cape May, N. J.

101,615.—Bread Machine.—John E. Hawkins, Lansingburg, N. Y.

101,616.—Brick Machine.—C. V. Hemenway (assignor to himself and A. A. Powers), New London, Ohio.

101,617.—Direct-Acting Compound Steam Engine.—Wm. H. Henderson, Philadelphia, Pa.

101,618.—Closet for Cake.—George A. Higgins, New York city

101,619.—Horse Collar.—George Horter (assignor to himself, T. K. Peterson, and E. C. Fenner), New Orleans, La.

101,620.—Mouse Trap.—A. H. Hotchkiss, Sharon, Conn.

101,621.—Furnace.—John Hulbert, Jr., Richmond, Ind.

101,622.—Boiler and Washing Machine.—D. H. Hull (assignor to himself and J. B. Savage), Plantsville, Conn.

101,623.—Horse Collar.—Robert Humphrey, West Troy, N. Y.

101,624.—Manufacture of Steel.—O. E. Hunter, Keyport, N. J., assignor to Adeline M. Jenkins, administratrix, and Henry M. Jenkins, and J. W. Barret, administrators of T. H. Jenkins, deceased, all of New York city.

101,625.—Composition for the Manufacture of Friction Matches.—J. J. Karlen, Erlenbach, Switzerland.

101,626.—Field Roller.—A. S. Keagy, Harristown, Ill.

101,627.—Blotting Pad.—J. M. Keep, New York city.

101,628.—Folding Chair.—Frederick Kilian, New York city.

101,629.—Picture Cord.—Tobias Kohn, Hartford, Conn.

101,630.—Scrubbing Brush.—Benj. F. Koller, Shrewsbury, Pa.

101,631.—Storing Power in Pneumatic Locomotives.—H. F. C. Krumme, Ridgeway, Pa.

101,632.—Permutation Lock.—John H. Larry, Weston, Mass.

101,633.—Weighing Faucet.—Daniel Lesh, Jr., Liverpool, Pa.

101,634.—Variable Cut-off Valve Gear.—N. K. Lynch, New York city.

101,635.—Roofing.—T. A. Makibbin (assignor to himself, W. M. Pusey, and Seelye Richmond), Annapolis, Md.

101,636.—Pressure Gage.—J. W. Maloy (assignor to the Maloy Pressure-Gage Co.), Boston, Mass.

101,637.—Cartridge Ejector.—John M. Marlin, Hartford, Conn

101,638.—Flooring.—Charles J. McAlister, Chicago, Ill. Antedated March 24, 1870.

101,639.—Brake to Prevent Reverse Motion in Driving Wheel in Sewing Machines.—E. D. McIntosh (assignor of one third of his right to E. W. Anderson), Washington, D. C.

101,640.—Ditching Machine.—S. P. McKelvey, Farmer City, assignor to himself and G. W. Snook, Saybrook, Ill.

101,641.—Manufacture of Safety Match.—L. Otto P. Meyer, Newtown, Conn.

101,642.—Hame Fastener.—Chas. H. Miller, Buffalo, N. Y. Antedated April 1, 1870.

101,643.—Washing Machine.—John Miller, Youngstown, Ohio.

101,644.—Sewing Machine for Boots and Shoes.—Daniel Mills, New York city.

101,645.—Fireplace.—James Moore, Ergineth, Ireland.

101,646.—Horse Hay Rake.—John H. Morris, Maquoketa, Iowa.

101,647.—Beehive.—Marcus Morton, Gallatin, Mo.

101,648.—Furniture Pad.—William B. Moses, Washington, D. C.

101,649.—Hand Stamp.—Albert L. Munson, New Haven, Conn.

101,650.—Machine for Crozing Barrels.—Hiram Nelson, (assignor to himself and Alpheus Dolloff), Lake Village, N. H.

101,651.—Flood Gate.—A. E. Noble, La Motte, Iowa.

101,652.—Gridiron Case.—M. V. Nobles, Elmira, N. Y.

101,653.—Lath Machine.—Josiah Oothoudt, Minneapolis, Minn.

101,654.—Desulphurizing Ores.—John F. Osgood, Boston, Mass.

101,655.—Belt Awl.—Frederic I. Palmer, Youngstown, Ohio.

101,656.—Trace Fastening.—Oliver Palmer, Cincinnati, Ohio.

101,657.—Hitching Post.—Walter W. Powers, Belleville, N. Y.

101,658.—Puddling and other Furnaces.—T. E. Purchase (assignor to himself and S. T. Hodgkins), Reading, Pa.

101,659.—Harvester.—Eli B. Rice, Madison, Wis.

101,660.—Spring for Bed.—Charles Rich (assignor to himself and D. S. Mallory), Poughkeepsie, N. Y.

101,661.—Tanning by Infiltration.—L. T. Robertson, New York city.

101,662.—Hitching Post.—J. S. Rohrer, Lancaster, Pa.

101,663.—Vehicle.—Elias Rowe, Vandalia, Ill.

101,664.—Grain Separator.—Lewis Royer, Royerton, Ind.

101,665.—Boat Detaching Apparatus.—Wm. S. Ryerson and George Stancliff (assignors to themselves, O. T. McIntosh, Amos L. Tripp, and Charles Chambers, New York city.

101,666.—Churn.—J. B. Schuette, Lockington, Ohio.

101,667.—Car Brake.—G. H. Seymour, Newark, Ohio.

101,668.—Steam Radiator.—Joseph Shackleton, Rahway, N. J.

101,669.—Steam Heater.—Joseph Shackleton, Rahway, N. J.

101,670.—School Desk.—Calvin W. Sherwood, Chicago, Ill.

101,671.—Chair Seat.—C. D. Smith (assignor to himself and P. C. Sawyer), Templeton, Mass.

101,672.—Teapot.—Thomas Smith, Jr., Boston, Mass.

101,673.—Reversible Latch.—William B. Smith, Bramford, Conn.

101,674.—Nut Lock.—C. S. Southwick and D. H. Barker, Newport, R. I.

101,675.—Broom.—Greenleaf Stackpole, Elizabeth, N. J.

101,676.—Summer Cooking Furnace.—Rufus O. Stevenson, Baltimore, Md.

101,677.—Carpet Stretcher.—G. W. Story, Kansas City, Mo.

101,678.—Suspension Bath Tent.—H. N. Taft, Sag Harbor, N. Y.

101,679.—Composition for Cleaning Plate and Glass.—Hermann Teats, Ann Arbor, Mich.

101,680.—Tag Holder.—Edgar C. Ten Eyck, West Meriden, Conn.

101,681.—Hoisting and Lowering Apparatus.—Hamilton E. Towle, New York city.

101,682.—Ice Machine.—D. K. Tuttle and Orazio Lugo, Baltimore, Md.

101,683.—Hot Air Furnace.—J. S. Van Buren, Green Island, N. Y.

101,684.—Lock.—Edward Voight and Philip P. Mathes, Philadelphia, Pa.

101,685.—Vegetable Washer.—Hiram J. Wattles, Rockford, Ill.

101,686.—Car Wheel.—James W. Weston, New York city.

101,687.—Compound for Paint, Cement, etc.—C. W. Westover (assignor to himself and E. J. Carter), St. Joseph, Mo.

101,688.—Base-Burning Stove.—Alexander White, Geneseo, Ill.

101,689.—Sliding Caliper.—A. E. Whitmore, Somerville, Mass.

100,690.—Brick Machine.—Carmi H. Williams, Rhinebeck, N. Y.

101,691.—Street Pavement.—W. H. Williams, Little Falls, N. Y.

101,692.—Blow Pipe.—L. B. Wilson, Cambridge, Ohio.

101,693.—Snow Plow for Railways.—Robert Wilson, Des Moines, Iowa.

101,694.—Car Coupling.—Wm. Wimer, Union City, Ind.

101,695.—Cultivator.—Reuben Wottring, Prospect, Ohio.

101,696.—Brick Machine.—Charles T. Wrightington, Boston, Mass.

101,697.—Time Indicator for Letter Boxes.—James T. Young, Washington, D. C.

REISSUES.

3,902.—Coal Scuttle.—James Edgar, Newark, N. J., assignee of Wm. Miller.—Patent No. 37,871, dated March 10, 1863.

3,903.—Mode of Ornamenting.—Henry Harrop, Hoboken, N. J.—Patent No. 46,354, dated Feb. 14, 1865.

3,904.—Steam Boiler.—Hugh Leslie, Jersey City, N. J.—Patent No. 43,417, dated July 4, 1864.

3,905.—Tile Machine.—J. W. Penfield, Cleveland, Ohio.—Patent No. 98,519, dated Jan. 4, 1870.

3,906.—Skate.—J. L. Plimpton, New York city.—Patent No. 37,305, dated Jan. 6, 1863.

3,907.—Manufacture of Paper.—The Okra Paper Company, New York city, assignees of J. B. Reed.—Patent No. 51,311, dated Dec. 26, 1865.

3,908.—Coffee Strainer.—E. P. Woods, Daniel Sherwood, and C. H. Latham, Lowell, Mass., assignees of Daniel Sherwood.—Patent No. 32,791, dated July 9, 1861.

3,909.—Reversible Knob Latch.—The Norwalk Lock Co., South Norwalk, Conn., assignees of Henry H. Elwell.—Patent No. 37,280, dated July 21, 1863.

DESIGNS.

3,947.—Center Piece.—Henry Berger, New York city.

3,948.—Ornamental Letter.—W. H. Clendinen, Baltimore, Md.

3,949.—Spool for Thread.—Hezekiah Conant, Pawtucket, R. I.

3,950.—Pruning Shear.—Charles Condon, Rochester, N. Y.

3,951.—Cooking Stove.—William C. Davis, Cincinnati, Ohio.

3,952.—Harness Mounting.—Charles Eisele, Newark, N. J.

3,953.—Bracket.—M. D. Jones, Somerville, Mass.

3,954.—Ornamentation of Glass Ware.—W. M. Kirchner (assignor to Bakewell, Pears & Co.), Pittsburgh, Pa.

3,955.—Brake Wheel.—Anson Merriman, New York city.

3,956 to 3,958.—Floor Cloth Pattern.—Charles T. Meyer, Newark N. J., assignor to Edward C. Sampson, New York city. Three Patents.

3,959.—Soda-Water Fountain.—Andrew J. Morse, Boston, Mass.

3,960.—Sprig of Artificial Flowers.—L. D. Newell, New York city.

3,961.—Tobacco Pipe.—Goldsbury H. Pond, Rutland, Vt.

3,962.—Frame for Containing Stationary Articles.—Charles H. Wight, Baltimore, Md. Antedated March 19, 1870.

U. S. Patent Office.

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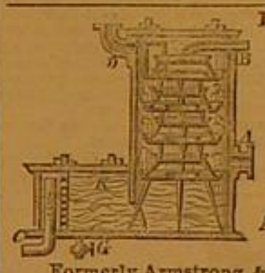
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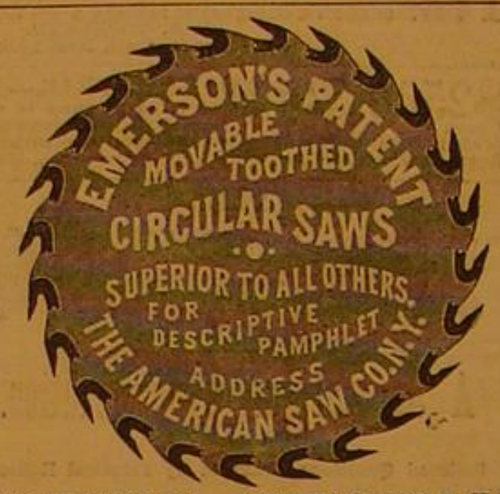
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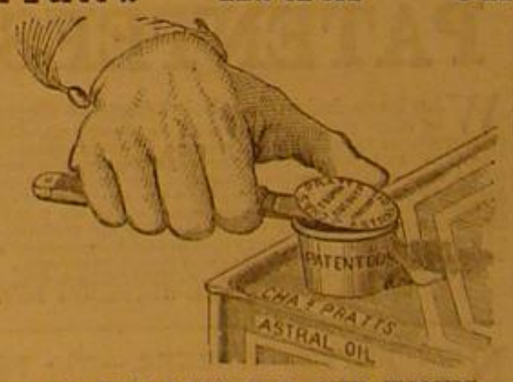
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SCIENTIFIC AMERICAN

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

Vol. XXII.—No. 17. [NEW SERIES.] NEW YORK, APRIL 23, 1870. $3 per Annum [IN ADVANCE.]

The Ballard Pavement.

Wood pavements being in public favor, we look upon the invention, represented by our engraving, as of much importance. The foundation for this pavement is prepared in the usual manner, with a covering of plank of suitable thickness, and in sections of the country where gravel is abundant and easily obtained, a concrete foundation of proper thickness, well rolled, may be used if desired.

The broad-based, wedge-shaped blocks are placed upon the foundation, in rows across the street, the rows touching each other at their base, forming wedge-shaped interstices across the street; and square spaces (on a line with the street), one inch in width, are left between the ends of every two or more blocks, as may be desired; these spaces breaking joints with those in the adjoining rows; and the spaces between the sides and ends of the blocks are then filled with fine, clean gravel, cement, and coal tar, thoroughly rammed into them.

Such end filling, running in irregular lines, at right angles to the continuous regular lines of the side filling, interrupts the surface of the pavement both ways, thus affording an excellent and sure foothold for horses' feet. The continuous bearing surface of the broad-based, wedge-shaped blocks, combined with the wedge-shaped interstices running across the street, and also in combination with the square spaces at irregular intervals lengthwise of the street, filled with concrete thoroughly rammed into them, not only firmly wedges the pavement both ways, forming an unbroken keyed arch of great strength and firmness, but also renders it impervious to water, which would enter between the ends of the blocks, were they set with their ends contiguous, without any filling so rammed between them.

The more wear upon this pavement the more compact it becomes. Both blocks and filling being wedge-shaped from top to bottom, every shrinkage will be supplied by a downward movement of the filling. The effect of travel is to constantly produce this downward movement of the concrete filling, wedging the pavement tighter and tighter with each movement; whereas, without the wedge-shape form of block and filling, the spaces are the same in size from top to bottom and a movement does not tighten but loosens, there being no principle of the wedge involved as in this Ballard pavement; The Ballard block being broad-based, the foundation is not broken or displaced by heavily-loaded teams, and the constant wear and pressure of travel.

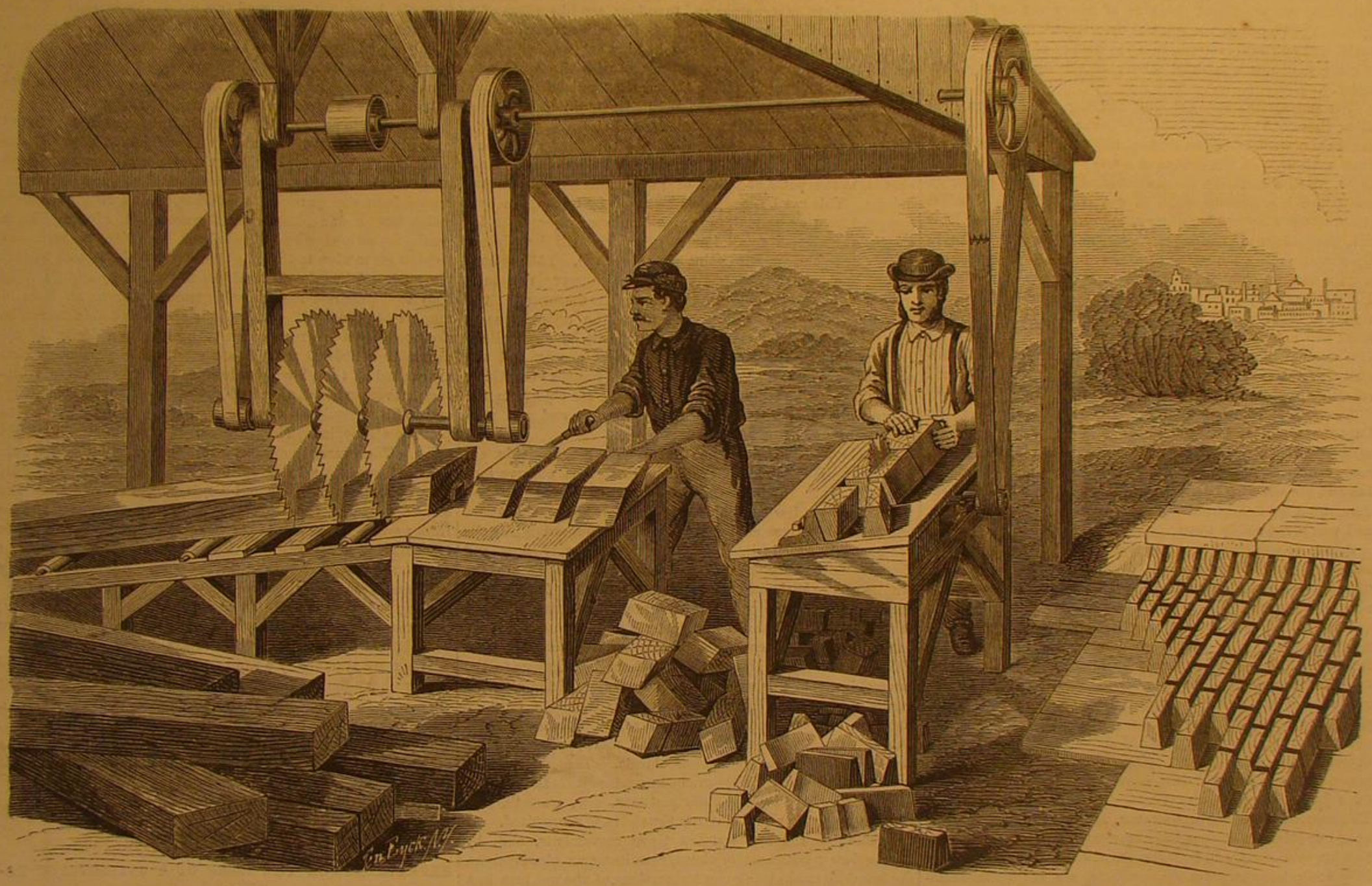
Nails are not necessarily used in putting it down. No bands, strips, or fastenings, which tend to early decay, are used in its construction. The blocks cannot work upward or laterally. Sand and gravel cannot work underneath them. Few or many blocks may be taken up and replaced, without in the least disturbing those remaining. The strips or pickets used in other pavements, and found objectionable by their frequently working upward, loosening the concrete filling, and thereby weakening the general structure, are not used in this pavement. The flooring and blocks may be treated by any known process for preserving wood from decay.

The construction of this pavement, in all its parts, is so simple, that any portion of the work may be performed by common laborers, and the pavement laid with great rapidity. Its cost is no more, well laid, than that of any patented wood pavement in which a suitable and like quality of lumber is used.

We believe that a pavement, well laid, of the broad-based wedge-shaped blocks, to stand but four inches high, keyed with the well rammed concrete filling, as above, will make a stronger and more lasting pavement than made of any other blocks in use to stand the usual hight—six inches.

The lumber for the blocks may be sawed at the lumber mills, any convenient length, any size from three inches to the full size of the log or timber one way, and should be seven inches the other way. The feed table of the machine for sawing off the blocks, is inclined at right angles to the line of the cut of the saws, which gives the top and bottom of the blocks the proper angle to form the bevel to two sides of two blocks; as represented under the gang of swing saws in the engraving; and the splitting saw table has a like inclination, giving the same bevel to the other two sides of two blocks when split, also represented in the engraving. So that with the feed tables at an inclination of one inch to the foot, by one sawing and one splitting, two finished blocks are produced, wedge-shaped, to stand six inches high, four inches wide at the base, three inches at the top, and of a length equal to the width of the lumber, either side of each block having the same inclination, one side leaning with the fiber, and the other slightly oblique to it. This splitting saw may be fed with rollers. It will also be noticed that this form is secured without waste of material, or extra sawing, and that the use of pickets is obviated, thus lessening the amount of sawing required in the construction of other wood pavements.

The inventor has had large experience in laying wood pavements of the kinds most in use, and he brings this experience to bear upon the construction of the improved pavement he has devised with a view to the correction of their radical defects.



THE BALLARD PAVEMENT AND MODE OF CUTTING THE BLOCKS WITHOUT WASTE OR EXTRA SAWING.

This invention is covered by a number of United States patents, issued in 1869 and 1870, embracing the wedge-shaped blocks, wedge-shaped interstices, and wedge-shaped key, or filling, among the claims. Patents have also been issued, through the Scientific American Patent Agency, in England, France, and other foreign countries. Further information can be had at the office of the "Ballard Pavement Co.," No. 117 Broadway, New York.

CANDLE STAMP.—It is marvelous, writes the *Scientific Review*, to observe what trifling articles may form the subject of a useful invention; the stamping of candles, for example, would appear to be a very unimportant matter, yet Mr. Schleidner, of Paris, has designed a special machine for the purpose. The candles are placed on an inclined plane, from which they successively slide into the notches of two similar wheels, or rings, which, at each revolution of the driving pulley, bring a candle under the stamp. This stamp, suitably engraved, is heated to an unvarying temperature, by steam or otherwise, so that upon pressing lightly upon the candle it melts the fatty matter, leaving the candle stamped with a very clean impression, obtained without shock or stain. The candle then leaves the notches, falls upon another inclined plane, and passes thence into a box.

BAUR or chrome steel is not only one-third stronger than any other steel, but can be produced at small cost, from the fact that when worn out, as in a steel headed rail, it has a market value, as it can be made over again, which is not the case with Bessemer or any other cast steel. It will also weld without borax or flux, and when burnt can be redeemed on the next heat

LIGHT AND VISION--MORE ESPECIALLY HOW LIGHT IS CONVERTED INTO THOUGHT.

[Being one of the Cooper Union Lectures for the Advancement of Science and Art, delivered in the Great Hall of the Cooper Institute, in New York, on the 26th of February, 1870.]

BY H. KNAPP, M. D.

Light and Vision form too vast a subject for a single lecture. I shall, therefore, confine myself to the exposition of one question of paramount interest connected with it, namely, "*How is light converted into thought?*"

This problem is not new. On the contrary, it has a history dating back to the works of the earliest philosophers; while it still engages the untiring efforts of the greatest naturalists of the present day. Let us consider what were the course and practical results of this long series of investigations, engendered and kept alive by a question of apparently little practical importance.

As the origin of all ideas may be traced to impressions on the senses, the highest of them, sight, is consequently the most fruitful source of ideas, and its organ, the eye, the broadest channel for conveying impressions to the brain. All speculation on thought, therefore, had to take into consideration, above all, how an impression of light is transformed into an idea. This is the reason that, at all times, light and vision have concentrated the efforts of the greatest naturalists and philosophers. The opinions on vision entertained by the prominent thinkers of every century had so great an influence on the general opinions concerning all material and spiritual matters, that the history of the theory of sight constitutes a faithful mirror of the history of philosophy.

The perceptions of sight and hearing are distinguished from those of the other so-called lower senses, by the remarkable fact that, in the former, the objects perceived act from a distance on the organs of sense; while, when we feel, taste, smell something, the perceived object comes either in solid, liquid, or gaseous state, in contact with the terminal fibers of the sensitive, gustatory, and olfactory nerves. How is it possible for me to open my eyes, and instantly take in the sensation of a landscape of almost infinite extent, whilst not the smallest particle of it touches any organ of my body? I see a mountain far away. This is a commonplace observation, you say; but if I ask how this observation is at all possible, and how it is accomplished, you will, most likely, be just as much puzzled as the illustrious philosophers of antiquity, the medieval mystics, and the profound and learned scientists of modern civilization.

The old Greeks asked themselves, above all, this question: Does the mountain I see yonder come to me, or do I go to the mountain? Their opinions differed; some held to the one, some to the other, some to both at the same time. Democritus and his adherents supposed that a subtile substance, light dust, detached itself from objects, penetrated into our eyes, and was perceived by them.

Others believed that light dust emanated from our eyes, impinged upon the surface of objects, and caused a sensation of the latter by either returning to the eye, or remaining always in connection with it.

Plato started with the axiom that only homogeneous substances are capable of acting upon one another. Light dust must therefore, said he, not only be detached from the object, but also emanate from the eye. Both meeting midway between the object and the eye, cause, by their contact, visual sensations of light, color, and form.

The great philosophical mind of Aristotle refuted all these theories, and replaced them by another coming nearer to the truth. If a subtile light dust, argued he, detached itself from the object, it would require a certain time to travel to the eye. The perceptions of sight, however, are instantaneous. We open our lids, and at once the remotest objects would, were this hypothesis correct, be the more clearly seen, the nearer they are to the eye. But the truth is, we see them indistinctly when they are held close by. If, on the other hand, light emanated from the eye, the eye would, above all, see itself; and it being the origin and source of light, would also illuminate the darkness.

His theory was the following: Between the visual object and the eye there exists a subtile substance, capable of assuming different states. In the state of activity, it becomes transparent and excites the eye, as light; in the state of rest it becomes opaque, and produces in the eye the sensation of darkness. Both states, light and darkness, combined in different degrees, produce the variety of colors.

The Aristotelian was the theory generally received, up to the time of Kepler, in 1604. This great naturalist applied the principle of an invention of Porta, viz., the well known camera obscura, to the explanation of the act of vision. He said the eye represents a natural camera obscura, having a system of transparent collective lenses (cornea, crystalline lens, aqueous and vitreous humors), walls blackened inwardly, and a receptive screen, the retina. When the eye like the photographer's camera, is turned toward an illuminated object, an image of the latter is cast upon the retina. Kepler reviving the theory of Democritus, explained vision as follows: Images, detached from the visual objects, enter the eye and place themselves upon the retina. There they are touched by the spirits of the optic nerves, which then communicate their impressions to the soul whose seat is in the brain. From the report of the optic nerve spirits, the soul draws a conclusion or passes judgment, and this constitutes the notion or idea we have of the object. In case the soul, while forming an idea of a thing, does not rely on the report of the spirits of the optic nerves alone, it sends the spirits of the sensative nerves into the ends of the fingers, ordering them to examine the same object by the touch. After the reception of their report, the soul forms a judgment on the statement of two witnesses, in order to guard itself against the fallacy of one sided impressions. Thus Kepler held the three periods which constitute the act of vision, definitely apart, though his manner of conception and interpretation appears, now-a-days, rather childish.

The first and second periods of vision, the physical condition of the formation of the visual images, and the physiological process of receiving and conducting the light impression to the brain, have been explained, thanks to the progress of science, in a surprising manner. But we must confess that our knowledge of the third period of vision, the psychial work of forming the idea, is still in its infancy. Kepler was able to explain the first period of vision by the physical laws of optics, but his century was not yet prepared to comprehend the second period of vision, the physiological sensation of light: he resorted to personifying, as the human mind is accustomed to do, whenever its knowledge is unripe. He needed the spirits of the nerves, which constituted, as it were, the emissaries of the head of the government—the soul. With regard to the latter, we also, the enlightened citizens of the nineteenth century, must resort to personifying no less than Kepler, one of the founders of modern astronomy. A real or scientific comprehension of the nature and faculties of the soul will not be possible until the anatomy and physiology of its seat, the brain, are satisfactorily understood. Our knowledge of the brain, however, and methods to inquire into its structure and functions, are like those of a boy, who, impelled by scientific proclivities, beat a watch to pieces with a hammer in order to learn what was contained within the little case. To former centuries the eye was a case as dark and incomprehensible as the brain still is to the present. Let us, therefore, proceed to consider how we have discovered the structure and functions of the eye.

Kepler supposed that the retina was the percipient membrane of the eye, because it corresponds to its focal plane, that is, to the point of union of rays coming from distant objects. This can be easily demonstrated by turning an eye, removed from an animal, toward a luminous object—for instance, a candle—a small image of which will be plainly visible upon the opposite point of the eyeball. This retinal image, however, showed one quality which gave rise to a good deal of discussion, from the time of its discovery to the present epoch—I mean the reversion of the retinal image. The same peculiarity obtains in images cast by any collective system. In the pictures of the camera obscura all the objects are inverted. When in the retinal images everything stands upside down, how then is it that we see objects in the natural upright position? This was the universal and puzzling question.

Berkeley, in 1709, was the first to give a reasonable explanation. He argued: The earliest conscious observations of a child are the movements of its own hands. If you watch a baby a few months old, you will notice the queer and manifold movements of its hands and fingers, while its yet unsteady gaze is directed on them, and every now and then the fingers are brought to the mouth. These are the studies of the little creature. The hands and fingers cast images on the retina, which it learns to comprehend. It calls in aid the senses of touch and taste, and by unvaried comparisons of the impressions which the same object makes on different senses, it learns to refer these impressions to the same object. In this way it acquires a notion of the different qualities of a thing. Some of these qualities can only be furnished by one sense; for instance, light, colors, taste. Others may be perceived by two and more senses; for instance, the position and size of objects. The hand brings itself and things within its grasp, in contact with the lips and other parts of the body. Their positions, size, warmth, consistency, and other qualities, are thus felt and recognized. At the same time the eye watches these movements, and, by numberless repetitions of these simultaneous observations, the mind learns to bring the impressions of the eye into harmony with the impressions received from the nerves of feeling. Constant habit establishes a law, and it is not astonishing to find such a law also in the sensations of the retinal nerves. Each nervous fiber receiving, at all times, the image of an object invariably from the same direction, cannot but refer an impression to a luminous object placed in the like direction. This law is so compulsory, that irritation of the retinal nerves by other causes—electricity, injuries, etc.—is always judged in the same way as referring to luminous objects, which would have cast their images on the parts of the retina excited by the electric current, the injury, etc. If you press quickly with your finger on the temporal side of your eye, you will perceive a luminous flash over the nose. In this way all the impressions of the retinal nerves are referred to objects without the eye, lying in the opposite part of the field of vision. Physiologists call this invariable mode of interpretation of retinal impressions by the mind, the law of projection of the retina. Being a law of nature, it admits no arbitrariness of judgment, no divergence of its meaning, no exception. If any part of the retina is excited by rays of light, pressure, or electricity, the mind always sees a luminous object in a definite direction, which is determined by a straight line drawn from the excited point of the retina through a point near the posterior pole of the crystalline lens, called the optical center, or the nodal point of the eye.

In ordinary vision the outward world is portrayed as a miniature panoramic picture on the retina, every point of which is referred by the mind to the corresponding point of the landscape spread out before the eye according to the law of projection. The mind has not the least cognizance of the way on which the light, exciting the retinal fibers, traveled. If a prism, or any other optical contrivance, be interposed between the luminous body and the retina, whereby the rays are deflected from their original straight lines, the mind knowing of no other code while judging the retinal images than the law of projection, sees the object in a wrong position. If the vitreous humor, lying before the retina, is not pure, but has some opaque spots in its tissue, they cast a shadow on the retina, which is mistaken for a dark object outside the eye, a floating mote, etc., according to its shape. Numerous errors are committed by relying solely on the impressions of one sense. They are called illusions, and many of them amuse or frighten people according to their nature.

If we recapitulate this chapter on the reversion of luminous object and retinal image, and the interpretation of the latter according to the law of projection, we arrive at the following summary:

The mind is in intercourse with the outward world by means of a pictorial language, photographed upon the retina. It has learned, in early youth, by habit and the co-operation of other senses than that of sight, to read this pictorial language according to a certain law, that of the projection of the retina, by which every point of the miniature panorama on the retina is referred to an object point, lying on the opposite side in the real landscape.

This sentence expresses in brief the opinion entertained by the most advanced natural philosophers of the present time regarding the art of vision. It gives a general idea, a rough outline of our subject, how light is converted into thought. But were I to stop here, I should have treated it very unsatisfactorily, leaving it immersed in a sea of obscurities. To dispel these we must advance farther into the temple of science.

The sun, the central body of our planetary system, is a glowing mass, surrounded by an atmosphere of glowing vapors. Light and heat emanate from it to create and sustain all animal and vegetable life on our little planet.

According to modern science, both light and heat are not real, physical particles, or molecules, detached from the incandescent body and propelled through space with almost inconceivable velocity, but they are a mode of motion, transmitted from one particle to another. The single particle makes but an exceedingly small movement, always like a pendulum swinging to and fro about its point of rest, but imparts its motion to the neighboring particle almost instantaneously. Thus the original impulse given by the glowing body to the nearest molecules, is transmitted to an infinite number of others with incalculable speed, and this transmission is called the propagation of light. Its velocity is approximately 200,000 miles in a second. The particles which are excited by the glowing substance to perform these vibratory movements, are supposed to be of the utmost subtilty, and to fill not only all space, celestial and terrestrial, but to pervade all bodies. They are called luminiferous or light ether. Their rarer or denser accumulation in different substances has a remarkable influence on the course of light. Through substances of equal density, light travels with the same speed, and the transmission of the vibratory motion from particle to particle is perfected in a straight line. This transmission is nothing else than what we call a ray of light—a sunbeam, if it comes from the sun. But any glowing body emits rays which travel through space in straight lines as long as their course is in the same medium. As soon, however, as the density of the substances changes, the rays of light are deflected from their original course.

When we accompany a ray of light as it proceeds from the sun, we have first to travel through an immense space, filled only with ether. The sunbeam passes through it in a straight line, until it reaches the atmosphere of the earth, which, being a denser medium, deflects it somewhat from its original course. After having traversed the atmosphere, it illuminates the landscape around our dwelling-place, and, reflected from the objects enters our eye, where, after various refractions, it ends in the retina.

[To be concluded next week.]

EXPERIMENTS ON THE HEAD OF A GUILLOTINED PATIENT.

At the time Troppmann was beheaded, a medical man in Paris, Dr. Pinel, made the startling announcement in one of the political journals, that death by the guillotine was the most cruel of all, as, through the suddenness of the process, life remained in the head of the criminal at least one hour after the execution. This statement was supported by physiological notions peculiar to the author; but, notwithstanding their heterodoxy, they might have been brought forward without any blame attaching to M. Pinel, had not he adopted the curious proceeding of publishing his note in a political journal instead of a professional one. At all events, the note produced the desired effect. The public mind was deeply moved, and a host of extraordinary histories went the round of the journals. Such sensational stories as Heindrich, the executioner, being bitten by the head of a *guillotiné*; of several heads, fallen into the same basket, having bitten each other, etc., were quoted from journal to journal, and struck with horror the good people of Paris.

Some of the medical journals entered a protest against M. Pinel's extraordinary physiological ideas, and the nonsensical stories to which they had given rise. Among others, M. Desprez, surgeon to the Lock Hospital, took the trouble to show the falsity of all this anti-physiological stuff. But MM. Evrard and Beaumetz, both medical men at Beauvais, have done more. They determined to make experiments on the head of a *guillotiné*, and the occasion was afforded them soon after the death of Troppmann, by the execution of a parricide at Beauvais. The results of these experiments were communicated in March last to the Medico-legal Society of Paris, and they are really well worth being noticed.

The head of the culprit was delivered to them five minutes after the execution, and was subjected to various processes which are most curious, and imply no small courage on the

part of the investigators. First, MM. Evrard and Beaumetz tell us that the head was placed on a table covered with compresses, so as to show the amount of blood which would be obtained. The face was then bloodless, of a pale and uniform hue; the lower jaw had fallen and the mouth was gaping. The features which were immovable, bore an expression of stupor, but not of pain. The eyes were open, fixed, looking straight before them; the pupils were dilated; the cornea had already commenced to lose its luster and transparency. Some sawdust still stuck here and there to the face, but there was no vestige of any either on the inner surface of the lips or on the tongue. This is an important fact.

The opening of the ear was then carefully cleansed, and the experimenters applying their lips as closely as possible to the orifice, called out three times in a loud voice the name of the criminal. Not a feature moved; there was no muscular movement, either of the eyes or on the face. A piece of charpie, saturated with ammonia, was next placed under the nostrils; there was no contraction of the alæ nor of the face. The conjunctiva of each eye was deeply and several times successively cauterized with nitrate of silver; the light of a candle was brought within two centimeters distance of the cornea, and yet no contraction was observed either in the eyelids, eyeball, or the pupils.

Electricity was then resorted to as a more powerful means of excitement of the nervous system. One of Legendre's electric piles, with a current of moderate intensity, determined vivid contractions in such of the muscles of the face as were directly subjected to its influence. But was this evidence, say the investigators, of a feeling of pain expressed by the physiognomy? Certainly not: and this for two reasons; first, because, whilst the experiment affected the left side of the face, the muscles of the right side retained their expression of stupor, even when the opposite side was the most convulsed; next, because the electrized parts themselves resumed their cadaveric impassibility as soon as the electric current ceased to animate them.

The integuments of the cranium were then incised from the nape of the neck to the root of the nose; the bones of the skull were uncovered down to the zygomatic arches. In performing these incisions, say the investigators, many nerves were cut, of which the section would have been most painful; the muscles of the neck and temple were still alive, since they retracted energetically under the knife; notwithstanding, no contraction of the face, no reflex action was observed. At that time three-quarters of an hour had not yet elapsed since the execution. The skull was then sawn through, and the brain removed; the muscles of the face and those of the jaws continued to obey the electric current, as when the brain was unimpared. The integuments had then begun to get cold, and yet, with an intense electric current, the same muscular contractions were obtained half an hour after the extraction of the brain. Nobody will say that the brain still continued to act and think, though the muscles still responded to electric excitation. Beyond doubt the brain was as lifeless during the first part of the experiment as during the second. Indeed, at the very moment of the execution, through the sudden interruption of circulation, and consequent syncope, the brain was quite as unable to feel as to express its sensations.

This view MM. Evrard and Beaumetz base on the condition of the brain and its envelopes when examined. There was no fluid in the large arachnoid cavity; the vessels of the pia mater were almost bloodless, and filled with aëriform fluid; the lateral cavernous sinuses were absolutely bloodless. The ventricles contained scarcely a teaspoonful of fluid, and in no situation was the brain injected. These facts entirely overthrow what has been advocated by some with regard to the persistence of the cephalo-spinal liquid, and of cerebral nutrition.

The thoracic viscera were also examined. The heart was found to be enormous, and was seen to beat under the pericardium; the lungs shrunken, and of a blackish hue. There was an enormous dilatation of the right auricle, and the ventricle of the same side was also dilated and tense. The left auricle was remarkably small, hard, and retracted. The right auricle and ventricle were filled, not with blood, but with an airy fluid. Pressure reduced their volume to three-fourths of their apparent size. Whilst the contraction of the auricles persisted, those of the ventricles became less frequent. A quarter of an hour after, the auricle and ventricle were once more swollen and distended, and it seemed that air, solicited by the contraction of the auricle, came from the vena cava (which was bloodless and dilated), as well as from the brachio-cephalic venous trunks. An hour and a half after the execution, the contractions of the right auricle were still perceptible, though rare and weak; the right ventricle was then wrinkled, shrunken, and could not contract in the least.

The results of these experiments are in entire accordance with those which had already been obtained in 1803 by the Medical Association of Mayence, which had been led to investigate the subject by the same motives as had actuated MM. Evrard and Beaumetz. The experiments then made, such as calling out the names of the criminals in the respective heads, were much the same as those which I have just related.

The falling of the lower jaw, which takes place instantaneously, serves to explain (to a certain extent), according to MM. Evrard and Beaumetz, all the extraordinary stories of the heads biting each other which have recently been propagated as coming from Sanson and other executioners. The fact would be a mere coincidence, due to the position of the various heads in the basket. Besides, the experimenters assert that Heindrich, the present executioner, has positively assured them that he has never noticed this fact, nor indeed, any sign whatever of persistent life in the heads of *guillotinés*.—*Lancet*.

A TRIP OVER THE CENTRAL PACIFIC RAILROAD.

A contributor to the *American Churchman* thus graphically describes a trip over the Central Pacific Railroad:

The real difficulty in the way of engineering, in connecting the two oceans, occurs on the western side. It is all plain sailing on the eastern, till the road descends by a steep grade and through a pair of long tunnels into the Salt Lake Basin by Weber and Echo Cañons. The level plains of Nebraska, and the high table land of the Laramie Plains, by which the road ascends and crosses the Rocky Mountains, at an altitude of 8,000 feet, offered no difficulty to the engineer. The trouble on the Union Pacific was from the Indians—the warlike Sioux and Cheyennes—and from the fact of the great distance from supplies and material. But on the western side, the engineering problem was the great one from the start.

Immediately after leaving Sacramento the ascent begins, and the problem was to ascend the Sierra Nevada range to a hight of 7,000 feet within a distance of 80 miles.

There was no getting round the thing. The mountains stood there barring the way eastward. They would not get out of the way for a railroad, and the "passes," by which travelers in the old time surmounted the obstacle, are all from 5,000 to 8,000 feet at their hight above the sea level.

It was, indeed, the common talk in California that it was impossible to carry a railroad up the western face of the Sierra. Even good engineers considered the undertaking preposterous.

It is easy enough to mount it from the east, for the high table land of the "great desert" comes up to its eastern side from 4,000 to 5,000 feet. In fact, the Sierra Nevada is the western face of an embankment—the embankment being half a continent—and this, the guttered and storm-washed front of it towards the Pacific.

The point was to get up this rocky face to the table land it bounded, and to do that in a very short space, for the continent breaks off short and comes down sheer.

But California energy, using 10,000 patient Chinamen, solved the problem, and took the track up and over, along the mountain side, through deep and long tunnels, across rifted chasms in the rocks, over headlong torrents and by the dizzy edges of abysses thousands of feet down, and "around Cape Horn."

But even when the work was done, the snow avalanche, or the earth slide from the mountain round whose side, half up, the iron path winds twisting upward, might sweep the work away, or overwhelm the track, and make it useless for weeks or months.

There was a remedy also for this in the skill and determination of the men who did this work. They just roofed in their road for fifty miles!

They took the giant stems of the pines and braced them against the mountain side, framing them and interlacing them beam with beam. They sloped the roof sustained by massive timbers, and stayed by braces laid into the rock, and covered with heavy plank, up against the precipice, so that descending earth or snow would be shot clean over the safely housed track into the pine tops below; and so they run their trains in security under cover, and have conquered the snow in its own domain.

There is one drawback. These "snow sheds" shut out forty odd miles of the most magnificent scenery on the whole trip—notably Donner Lake, and the deep valley inclosing it, which lies straight down below the passing trains.

It was up this slope I traveled yesterday afternoon and evening. It takes two locomotives to persuade the trains to ascend. I found a place just after leaving Sacramento, on the foremost, and had a mountain ride, which I think must be unequaled considering the mountains and the horse.

First there was the Sacramento valley—oak opening all, which, to most of your readers needs no description. Only the oaks are a species not seen in Michigan or Wisconsin. California is rich in oaks, and these, scattered about as thickly as apple trees in an old orchard, are the live oak, small-leaved evergreen.

Then came the "foot hills" and a gradual change in the wood growth. The Manzanilla wood, with its shining stem and dark green glistening leaf, mingled with the oaks and the buckeye, which, in California, is a many stemmed bush, springing from a common root hung heavy with its pear-shaped fruit, filling up the space beneath the taller oaks and the nut pines.

Finally, we came into the realm of the *coniferæ*, and the tall stems sprang up smooth, branchless, and tapering, rearing their green coronals to the sky.

We are going up the mountains! In a valley on one hand lay a mining village—the most beautiful villages in the State are these mining villages now. Down the mountain side, on the other, ran the water, led in sluices like a mill race, around a point here and a bend there, and across a gorge yonder—the water to be used, under the mighty power its descent gives it, to tear the hill side down and wash the rocks to pieces in "hydraulic mining"—mining, that is, which consists in discharging a stream of water, with a head of a few hundred feet, full in the face of a hill side till it is knocked into bits!—bits which contain gold, of course, or are supposed to.

But these too are left, as we go clanking on through pitch-dark tunnels, and over trestle works that look like spiders' webs, and along the maze of dingy precipices; the engine, coughing and straining in the tug up the steepest grade yet ventured by any engineer.

The day died out before we reached the summit, but died into a cloudless moonlight so brilliant, so silvery white in the flood of light it poured across land and sky, that one sent no regrets after the sunset.

Moonlight in the mountains, and such a moonlight is something to be remembered for life. I lost all sense of the poor, every-day world, forgot so vulgar a thing as a railway car, even the clank of the engine seemed to come softened as from far away; and I was sailing over pine-clad mountains, silvery white, in an air of balm and fragrance, and, in fact, I think was about half asleep when my friend, the engineer, plucked my sleeve—we were doubling Cape Horn!

Round the jutting mountain wall, so called from its bold advance into the valley, and its precipitous face, the road winds like a ribbon. No human foot had ever trodden this hight, as far as man may judge, till the first "hand" was lowered down to lash himself to a tree and begin, with pick and spade and crow, to cut a shelf along the dizzy hight! Not even an Indian trail had ever passed where the long train was passing now. The foot-sure savage had never ventured here. Three thousand feet sheer down lay the valley, in the moonlight like a lake, the mist slowly rising and swaying, silvered by the descending light. The feathery tops of the rock-anchored pines rose out of the mist far below. Across the valley the other mountain face frowned darkly, shaggy with bristling pines from base to summit.

That was one side.

On the other rose the almost perpendicular wall of the mountain, round which we were rushing on a shelf cut into the rock wide enough for the rails, of course—what need of anything more, when they are treble-spiked, and the rolling stock of the best, and the engineer the safest man to be found?

If we went off? If a broken rail should be ahead, if a rock should have rolled down beyond the curve yonder? Well, I suspect it would not make much difference, in that case, whether one was on the engine or in a car yonder. It would amount to the same thing, I think, when we all reached the valley together.

But there has never been an accident, and it is just such places as this that are most carefully guarded, and where all prudence and forethought and skill are engaged to be active.

I do not know that I have been able to give you half an idea of the magnitude of this undertaking, which has annihilated these weary desert spaces, and brought East and West together. If I have said much about it, it is because, after all, looking at it as I have, it seems to me the railroad across the continent, the double iron bands that tie Omaha and Sacramento each together, over the mountains, across vast deserts where human life finds nothing to sustain it, through the territories of tribes, too, a few years ago a terror to the whole border—it seems to me the railroad is really the most wonderful thing one sees, after all.

New Attractions for the Central Park.

The New York Historical Society is about to give the most gratifying proof of being alive to the interests of art and of the public improvement. According to the *Evening Post* it proposes to establish in the Central Park a Museum of History, Antiquities, and Art.

By an act of the legislature of the state of New York, the Central Park Commissioners are authorized to set apart, and appropriate to the Historical Society such portion of the grounds lying near the Fifth avenue, between Eighty-first and Eighty-fourth streets, as may be required for the erection of suitable buildings for this museum.

The plan contemplates the removal of the rich treasures of the society from the building in the Second avenue, which has long been too small for their proper disposition and display, to a new and larger building in the Park, where, under proper restrictions, they shall be readily accessible to the public.

In the department of history the collections of manuscripts, maps, charts, newspapers, coins, and medals, will make a most conspicuous and interesting feature.

In the department of antiquities the Abbott collection of Egyptian memorials, the Nineveh sculptures presented by Mr. James Lenox, and the numerous relics of the aborigines of the American continent, will attract great attention. These valuable curiosities have long remained packed in the society's present buildings, for want of space to open them for exhibition.

The department of art is that which will prove the most popular with the visitors in general, and this will contain, at the very beginning, the well-known collection of the New York Gallery of the Fine Arts, the Bryan collection, and the Audubon collection, constituting the nucleus of a gallery which, in time, we may confidently hope will be worthy of the city, and of the beautiful pleasure ground in which it will be placed.

The New York Historical Society, in taking this step, has entitled itself to the hearty suppport of this community and to the thanks of the lovers of art throughout the United States.

GLASS FOR WINDOWS.—A window glazed with ground glass is almost always unsatisfactory. The vitrified surface being removed, the smoke and dust discolor it, and make it difficult to be kept clean. White enamelled glass, having a semi-opaque figure upon a transparent ground, is more satisfactory. If the windows of a dining-room were filled with clear light pink glass, the effect of the room would always be pleasant and comfortable. The greatest care should be taken to avoid introducing dark colors.

THE first bar of tin ever made in the United States has been presented to the Secretary of the California Pioneers. It is eight inches long, four inches wide and two inches thick. The bar is appropriately inscribed.

Turning Irregular Forms.

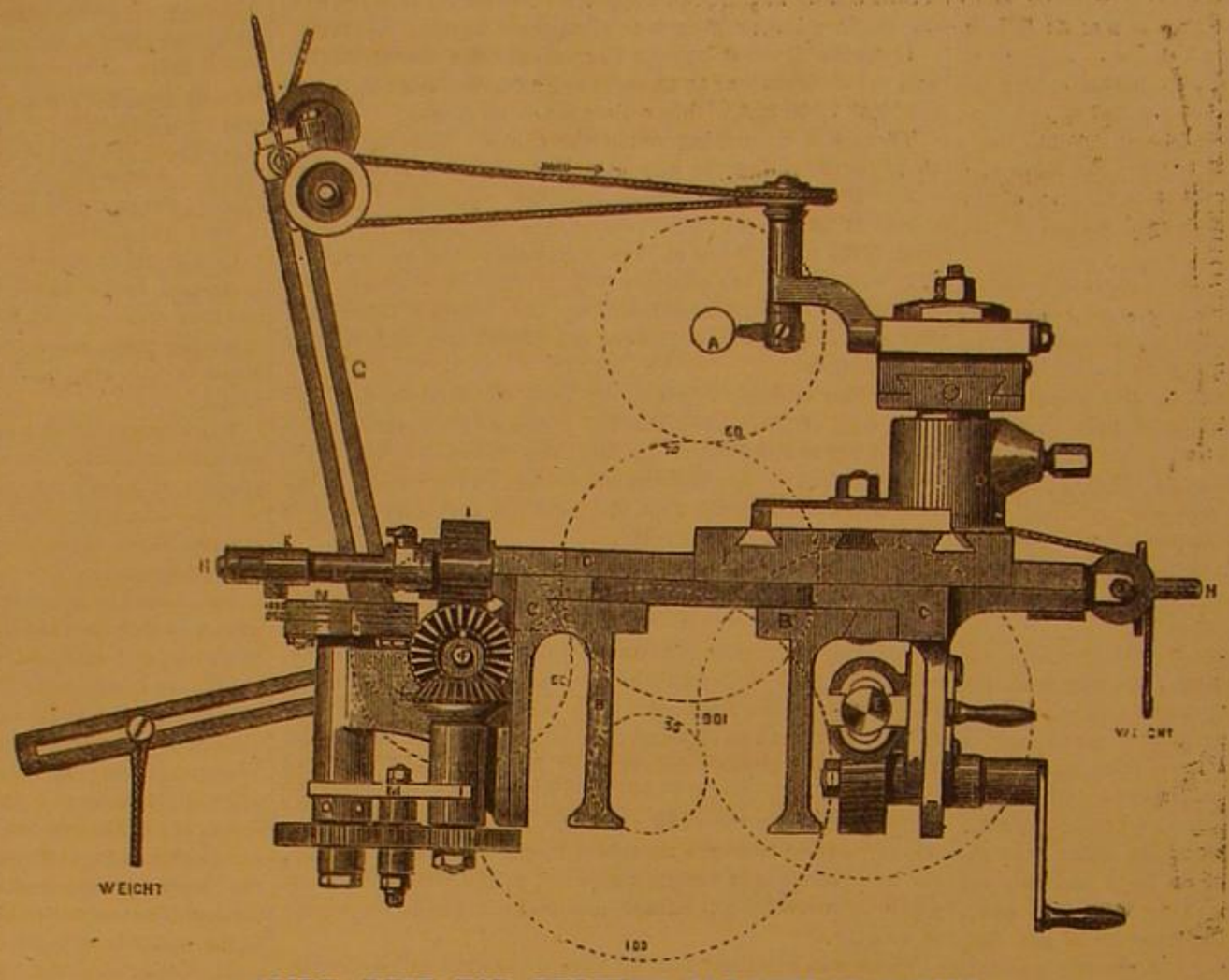
We illustrate from the *Engineer* an ingenious slide rest, designed by Mr. W. H. Northcott for turning articles of irregular sections. This system differs from the Blanchard and other lathes, because it is applicable to ordinary slide and screw-cutting purposes, as well as to turning irregular forms.

A is the center line of lathe spindle; B is the lathe bed, which carries a pair of ordinary headstocks; C is the saddle of the slide rest, which is caused to travel along the lathe-bed in the usual manner by the leading screw, E; D is a rest-holder, bolted down on the surfacing slide, for receiving and carrying any convenient form of tool-holder and slide; an ordinary short slide and Willis' holder is shown in place and carrying a light fly-cutter. This cutter is driven from overhead by means of a cord or gut, which is kept strained in every position of the slide by means of the lever, G. The shaft, F, and the leading screw, E, are driven from the lathe head by suitable change wheels which of course vary according to the relative speeds required, but generally the shaft, F, at the back of the lathe bed runs at the same speed as the lathe spindle. The surfacing slide carrying D, is caused to move across the saddle by means of the screw, H, either by a handle in front or automatically by means of a worm-wheel, I, driven by a worm on the shaft, F, the motion of the worm, I, being communicated at will to the screw through a sliding clutch. The surfacing-screw, H, is continued past the worm-wheel and clutch, and at its end is fitted with a bearing and adjusting nuts, to run in a cross head, K, which cross head slides on guides, L, one each side of the screw. The shaft, F, carries a small wrought iron miter wheel which rotates with the shaft, but, by sliding along it, is enabled to follow the saddle anywhere along the bed. This miter wheel gears with a similar wheel below it, attached to a short stud or shaft, having its bearings in a casting fastened to the slide rest saddle. At the lower end of the vertical shaft is a spur wheel, one of a series of changes any of which may be used to obtain the required speed. There is also another longer vertical spindle placed at the back of the saddle, and which rotates in a long boss forming part of the same frame. At its lower end this spindle is also fitted to receive a change wheel, driven either directly from a wheel on the other spindle or through double or single intermediate carriers by the short, radial arm, M. The top of the long spindle has a large collar or disk, to which is fastened another disk or receiving plate, N. The fastening is made with two small bolts with T heads fitted into a circular undercut groove in the top plate, and passing through the collar below. The edge of one plate is graduated, and the other has a pointer attached to it, so that the top plate may be moved round any distance, and fastened by tightening the small nuts below. The top surface of the upper plate has a number of holes in it which are tapped to receive screws, and also a larger hole in the center. These holes serve for fastening the various shaper plates or cam plates to the disk. The sliding cross head, R, carries a suitable rubber, O, placed just below the bearing of the surfacing screw, and the shape of this rubber depends upon the shape of the copy-plate, being sometimes a flat bar, at others a roller, and sometimes an angular point. The surface screw, H, has its usual bearings in the metal of the rest saddle, but the collars to the front bearing are formed by four nuts which allow of any end play being taken up. The inside pair of nuts, however, must be screwed back when the irregular mechanism is in use, as the screw has to slide endwise in its bearings. On the lathe being started, the bevel-wheel on the shaft, F, drives the first vertical spindle, and this motion is communicated by the change wheels to the copy plate attached to the top of the long spindle. The shaper plate in rotating being pressed against by the rubber, O, causes the cross head, K, and screw, H, to reciprocate or slide endwise, and the reciprocating motion of the screw is of course partaken of by the surfacing slide and cutting tools carried by the slide. The velocity of this reciprocating movement will vary according to the shape of the copy-plate, and its shape will therefore govern the shape of the work produced. The rubber is kept in contact with the copy by a weight attached by a cord to the surfacing slide, passing over a small pulley in front. With the tools point-level with the center, with an eccentric circle for the copy-plate, and with equal rotations of copy and work, when the tool's point describes a figure much smaller than the copy-plate the shape produced is cardoid, or heart-like, and this shape becomes more decided, and finally becomes looped as the tool gets near the center. When the figure is of the same size of the copy plate, its shape is also the same, namely, an eccentric. When the figure is made much larger than the copy-plate its shape is still somewhat the same as the copy, but its eccentricity is not increased.

It will be understood that when articles of irregular transverse section only have to be turned, the work and copy-plate generally make equal rotations; when the position of the shape has to vary there must be some slight difference between their speed. But by giving the copy a very slow motion compared with the work, instead of the article being turned of irregular transverse section, it is turned circular, but of irregular longitudinal section. For example, by having a shaper-plate formed of a portion of a true spiral, tapering shafts can be produced. If the spiral copy have a rise of ¼ inch, the large end of the shaft will be ¼ inch larger in diameter than the small end, and the length of the taper will be equal to the distance traveled by the tool while the rubber has traversed the edge of the spiral copy-plate.

The drawing rollers of spinning machinery, handles for starting levers, bolts with countersunk heads, and many other articles frequently required in large numbers, can also be produced from suitably formed copy-plates; while for cabinet-making and for ornamental turning the applications of the mechanism are almost endless.

The device is interesting as its capacity is more extended than the Blanchard lathe, familiar to American mechanics.



SLIDE REST FOR TURNING IRREGULAR BODIES.

BORING INSECTS.

Many of the lower forms of animal life possess powers of boring which, considering the soft materials of which they are made, seem very surprising. It is hard for us to understand how such animals are naturally provided with tools adequate in some cases for penetrating into the densest timber, or in others even into the solid rock.

We find no difficulty in understanding how shellfish can bury themselves in the sand—the common cockle is an excellent burrower in this yielding material. The razor-shell dwells in a long tube in the sand which he has formed by his own labors, from which he can only be extracted by darting down it a long barbed rod. This penetrates his shell and he is withdrawn; but if this be not done with great rapidity he is enabled to escape, as he can move very quickly in his hole. There is another shell belonging to the same tribe as the razor-shell, which excavates for itself a hole in the solid rock. This animal has no English name; its Latin one is *Pholas*. It is to be met with in limestone rocks on the sea coast, into which it bores holes to a depth of several inches.

It is still a disputed point among naturalists as to how this boring is effected. Some think that the animal is enabled to secrete some acid which softens or dissolves the limestone, while others think that it is by the mechanical process of grinding that it is accomplished

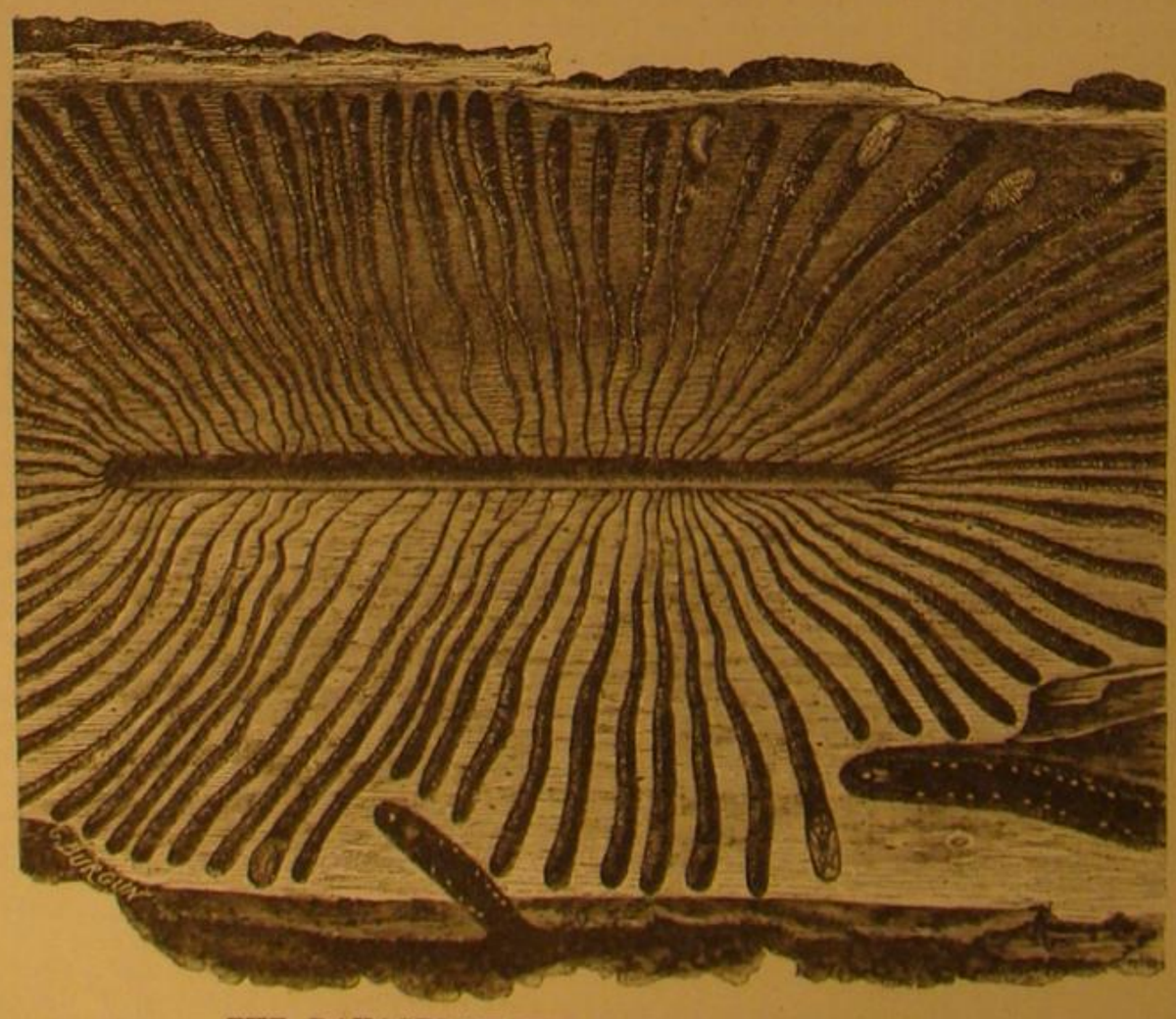
The preponderance of opinion seems to lie now with the latter view. Another boring shell is the well-known ship-worm or teredo. This burrows into wood to a great depth, and many an otherwise good ship has been rendered unseaworthy by the attacks of this indefatigable borer. Of course a metallic coating to the vessel is a complete preservative against their attacks.

Our illustration represents a borer of a very different kind. The animal that accomplishes these excavations in the trunk of a tree is not a shell-fish, but an insect. The parent, when about to deposit her eggs, selects a tree of suitable size, and commences her operations on the bark. At the bottom of the illustration will be observed a small inclined hole, and at the end of this a beetle is to be seen; this is the little architect who, by the joint exertions of herself and her progeny, has so wonderfully penetrated the tree in every direction. Another hole, running horizontally across, will likewise be seen at the right of the figure, and in the end of this another beetle may be seen similarly engaged. When the exertions of the insect have prepared a sufficiently large hole she then commences to lay her eggs. But before proceeding to this subject, let us just dwell for a moment upon the magnitude of the work she has accomplished.

The hole bored into the heart of solid wood is about fourteen or fifteen times longer than the body of the beetle, and the animal must, by the help of its jaws, tear away and remove a bulk of timber more than twenty times its own bulk. We shall gain some idea of the amount of labor necessary for this, by considering what would be the corresponding work that should be executed by a man, were he to be equally adapted with the beetle for this kind of work. He would have in a few days to bore into a mass of solid timber a cylindrical hole, about eighty or ninety feet long, and about three feet in diameter.

The central part of the illustration shows another stage in the history of these tunneling operations. We will suppose that a beetle has finished the hole of which the two already described are the commencements. All along each of these will be seen little white spots; these represent the eggs which she lays as she proceeds. The long line in the center of the figure represents a part of the completed hole, along the sides of which the eggs are laid.

When the eggs of the beetle are hatched, the little animal that comes from them is at that stage of its existence utterly unlike its parents. It is at first a little grub without legs, and quite as unlike a beetle as an earth-worm is unlike a house-fly; this is called the larva condition of the beetle; and it is equally true of every other insect, that in the early stages of its existence it is utterly unlike in appearance, in food, and habits, to the parents from whom it has sprung. Thus the dragon-



THE RAVAGES OF THE WOOD-BORING BEETLE.

fly, with which we are all so familiar, and which is such an ornament to our streams, was, when young, an unattractive and somewhat ferocious-looking grub, wholly resident in the water, over which, when mature, it skims, but which it never touches. The food, too, of the larva of the dragon-fly is quite different from that of the mature insect.

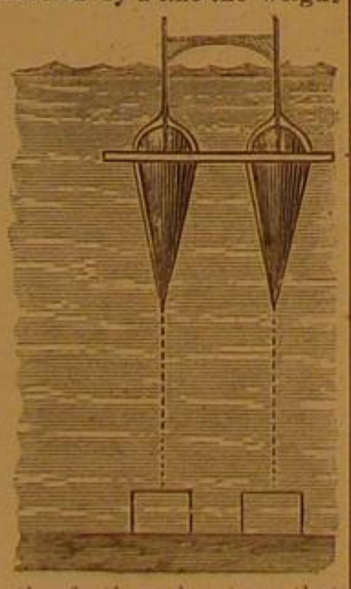
This being understood, we shall not be surprised to find that when the eggs of the beetle we are describing are hatched, the young that come from them are quite unlike their parents. They are small white grubs, rather uninteresting in appearance, but endowed with a most tremendous appetite and vast powers of digestion. The food which supports the little grub is the solid wood of the tree itself. It will be remembered that each egg was deposited on the side of the hole, and there it remains attached until it is hatched; thus the little creature finds, the moment it becomes conscious of its existence, the food which nature intended for it surrounding it in boundless profusion. At once it commences to eat the wood that is under it, and thus it speedily excavates for itself a little hole, the bottom of which gradually deepens as the insect proceeds. Its brothers and sisters, likewise hatched about the same time, commence each to eat their small hole, and thus from the main tunnel a number of small holes gradually extend through the trunk, all commencing, of course, from the hole originally made by the parent insect.

Now, as the little grubs progress onwards, they, at the same time, grow in size, and their appetite consequently increasing, the hole gets gradually larger, and this is, of course also necessary to allow for their increased dimensions. Gradually they proceed farther and farther from the center, and approach nearer and nearer to the outside of the tree; but just before they finally emerge, when they are just beneath the bark, a curious change comes over them. They have now grown to be as large as their parent, but still they are grubs; they have not donned the legs and wings which are necessary for the perfect beetle, but the tree which has housed and fed them in their infancy still affords them shelter till their final development. As they get near the bark they cease to eat, and fall into an inert condition; but all this time a wonderful change is taking place within their bodies—they cast off their skin and are transformed into perfect beetles. Speedily they emerge from the tree to find themselves in a new and wondrous world, and to use and enjoy those powers of flight which they have so recently and so curiously acquired. Truly this is a very astonishing history; we have seen one beetle boring into a tree, we see a hundred emerge from it; the solid substance of the trunk has afforded nourishment to the numerous offspring. There is no more interesting department of natural history than that which treats of the habitations of insects; and there is, perhaps, hardly any insect more interesting in this respect than this wood-boring beetle.

SUBMERGED BUOYS AS A BASIS FOR STRUCTURES IN DEEP WATER.

The following, from a letter from Mr. Thomas Morris, of Carlton Chambers, England, to *The Engineer*, appears to us to contain a good idea.

"The purposes and situations of structures in deep water are so numerous and various that every available principle becomes worthy of record. I suggest the application of submerged buoys to such uses, and my reasoning is this. If you have a water-tight vessel with a certain floating power, say equal to 100, and to that vessel you attach a weight equal to 110, and cast it into the water, both weight and float go to the bottom. But if they are connected by a line the weight alone sinks to the bottom, and as soon as it has found its resting place the descent of the float ceases. It becomes stationary above the weight, with the length of the line between them. In this situation the float possesses a remarkable property; the original weight having ceased to exert a sinking force, it can only be farther depressed by a new load greater than its ascensive power of 100. In still water a vessel wholly submerged has obviously great advantage in point of economy, perhaps four fold, over one partially immersed; but where the surface is agitated there is the further advantage that the submersion may be fixed at the dead water point, and uprights of small comparative sectional area alone be exposed to the action of waves. The figure shows a couple of these buoys applied to the cross section of a pier or jetty where the upright posts, horizontal bearers, platform, and parapet, being well connected and braced, would give firmness and the requisite degree of rigidity. It is supposed probable that some means of submerging the buoys may supersede the use of weights should the principle be practically adopted; and from the known effect of deep water currents, some kind of anchorage would be essential in situations exposed to their influence."

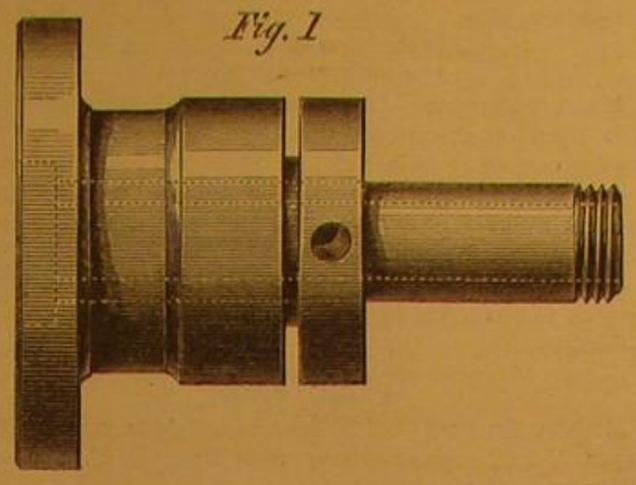


A CORRECTION.—In our description of the Bolt Cutting Machine, manufactured by the Howard Iron Works, Buffalo, N. Y., published on page 215, current volume, a typographical error occurred which might mislead some of our readers. In the fifth line the first word should be *three*, instead of "these," as the types made us say. The sentence should read "The machine herewith illustrated has three dies in the cutter head," etc.

IMPROVED PACKING STEAM DRYING CYLINDERS ON PAPER MACHINES.

We are informed that the invention we herewith illustrate has been applied to two hundred and twenty-five cylinders during the past year, and has been tested under pressure of seventy pounds with marked success.

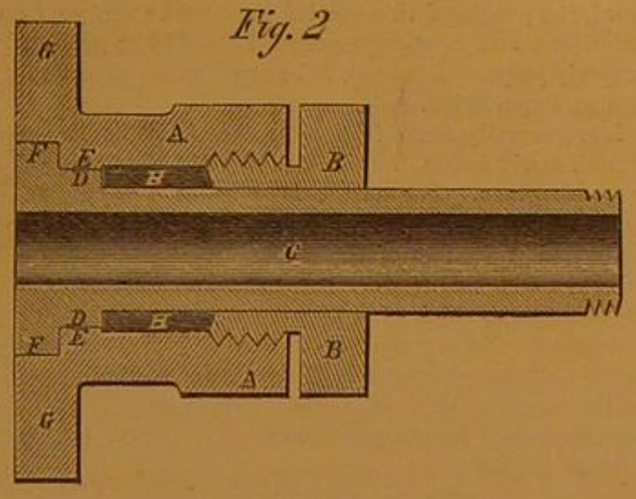
Fig. 1



The stuffing box is shown entire in Fig. 1, and in section in Fig. 2. A is the box containing the packing material, and B the packing nut. The box, A, has a flange, G, by which it is bolted to the end of the cylinder, with which it revolves; the steam induction pipe, C, remaining stationary. The box, A, is also provided with an internal shoulder, D.

The inner end of the induction pipe has two shoulders, E F, formed upon it. The packing, H, is of rubber, or any suitable material.

Fig. 2



The action of the device is as follows: When steam is admitted to the cylinder, the pressure therein of the steam acts upon the end of the pipe, C, to thrust it outward, whereupon the shoulder, E, compresses the packing, H, and keeps it tight.

Though originally designed for steam drying cylinders on paper machines, upon which it has been extensively tried, and proved to be very satisfactory, it is obviously adapted to various other uses.

Patented, through the Scientific American Patent Agency, June 8, 1869. For further information address W. B. Fowler, patentee, Lawrence, Mass.

A Valuable Invention.

A few weeks ago there appeared, in the SCIENTIFIC AMERICAN, an article calling attention to the great waste of labor involved by the present method of raising bricks and mortar to the upper stories of buildings under construction, and asking if it were not possible for the genius of our inventors to produce a remedy for the evil. *The American Builder* says this question has been answered in the most practical manner by a Chicago builder, who has invented a machine by which two men can easily and rapidly accomplish the labor of several, effecting a saving, not only in money and labor, but in time also.

The apparatus, which is destined to do away with the tedious practice of carrying the material for building up long ladders, endangering the lives of workmen, and involving such an amount of unnecessary work, is described as follows:

Two endless chains, made of any required length by a simple device, connected together at intervals of about a foot by iron cross-bars, pass at their lower extremity over a broad pulley or wheel, located as in an ordinary windlass, such as is usually employed in raising stone where a crane is used, and worked in a similar manner. The parallel endless chains thus connected pass over another broad pulley or revolving wheel, supported on four legs, much as a grind stone is usually placed. This upper pulley is put in any part of the building where the bricks may be wanted, usually in the inside. The ordinary hods are used to raise the bricks and mortar, with the addition of a broad, stout, iron hook projecting downwards at the end of that part of the hod containing the brick which is farthest removed from the shoulder when carrying. The hod, being filled, is hooked by the contrivance mentioned to one of the cross-bars of the endless chain, the handle pressing upon the lower cross-bars and acting as a lever to keep the hod firmly in position; and, as two men work the windlass is raised to any required hight. The hods can be placed as close together as their length will allow. The empty hods, in a like manner, are hooked at the top of the machine on the descending side and received by the workmen on the ground. Probably the best method of placing the machine is in the interior of the building, when the legs supporting the upper pulley over which the parallel endless chains are made to pass are placed so as to locate the pulley directly over an aperture through the loosely laid floor of the story where the material is required. These legs may be of any length, and the hods can be raised to the shoulders of the workmen who deliver their contents to the masons. The machine is already in practical operation, with the most satisfactory results, in a large building now erecting in Chicago, and two men raise easily four hods a minute to the fourth story. Of these hods three usually contain brick, and one mortar, thus furnishing all the requisite material for carrying on the work. The hods contain on an average sixteen bricks each, and consequently in a day of ten hours, two men can raise nearly twenty-nine thousand brick with the mortar necessary for laying them. The laying of two thousand bricks is, we believe, a good average day's work for a mason, and two men are by this device enabled to raise the material for fourteen bricklayers. Those acquainted with the business will readily perceive the advantages of the invention. Of course men are required to fill the hods at the bottom and empty them at the top, but by no means what has been the usual number for doing the work are required. The apparatus simply substitutes a vastly better method for raising the material.

Professor Chandler on the Purity of Croton Water.

The water supplied to the citizens of New York, at the liberal rate of sixty-five gallons to each person daily, is collected by the various branches of the Croton river from an area of 338 square miles in Westchester, Putnam, and Dutchess counties. The character of this water-shed is a sufficient guaranty of the purity of the water. The surface of silicious gravel rests on hard Laurentian gneiss, and is open pasture or woodland, with few swamps. No factories line the streams, which are liable to contaminate the water with refuse chemicals, and no towns or large villages exist anywhere in the district to pollute the waters with sewage. A recent survey of the water-shed has indicated fifteen points at which dams can be erected for the creation of large storage reservoirs, whose joint capacity would be 67,000,000,000 gallons, or a supply, at the present rate of consumption, for 1,000 days. One of these dams, 650 feet long, is now in process of construction at Boyd's Corner, in Putnam County, twenty-three miles from the mouth of the aqueduct. When this dam is completed it will flood an area of 303 acres, and the reservoir thus produced will contain 3,369,206,857 gallons, or a supply for fifty to fifty-five days of drought.

Examinations were made of Croton water which had been in contact with lead for different lengths of time, under usually occurring circumstances, of which the following are the results:

1. A gallon of Croton water from a lead-lined cistern, in which it had stood for several weeks, was found to contain 0·06 grain of metallic lead.

2. A gallon of water which had remained six hours in the lead pipes of the chemist's residence yielded 0·11 grain metallic lead, a considerable portion of which was visible to the eye, in the form of minute white spangles of the hydrated oxycarbonate($PbO,HO + PbO,CO_2$).

3. Water drawn from one of the hydrants of the School of Mines Laboratory, in the middle of the day, when the water was in constant motion, yielded traces of lead. This water reaches the school through about 100 to 150 feet of lead pipe.

These results indicate the source of many hitherto unaccountable cases of lead poisoning, and are of a character to alarm the residents of New York, and to lead them to adopt precautionary measures for protection against this insidious cause of disease.

Many have already introduced as a substitute for lead pipe the "tin lined" or 'lead-encased block tin" pipe.

Chinese Pottery and Glass.

Po Shan, in the Lanfoo valley, contains extensive potteries, three different kinds of ware being manufactured—the fine straw-colored porcelain, the common red ware, and a peculiar shining black ware, very light, that looks like metal (lead), and is valued in districts where fuel is dear, in consequence of its rapid heating qualities. The red paving tile and the large red water kongs are also made here. Yen-shing has extensive glass manufactories of which foreigners are little aware. I was much surprised at the quantity and excellent quality of the glass. There is a quarry in the immediate neighborhood, from whence is obtained the stone which, pulverized and smelted with nitrate of potassa, forms the glass. This stone is similar to granite, only of a beautiful lilac color. Nearly every house in the city of Yen-shing, is either a glass manufactory, or a shop where glass ware is sold. We found them blowing glass, running it into rods and plates, making window glass, bottles, beads, lanterns, and ornaments of every description. Some very beautiful opaque bottles of different shapes and finely painted I procured here. The glass seemed extremely pure, and sold at very reasonable prices; the rods of pig-glass about 30 inches long, and 1¼ inches in diameter, costing 30 cash a catty, or less that 1d. per pound. Saltpeter, much used in the manufacture of glass, is found in the vicinity of Po-shan-shien.—*J. Markham.*

Iceberg Alarm.

Mr. Charles Dion, of this city, proposes to place an apparatus on board of steamers and other vessels, so arranged as to sound an alarm on approaching the vicinity of an iceberg. The device is arranged on the bottom of the vessel, and is of such a nature that when the keel strikes any very cold strata of water the alarm is sounded.

It is well known that icebergs refrigerate the water around them to a considerable distance. Mr. Dion's instrument will exhibit the exact temperature of the water below the vessel at all times.

Correspondence.

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

Method of Restoring the Beauty of Silver Filligree Ornaments.

MESSRS. EDITORS:—The process of producing or restoring what is technically termed the "dead white" which constitutes the principal beauty of solid silver filigree ornaments, such as filigree earrings, pins, necklaces, etc., like the method of coloring gold filigree work, was once jealously guarded as a trade secret.

The more liberal spirit for imparting useful information, which characterizes the present age, may have already made it public; but I have never met with it among the many published recipes for cleaning silver, and in consequence send it to the SCIENTIFIC AMERICAN for the benefit of those still ignorant of it. It will prove useful to them, as ladies often carry their silver sets to the jewelers to have the original beauty restored. In a large city like New York, where every branch of business is carried on, the jeweler can always get an order executed when unable to do the work himself; but in the smaller towns and villages there are not the same facilities, and many a profitable job must either be declined from lack of ability or else sent to the city, causing unnecessary delay and expense.

The process for producing or restoring the dead white to silver is so simple that, when known, any workman of ordinary capacity can do it without difficulty in a few minutes.

Before attempting it, however, the work must be carefully examined to discover whether it has been previously repaired. Unskillful workmen—especially in the country—often resort to "soft solder" unnecessarily. If any "soft solder" (pewter) is found about the work, the process must not be attempted.

If the article is all right in that respect, pound together 3 parts charcoal and 1 of niter. Add sufficient water to form a paste. With a camel's-hair brush give the article a thin coat of the mixture, put it in a small annealing pan, and submit it to the fire until it becomes just red hot; then withdraw it from the fire, let it stand a minute, and turn it out into a weak solution of sulphuric acid (1 part acid, 10 parts water) in the boiling pan. Boil, pour off the acid, rinse; wash with warm water and soap, using a soft brush; dip in spirits of wine, and dry in box-wood sawdust. If any spots should still remain on the work, anneal it without the mixture, boil out and wash as before. Burnish the parts intended to be bright.

Do not use the common American saltpeter. The English refined niter, although it costs more, is really less expensive, as a smaller quantity goes farther, and does the work more effectually. Purchase at the wholesale druggists.

Never neglect to dip your work in spirits of wine, and dry in boxwood sawdust. You cannot dry it properly by wiping; a moisture will remain and the gloss is lost; while by dipping in spirits, all jewelry and silver ornaments may be taken immediately, thoroughly dry, and retaining their full luster.

ALEXANDER ALLAN.

Retardation of the Earth's Rotation.

MESSRS. EDITORS:—The SCIENIFIC AMERICAN has recently given extracts from British sources, of scientific repute, containing speculations on supposed existing causes, tending to retard the earth's rotation on its axis. The London *Spectator* alleges the *friction* of the tidal wave, to which I briefly replied through the SCIENTIFIC AMERICAN, that the wave or swell following the moon in its westward course around the earth, would draw its supply for continued renewal from the advancing tide and receding from the wave easterly on the retiring attraction.

Hence the flow to cause friction, both to and from the wave, would be in favor of acceleration.

The transcript on page 204 SCIENTIFIC AMERICAN, from the *Edinburgh Review* is silent as to friction, but states that the tidal wave (*per se*) is a constant source of retardation, at the same time admitting the earth to have been a "molten mass millions of years back," and consequently would be in a condition to yield to the centrifugal rotation, and assume the spheroidal form as we now find it, and as required by its present rate of rotation.

The deviation from a sphere is what eminent mathematicians from Newton downwards have demonstrated due to a fluid state. That fluid state, or at least its equivalent for computation is present with us, by the continuous oceanic intercommunication all over the earth, conforming to the oblate speroid generated during the plastic condition of a molten mass "millions of years in the past." T. W. B.

Pittsburgh, Pa.

Putting up Stoves---Wear of Front Driving Wheels of Locomotives.

MESSRS. EDITORS:—I have been running a stove for two years with the legs bolted on. I am sure of it for I set it up myself. It is the "Morning Glory," and was made at Albany, N. Y. Further, I once had to do with a stove, the legs of which were put on—I think, in a very proper manner—but perhaps not any better than to bolt them. The leg had not less than an inch upward draft, was fitted in the usual way, and with a projection at the top of socket for the leg to strike against when home, and prevent its getting stuck fast. The result was, the leg could not be taken off without raising the stove nearly an inch from the floor, and of course there was no danger from upsetting unless the stove was "toddled" up on blocks. Give stove legs or the sockets an upward draft, and very slight taper, and the legs will not come off without help.

I will suggest that H. R. Jones, who asks why the forward drivers of locomotives wear faster than the others, should look for an explanation to sand used forward of forward drivers, the second not getting so much of the grinding element. I once fired a locomotive that had but one sand pipe in order for *several years*, and the drivers upon that side were worn so much more than the other that it could be plainly seen, and felt too by the unpleasant side motion.

Gardner, Mass. H. C. K.

A Comfortable Stove.

MESSRS. EDITORS:—I set up a comfortable stove as follows: First I put on the carpet sheet zinc, 50 by 32 inches. Next a soapstone, 44 by 24 inches, and 1¼ inches thick, and raised ¼ an inch by wooden wedges, out of sight. On this I set my stove, without legs, which is 12 inches shorter and 8 inches narrower than the stone.

This is pronounced by all who try it to be the most perfect concern to warm feet by that they have ever met with.

Cornton, Vt. W. P.

Yopon Trees.

MESSRS. EDITORS:— I noticed an article in your valuable paper, No. 9, present volume, from Prof. H. E. Colton, on yopon trees of Carolina.

Now, I presume as he did not make mention of it in any other States than the Carolinas and Louisiana that he was not aware of the fact that it exists so abundantly in Texas.

The yopon is one of the natural productions of this State, to be found in all of the coast and middle counties, from the Sabine to the Gaudaloupe rivers, and has been used as a tea or beverage by the inhabitants of this country for many years, especially in the absence of imported drinks. During the late war, when coffee and imported tea could not be obtained in consequence of the blockade by the U. S. Government, the people of this section resorted to the yopon as a substitute, and it was pronounced by all who gathered and properly prepared it for use, to be equal, if not superior, to any foreign importation.

It is generally found in greater abundance and luxuriance on rich sandy loams, from five to twenty feet in hight, and is an evergreen. The main stem or trunk is of grayish color, and filled with beautiful red berries growing close to the limbs and at the root of the leaves.

I have seen hundreds of acres of land covered with this growth, and so thick as to be almost impenetrable for men or animals. Now if the yopon should ever become an article of commerce and profit, Texas will, no doubt, come in for the largest share, as it exists here in greater abundance than any other district yet known. T. J. GRACE.

Osage, Texas.

The New Thames Tunnel.

A new tunnel under the Thames has just been finished successfully in London, at a cost of £16,000; and a third is contemplated. Mr. Barlow, the engineer, seems to have had less trouble in this work than his great predecessor, Brunel. The London *News* says of this tunnel, which is called the subway:

"The mysterious-looking thoroughfare admits of a very brief description. It is a well-constructed tubular iron bridge, about a quarter of a mile long, and seven feet in diameter, sunk bodily into the bed of the Thames, so as to be snugly embedded in the London clay through its entire distance. Nowhere is the subway nearer than twenty-two feet to the water, and in places it is as much as fifty feet distant—an important fact to bear in mind in comparing the subway with the old Thames tunnel, over the arch crown of which there were here and there but four feet to the water. The subway, in point of fact, dips at the rate of one in thirty. At present the Tower Hill station at the one end and the Tooley street station at the other, are more useful than ornamental, especially when the cage by which passengers are taken down is at the bottom. We use the word "cage" because of its resemblance to that familiar object of the mining districts, but it is in reality rather a nicely padded little apartment, semicircular in shape, and with cushioned seat for four or six. Into this the passenger enters, and the doors are shut. There is a rumble, a rattle, a consciousness of steady downward motion, and an intention perhaps to remark to your neighbor that it is all very pleasant; but any such reflection is nipped in the bud by the termination of the journey, which has occupied about the time it would take to count a dozen. The distance is only fifty feet. Through a small waiting room you enter a long, low carriage, with seats for seven on each side. The signal is given, the drum begins to revolve, the wire rope twines swiftly around it, the pretty omnibus answers to the strain, and in about sixty seconds the subterranean passage of the Thames has been accomplished. Safety is secured in the shafts by an unusually powerful clip; in the subway by the single line of tram-rails, upon which collision is impossible. We walked through the narrow, dark road yesterday, absolutely dryshod, and without any inconvenience from defective ventilation. At times, a listener in the center of the subway can hear strange noises, said to be the reverberations of paddles beating the river overhead, and the sounds of hammering and thumping on board vessels. The Tower hill fares at present are fixed at a penny and twopence, but they will probably have to be reduced by one half."

Important to Oil Men.

The Commissioner of Internal Revenue has decided that men who own oil lands or hold them under leases and who sink wells therein and work them until they are exhausted, and then sink others in the same manner and for the same purpose may be allowed to deduct the cost of sinking such wells in their income returns; that in such case the business seems to be the production of oil for sale, and the expense of sinking the wells, which are worthless when they are exhausted, is one of the necessary expenses of conducting it. He decides, however, that no such deduction should be allowed to men who sink wells not for the purpose of working them, but for the purpose of thus improving the oil lands and then selling them thus improved; that in this case the expense of sinking the wells is as much an investment as though it were expended in erecting a house on the same lands, and should be governed by the same rules.

Deaths in the Mines.

The official report of the number of persons killed in the collieries in Schuylkill county, from May 1 to December 31, 1869, was 57, which is one for about 67,800 tuns of coal mined; and 91 persons were injured, which is one for about every 42,400 tuns mined during that period. Taking the whole year in the same proportion, it would give 72 persons killed during the year and 115 injured.

No official report has been kept of the number of the injured that afterward died, but as far as we received answers to queries which we ("Miner's Journal Coal Statistical Register, for 1870), addressed to operators, about one sixth of the injured persons have died, which would give number of deaths caused by casualties in the mines in Schuylkill county, in 1869, at 91, leaving 96 injured that survived, in the product of about 4,883,000 tuns.

The causes of the deaths and casualties were as follows:

Persons killed	57	Maimed and injured	91
Falls of coal	22	Falls of coal	21
Falls of rock	2	Falls of rocks	3
Falls in slopes and shafts	9	Falling in rolls	2
Caught in screens and belts	3	Falling in slopes and shafts	3
Explosions of gas	4	Explosion of gas	36
Explosions of powder	9	Explosion of powder	9
Crushed by cars	3	Being crushed	8
By sundry causes	5	Sundry causes	9

Leaving 30 widows and 132 orphans.

These official statistics show that there were but four deaths and thirty-six injured by explosions of foul gas in the collieries in Schuylkill county from May 1 to December 31, a period of eight months, while the deaths from other causes were fifty-three, and the casualties fifty-five from other causes. These are important figures in the framing of a bill for the protection of the lives of miners in our collieries.

The proportion of deaths to 1 for 103,000 tuns mined, holds good throughout England, Scotland, and Wales, for 1867.

The number of deaths in 1868 in England, Wales, and Scotland has been reduced within a few years. Falls of the roof kill more in the mines than explosions of fire damp.

We append the proportion in the different districts for 1868:

Northumberland	1 death to	175,000 tuns
South Durham	"	176,000 "
North and East Lancashire	"	118,000 "
West Lancashire and North Wales	"	82,000 "
Yorkshire	"	113,000 "
Derby, Nottingham, Leicester, and Warwickshire	"	128,000 "
North Stafford, Cheshire, and Shropshire	"	99,000 "
South Stafford and Worcestershire	"	95,000 "
Monmouth, Gloucester, Somerset, and Devonshire	"	96,000 "
South Wales	"	98,000 "
In Schuylkill county, 1869	1 for	67,800 "

A few years ago the number of deaths in England was greater than the average number in Schuylkill county in 1869.

These figures show the necessity of legislation for the better protection of the lives of miners in the collieries. It was legislation that largely reduced the number in the English and Scotch collieries.

Steel in the United States.

The *Protectionist*, speaking of the progress making in the manufacture of steel in the United States, says:

"Within the last six years it has been demonstrated that the steel-producing qualities do exist in American iron, and many of our best edge-tool manufacturers and machinists testify that steel, both cast and rolled, made in Pittsburg, from American iron, is fully equal to the best English makes.

"The steel-producing capacity of the works in and around Pittsburgh alone is estimated at seventy-five tuns per day. This industry may, therefore, be deemed an accomplished fact, and brief as its history is; it has already exercised an important influence in controlling foreign prices."

It is shown that American axes, shovels, spades, hoes, etc., have entirely taken the place of foreign tools. Nothing equal to them in shape or finish is made abroad, and they are now largely exported. American butts and hinges of all kinds are cheaper and better, and entirely excludes all foreign goods. In cutlery of all kinds, the medium American qualities, of which the largest bulk enter into consumption, are cheaper and better than those of foreign importation; only he very low and worthless grades, or the very expensive and luxurious styles can now be imported.

A New Safety Buoy.

A curious application of the spontaneous inflammability of phosphureted hydrogen gas, when brought in contact with the air, has been made to a life-saving apparatus and to buoys.

Something like a fuse is attached to the buoy, composed of a proper mixture of phosphide of calcium. In case of a man overboard, the life preserver is thrown into the water, the moment the fuse becomes wet it begins to give off a gas which takes fire in the air, and the wetter it becomes the more gas and the brighter the light produced.

The light can be made to last an hour, so that persons swimming can easily find, and attach themselves to the buoy, and the rescuing boats have a beacon to which to direct their course. It is proposed to have a number of such life preservers on every large ship.

The phosphide of zinc could be used as a substitute for the calcium compound, and the invention is capable of application for a display of fireworks on the water.

The Explosion of Kitchen and Circulating Boilers.

At the last meeting of the Executive Committee of the Manchester Steam Users' Association, held on Tuesday, the 22d of February, at the offices 41 Corporation street, Manchester, Thomas Schofield, Esq., Cornbrook, taking the chair in the absence of the President, Sir W. Fairbairn, C.E., F.R.S., etc., Mr. L. E. Fletcher, chief engineer, briefly referred to the number of fatal household boiler explosions that have recently occurred. This meeting had been specially convened for the purpose of considering the annual report to be laid before the body of subscribers at the approaching general meetings, but, owing to the number of lives which had been lost by the explosion of these household boilers during the recent frost, it was thought important to circulate at once some suggestions with regard to the cause of these disasters, with the hope of preventing their recurrence should the frost return. Under these circumstances the subject was only briefly touched on, the Chief Engineer hoping to treat it more fully, with the aid of illustrations, in his next ordinary monthly report.

The cause of kitchen or bath boiler explosions is very much misunderstood, and hence the constant recurrence of these disasters. They are wrongly ascribed to the introduction of a few drops of cold water into a red hot boiler. They are attributed to the thaw, whereas they are the result of the pipes being sealed by the frost. That the sudden introduction of cold water into a red hot boiler will not cause an instantaneous generation of pressure sufficient to produce an explosion, was shown by repeated experiments, fully described in the Chief Engineer's report for January, 1867.

The boilers that explode on the occurrence of frost are on the circulating principle. They are connected by two pipes to an overhead cistern, the result of which is that on the application of a fire to the boiler, as soon as the water becomes heated it rises through one of these connecting pipes, while the cold water, by its gravity, descends in the other, so that a constant circulation is kept up as long as the fire remains in action, the boiler and pipes are full, the passages open, and there is any water left in the overhead cistern. As long as these pipes are open they form a natural safety valve, and afford a pressure due to the hight of the column of water, and no more; but as soon as the frost seals them up, the pressure accumulates as long as the fire burns, when explosion becomes merely a question of time. This is the simple cause of these disastrous explosions, and that being so, it is clear that all that is needed to prevent them is to adopt the very simple precaution of fixing to every circulating boiler a reliable safety valve, that will not be affected by the frost. A drawing of a safety valve, recommended for this purpose, was given in one of the Association's printed monthly reports three years since, when attention was called to the subject, in consequence of a number of fatal explosions that occurred during a frost at that time. The valve recommended was of the external pendulous dead weight construction, and, having no lever, hinged joint, wings, or spindle, was not at all liable to derangement; while hundreds of similar valves of larger size, on steam boilers, have worked satisfactorily under the inspection of this Association for years. These valves should be fixed in the front of the range, being brought out, if necessary, by means of a connecting pipe, so as to be always in sight and accessible. They should be kept clean and bright —treated as an ornament, and then they can be depended on; but safety valves, if stowed away in a dark corner, and left out of sight for years, prove in nine cases out of ten, especially when of the ordinary lever, hinged-joint construction, to be stuck fast and useless just when they are wanted. These safety valves are very inexpensive; any brass founder should be able to turn them out, and every householder should have one applied, or some other simple contrivance for preventing the accumulation of pressure during all states of weather. It is possible that there may be other contrivances more convenient than the safety valve, and it is proposed to return to this subject on a future occasion, but from the number of fatal explosions which have recently occurred it is important to call public attention to this subject immediately, and if it is once fairly recognized that the cause of these explosions is a gradual accumulation of pressure, it will not be long before some suitable measures are contrived to meet it. To set a boiler in a kitchen alongside of a brisk fire without a safety valve, or something equivalent thereto, is very much like putting a cask of gunpowder into the oven to bake.

Solid Beer.

The age produces some queer paradoxes, and none more so than in the results of manufacturing science. In former days, says the *Food Journal*, it was the custom to buy bread and even beef by the yard; but we believe that it is only in the present day that we can get our beer by the pound. By a very simple process, introduced by Mr. Mertens, the wort, after being made in the mash tub of malt and hops in the usual manner, is sucked up by a pipe into a large vacuum (exhausted by an air pump), and then persistently worked round and round, while the moisture is evaporated. The wort emerges from its tribulations with a pasty consistence, and is allowed to fall from a considerable hight into air-tight boxes, in which it reposes like hard-bake. It soon gets so exceedingly tough that it has to be broken up with a chisel and mallet, and in that condition is easily sent abroad, or to any part of the world, for people to brew their own malt liquor. We have had the wort subjected to analysis, the results of which, in 100 parts, show that there is almost absolute purity: Gum, 64·219; sugar, 20·664; lupulin (the active principle of hops), 2·000; albumenous matter, 0·600; mineral matter, 1·500; moisture, 11·017.

On Red.

Red is the second and intermediate of the primary colors, standing between yellow and blue, and in like intermediate relation also to white and black, or light and shade. Hence it is pre-eminent among colors, as well as the most positive of all, forming with yellow the secondary orange and its near relatives, scarlet, etc.; and with blue, the secondary purple and its allies, crimson, etc. It gives some degree of warmth to all colors, but most to those which partake of yellow.

It is the archeus, or principal color, in the tertiary russet; enters subordinately into the two other tertiaries, citrine and olive, goes largely into the composition of the various hues and shades of the semi-neutral marrone or chocolate, and its relatives, spruce, murrey, morello, mordore, pompadour, etc., and more or less into browns, grays, and all broken colors. It is also the second power in harmonizing and contrasting other colors, and in compounding black, and all neutrals, into which it enters in the proportion of five; to blue, eight; and yellow, three.

Red is a color of double power in this respect also; that in union or connection with yellow, it becomes hot and *advancing;* but mixed or combined with blue, it becomes cool and *retiring.* It is, however, more congenial with yellow than with blue, and thence partakes more of the character of the former in its effects of warmth, of the influence of light and distance, and of action on the eye, by which the power of vision is diminished, upon viewing this color in a strong light; while on the other hand, red itself appears to deepen in color rapidly in a declining light, as night comes on, or in shade. These qualities of red give it great importance, render it difficult of management, and require it to be kept in general subordinate in painting; hence it is rarely used unbroken, or as the predominating color, on which account it will always appear detached or insulated, unless it be repeated and subordinate in a composition. Accordingly nature uses red sparingly, and with as great reserve in the decoration of her works as she is profuse in lavishing green upon them, which is of all colors the most soothing to the eye, and the true compensating color, or contrasting or harmonizing equivalent of red, in the proportional quantity of eleven to five of red, according to surface or intensity, and is, when the red inclines to scarlet or orange, a blue green; and when it inclines to crimson or purple is a yellow-green.

Red breaks and diffuses with white with peculiar loveliness and beauty; but is discordant when standing with orange only, and requires to be joined or accompanied by their proper contrast, to resolve or harmonize their dissonance.

In landscapes, etc., abounding with hues allied to green, a red object, properly posited according to such hues in light, shade, or distance, conduces wonderfully to the life, beauty, harmony, and connection of the coloring; and this coloring is the chief element of beauty in floral nature, the prime contrast and ornament of the green garb of the vegetable kingdom.

Red being the most positive of colors, and having the middle station of the primaries, while black and white are the negative powers or neutrals of colors, and the extremes of the scale; red contrasts and harmonizes these neutrals, and, as it is more nearly allied to white or light than to black or shade, this harmony is most remarkable in the union or opposition of white and red, and this contrast most powerful in black and red.

As a color, red is in itself pre-eminently beautiful, powerful, cheering, splendid, and ostentatious, and communicates these qualities to its two secondaries, and their sentiments to the mind.

Red being a primary and simple color, cannot be composed by mixture of other colors; it is so much the instrument of beauty in nature and art in the color of flesh, flowers, etc., that good pigments of this genus may of all colors be considered the most indispensable; we have happily, therefore, many of this denomination.—*Painter, Gilder, and Varnisher.*

The Leather Trade.

The *Bureau* thinks few, even among dealers in the article, are aware of the vast extent of the leather trade, and industries growing out of its use. Next to agriculture, it employs more capital and labor than any other interest of the country. Whatever, therefore, advances or retards its healthy condition and growth, is worthy of careful study and attention.

During the rebellion this industry, like many another, was greatly stimulated, being taxed to its utmost capacity to furnish supplies for the armies in the field. When the exceptional demand from this source was cut off with the close of the war, it was found that the foreign demand, upon which it had been accustomed to rely for the sale of its surplus products, had gone off to other markets, driven thereto by the inability of our dealers to supply its wants during those dark days of our history. The consequence was, that the flow of trade was checked, and over-production and stagnation supervened.

Some relief from legislation should undoubtedly be given to this branch of industry, in order that it may be enabled to regain a portion at least of its foreign trade, that with South America having been especially valuable. Our leather dealers were accustomed to receive from that portion of the continent, in exchange for their manufactured products, an article of hides, sole leather from which forms 90 per cent of the stock consumed in the country. These hides now pass into the hands of other parties abroad, who have supplanted our dealers in this profitable market.

With such a modification of the duties upon the raw material as will restore the exchange of products with Buenos Ayres, the leather interest may reasonably look for a restoration of prosperity far exceeding all former experience. The South has again become a valuable customer, and her demand is now for the better grade of goods, whereas, before the war, she only called for the inferior qualities. The astonishing recuperation of that section of the country has made itself felt in this branch of manufacturing industry, in a growing and healthy trade. Under these circumstances, it is not unreasonable to expect, in the course of five years, that instead of $225,000,000 as the total value of the leather manufactures of the United States, double that amount will be within bounds. The advantage that this country holds in respect to labor-saving machinery, upon which improvements are constantly being made, and the vast amount of capital that is only awaiting favorable conditions to be invested in this direction, indicate that in a few years American facilities will be such as that they can obtain and hold the markets of the world in leather manufactures.

This is one of those branches of industry which we want to see more extensively introduced into the West; and the farming community, by giving their attention to it, can turn their winter leisure to profitable account, as their brethren in New England have done for half a century.

Editorial Summary.

IN a recent number of the *Patrie* there appeared a panegyric on the French national arm. That journal said that since the various improvements which had been effected, the rifle had become one of the best in Europe, nevertheless, the service weapon was not finally decided upon. *Les Mondes* writes to know whether it is not true that two serious defects still exist. The first of these stated defects is that the needle does not strike the cartridge in a line with its axis, but eccentrically, and so often breaks. The second is that the cartridge when once inserted cannot be extracted, a grave defect, and likely to lead to accidents. We remember that after the battle of Mentana numbers of French troops were found wounded in the right hand. It transpired that their injuries were self-inflicted, but involuntary. The Chassepots had been loaded, had missfired, and their unfortunate bearers had attempted to force out the cartridge with their ramrods, at the same time forgetting to open the breach. The evil effects of forcing the cap of the cartridge against the sharp point of the needle by means of the ramrod may be imagined.

THE Commissioner of the General Land Office at Washington has received from Rockingham County, Va., specimens of crystallized Iceland Spar. They possess unusual transparency. This mineral when quite clear has a high value on account of its refracting qualities, which are such that it gives a double image of anything seen through it, and it is used in the construction of polarizing instruments. Hitherto it has always been imported by our opticians. The extensive use made of it in sugar refining for testing by polarity the strength of saccharine solutions, and in the various scientific and manufacturing processes in which the Nicol's prism is employed, need not be detailed. The Virginia quarry is said to afford abundant yield of most excellent quality.

THE PRESERVATION OF MILK.—The following recipe appears in *Cosmos:* "To every liter (= 1¼ pints, 5 oz.) of unskimmed milk, previously poured into a well-annealed glass bottle, add 40 centigrammes (about 6 grains) of bicarbonate of soda. Place the bottle (which must be well corked) containing the milk for about four hours in a water-bath, heated to 90°C. (194° Fah.) On being taken out, the bottle is varnished over with tar; and in that state the milk contained in it will keep sound and sweet for several weeks."

AN ANCIENT SILVER MINE IN GERMANY.—The recent earthquakes in Germany have occasioned the falling of a large mass of rock between Heidelberg and Weisloch, and the disclosure of a silver mine worked by the Romans. There is not much silver left, but the mine is rich in zinc minerals, which the Romans rejected.

M. SOMMER propounds a new theory of sleep: his idea is that sleep is simply a result of the deoxygenation of the system, and he believes that sleepiness comes on as soon as the oxygen stored in the blood is exhausted.

THE total area of the known or explored coal-fields in the civilized world, independent of our American coal-fields, are less than 20,000 square miles. When compared with the immense areas and extent of the latter, how small and insignificant the former appears.

MANY small basins of coal exist in the midst of the Rocky Mountains, not directly connected with the great coal-field along its eastern base, and we are ready to hear any day that some of these basins contain anthracite coal.

THE most powerful fog-whistle in America, is at Cape Fourcher, N. S. It can be heard fifteen miles in clear weather and twenty-five with the wind.

THERE are in America and Europe more than 250 manufactories of rubber articles, employing some 500 operatives each, and consuming more than 20,000,000 lb. of gum per year.

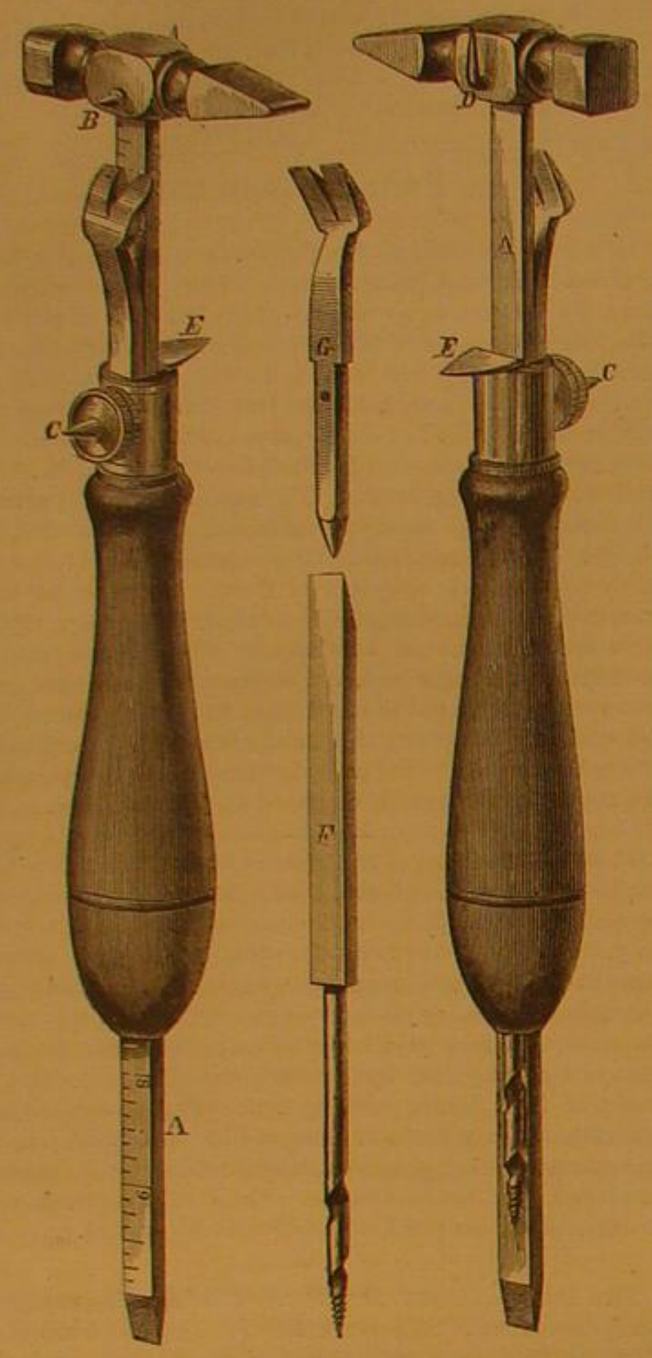
M. HESLING states, in the *Journal de Pharmacie et de Chimie*, that even long before milk becomes sour there are generated in it very small organized spores of an Ascophora species.

OUDEMONS has succeeded in making an alloy of zinc and iron. The new metal, which contains 4·6 per cent of iron, is remarkable for its whiteness and tenacity.

STOCKWELL'S IMPROVED COMBINATION TOOL.

This is one of the numerous family of tools designed to economize space and material, by making the parts applicable to various uses. It is a combination of a tack hammer, square, rule, screw driver, claw, marking awl, chisel, gimlet, can opener, compasses, and washer cutter.

The nose of the hammer is made flat on the bottom, and set at right angles with the shank, A. The shank is made of steel, and divided into inches and eighths of an inch. This construction gives the square and the rule. On one side of the hammer head is a point, B, and a similar point is made on the head of the milled set screw, C. By loosening this screw, the shank, A, may be drawn out or thrust in to adjust these points to different distances, so that circles of various sizes can be marked out with them, as with compasses.



On the opposite side of the head is a pointed hook, D, which, in connection with the blade, E, forms the can opener. The pointed hook is thrust through the tin plate, as near as may be to the center of the top of the can, and the blade, E, being pressed down through the tin, a sweep of the handle cuts out a circular disk, through which the contents may be taken out.

The end of the shank, A, opposite the hammer head, is formed into a screw driver. Loosening the set screw, C, allows the shank to be taken out of the handle, when the chisel and gimlet, F, may be taken out. When either the chisel or gimlet are required to be used, they may be placed in the handle and held by the set screw, C, as the shank, A, is held when the hammer is used. G represents the claw, which has at the opposite end a marking awl. This can also be used by fixing it in the handle with the set screw. By turning the handle so the knife will be on the same side as the point, or hammer, it can be used as a washer cutter for pump valves, wagons, etc.

The whole forms a neat, compact, and convenient implement for domestic use, and would form an excellent addition to a tourist's or traveler's chest, in countries remote from the usual facilities for repairs of small articles afforded by civilization. It is useful also for coachmen and teamsters, comprising, as it does, a tool requisite for repairing carriage harness, etc.

Patent allowed, through the Scientific American Patent Agency, April 12, 1870. For further information address G. W. Stockwell, inventor, Lock Box 43, Natchez, Miss.

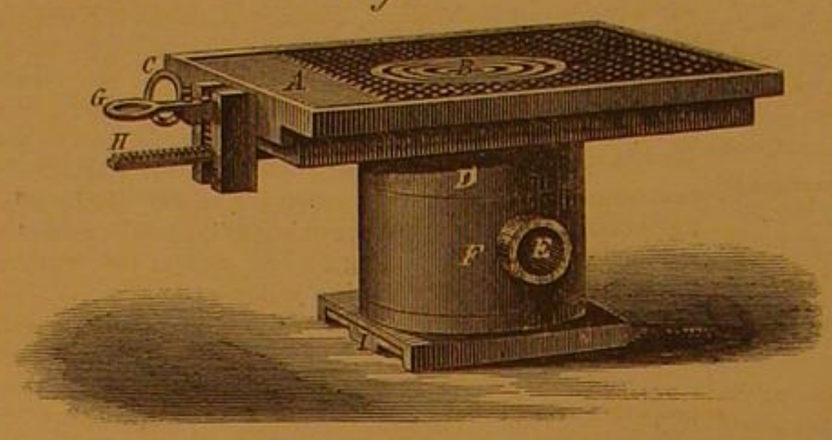
Paper Hangings.

Impressed gold papers, printed with finely-engraved brass dies, have been lately introduced, and for workmanship cannot be surpassed. Apart from their richness, there is no attempt at shadow, which should always be avoided. The ground colors are laid in a careful and superior manner, and a soft good effect is obtained. The specimens of flock paper are the reverse of the impressed gold; for as in one case the gold leaf is pressed by a warm cylinder into the ground color of the paper, so the relief effect accompanied by real shadow is produced by printing the block in size and flocking the same, repeating each process several times until the desired relief is formed. The pattern is then in relief in white flock upon a sized white paper ground. It is very easily applied to the wall, and especially suitable for panel decorations; it may be finished after being sized with ordinary glue size, and one coat of paint to prevent absorption in any tint of distemper color, or finished in paint, and relieved with color and gold according to taste, finished as the style of the room or staircase may require. The newest French paper-hanging patterns are raised in relief, and some have edging of gold as embroidery, producing the exact effect of *appliqué* work.

KAY'S PATENT REVERSIBLE SLIDE VALVE AND SWING GRATE.

It is a well-known and acknowledged fact among all blacksmiths, that much time is necessarily lost in changing from a smaller to a larger heat. This fact is easily accounted for when we remember that, by the construction of other tweer irons, the opening in the tweer plate, through which the blast issues, remains unchanged, however much the force of the blast may be increased, so that, while the fire directly above the place from which the blast issues may be at a melting heat, it is only spread by ignition from the center and not by a direct blast under every part of it; and even when the desired surface of fire is obtained, while it may be of sufficient heat to smelt the iron directly above the opening, the parts adjacent to the center may not have reached the desired heat, thereby giving an uneven and unsatisfactory heat to the whole. This is only partially obviated by frequently turning the iron, a very difficult and laborious operation when the piece is either large and cumbersome, or of inconvenient shape for thus turning.

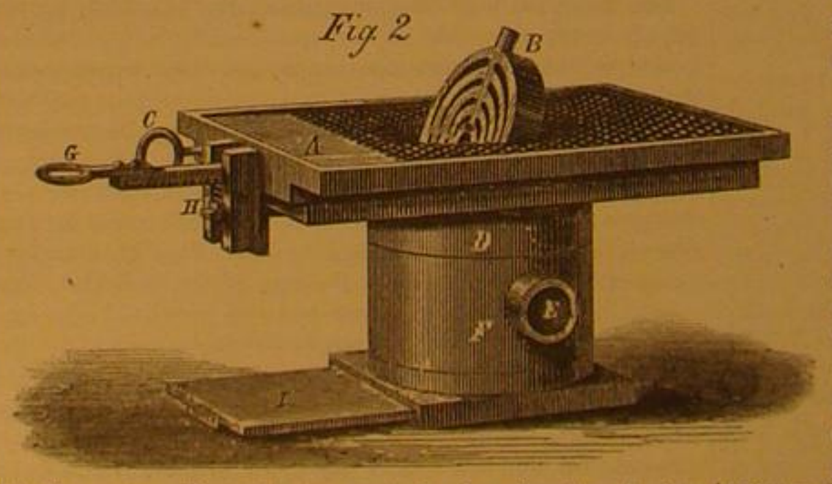
Fig. 1



The apparatus of which we give an engraving has been, we are informed, thoroughly tested, and found to not only obviate the difficulties above mentioned, but by it a larger or smaller surface of fire, with an even blast under every part of it, can be obtained. It can be used with Lehigh pea coal as well as with the Cumberland or sea coal, now generally used, thereby giving to the blacksmith the peculiar and well-known advantages of a Lehigh fire, of which, those using a tweer have heretofore been deprived.

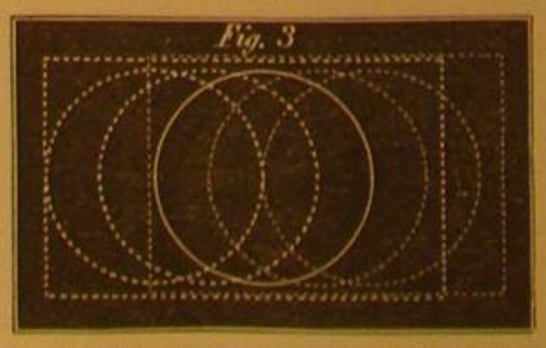
Fig. 1 represents the apparatus closed. A is the upper plate which forms the bed of the fire, and in which is placed a swing grate, B, pivoted so that the grate may be turned as occasion may require, to the position in Fig. 2, it being held in position by a rod, C, working through the bed, and fitting

Fig. 2



into the grate. Beneath the grate is the chamber, D, into which wind is admitted, through the adjustable collar, F, from the blower, by means of the pipe, E. Between the air chamber and the grate are arranged two slides, to each of which a rack, G and H, respectively, is fixed, and between the two racks a pinion is arranged, so that by moving one of the slides the pinion is turned, causing the movement of the other slide in the opposite direction. Through the two slides is formed a circular opening of the same diameter as the grate opening; the openings are represented in Fig. 3—the upper

Fig. 3



slide with heavy lines, the lower slide with light lines. Now if the upper slide be drawn out by the handle, G, attached to it, from the position shown in Fig. 1 to that shown in Fig. 2, the openings in the two slides come directly one over the other, opening to the fullest extent the communication between the air chamber, D, and the grate, B. In Fig. 2 the pin, C, has been drawn out, in order to allow the grate, B, to revolve and empty the ashes and scales through the opened slide, I, to the floor beneath, whenever the fire needs clearing; when this is not needed, but only the greatest amount of blast is required, it will not be necessary to change the position of the pin, C, and the slide, I; but by merely drawing out the handle, G, the blast and surface of the fire may be enlarged to any extent desired. In this movement the opening commences at the center, each slide opening from the center; the space opened is double the movement of either slide, and when the slides are opened to any required space, as denoted by the broken lines in Fig. 3, the wind is admitted centrally on to the grate, and the force of the blast spread equally under the fire by means of a cross piece in the collar, F; by which, as will be readily seen, a circular blast of any desired size, may be obtained, always enlarging from, or diminishing towards, the center of the fire, so that the blast is directly under the whole of the fire, rendering one part as hot as another, and giving an even heat to the whole. Every tweer is furnished with three grates—one for spreading the fire, one for concentrating it, and one of a pyramidal form, in order to allow the ashes and fused metal to slide off and not obstruct the blast by filling up the gratings while welding heavy pieces. This device is also a very cheap one; its price being, we are told, only twelve dollars.

This invention was patented June 8, 1869, by Joseph Kay, 34 Pearl street, New Haven, Conn., to whom all orders may be addressed; or to Mr. H. B. Bigelow, machinist and boiler maker, Grapevinepoint, New Haven, Conn., where it may be seen in operation.

Construction of Sky Lights.

The *Architectural Review* says: "the square sky light, properly constructed has advantages over the spherical or any circular form, being more thoroughly water-proof and far more easily set than the latter. As to the suitableness of the spherical form, to shed light in the back part of a store, we do not think it equal in *effectiveness* to the square sky light, although it is, to a certain extent, effective enough.

"While noticing this subject we would also refer to sky lights as applied to the lighting of several stories of a building. The number of stories must be taken into account and the hight of each and all collectively; whether there are any obstacles to the admission of the light perpendicularly; or if there be, at what angle it could be conveniently admitted. Another consideration is the amount of space over which the light is to be distributed, and whether it can be aided by blending with the light from any other source. All these points must be considered, and the best mode adopted accordingly.

"When we wish to admit a direct light from above to two or three stories, a square opening is best; having its four sides inclined upwards to an angle of, say, thirty-five degrees; and also having the well-hole or opening in each successive floor increased at a angle of ten degrees; thus giving to the lowest story the fullest benefit of the expansion of rays.

"On each floor (except the last) the well-hole should be inclosed with framed glass sides, the wood-work of which, as well as of all the curbs and trimmings, should be painted white, and if porcelain paint, all the better; for the reflection and refraction of light thus gained is a great object.

"The spherical dome or circular forms are not well adapted for practical use, the glass being cylindrical, the light is naturally concentrated and not reflected in its course as in the former instance; besides the construction is more difficult and expensive; as each light must be curved to its required shape, and the glass necessary for this purpose is of the ordinary thickness, and liable to breakage; while the other is entirely free from such danger. When the space to be lighted is but one story, the best mode is to bring the light through one side of a raised roof, using the rough plate glass, and placing the same at a slope of about twenty degrees from the perpendicular. The hight is regulated according to circumstances; for ordinary purposes they are two feet six inches; the roof to be raised to an inclination of from ten to twelve degrees, and plastered on the under side perfectly white to the same angle with the roof, until it meets the level ceiling. The opposite side, from the glass to the ceiling, should be continued down the same slope with that of the glass, until it meets the ceiling, and the ends are usually made to this same slope, all plastered white and finished to a polished surface.

"Sky lights of this form can be placed at intervals, according to circumstances, and multiplied to any number. They are the simplest, and also the most available, when applied to a single story.

"In some cases, where it is desirable to have a superior finish to the ceiling, a sash is placed on a level with the lower surface, and glazed with embossed glass of any desired figure."

BY digesting metallic zinc in iodide of ethyl we obtain a volatile liquid which takes fire spontaneously in the air. It can be distilled in an atmosphere of hydrogen, and if this gas be made to pass through the liquid it will carry off some of the zinc-ethyl, and when ignited will burn with a magnificent white flame. It is probable that ordinary illuminating gas would answer as well as hydrogen for this experiment. The light produced in this way can be employed to take photographs, but its actinic properties are not equal to the effects produced by burning magnesium.

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Contents:

(Illustrated articles are marked with an asterisk.)

*The Ballard Pavement....263
Light and Vision—More especially how Light is Converted into Thought....264
Experiments on the Head of a guillotined Patient....264
A Trip over the Central Pacific Railroad....265
New Attractions for the Central Park....265
Glass for Windows....265
*Turning Irregular Forms....266
*Boring Insects....266
*Submerged Buoys as a Basis for Structures in Deep Water....267
*Improved Packing Steam Drying Cylinders on Paper Machines....267
A Valuable Invention....267
Prof. Chandler on the Purity of Croton Water....267
Chinese Pottery and Glass....267
Iceberg Alarm....267
Method of Restoring the beauty of Silver....268
Retardation of the Earth's Rotation....268
Putting up Stoves—Wear of Front Driving Wheels of Locomotives....268
Yopon Trees....268
A Comfortable Stove....268
The New Thames Tunnel....268
Important to Oil men....268
Deaths in the Mines....268
Steel in the United States....268
A new Safety Buoy....268
The Explosion of Kitchen and Circulating Boilers....269
Solid Beer....269
On Red....269
The Leather Trade....269
Editorial Summary....269
*Stockwell's Improved Combination Tool....270
Paper Hangings....270
*Kay's patent Reversible slide Valve and Swing Grate....270
Construction of Skylights....270
An Anglo-American Turkish Bath....271
Boiler Inspection....271
Principle of the Lever....271
The West Side Elevated Railway....272
The Paris Observatory....272
Shut your mouth....272
Comparison of Turbine with other Water Wheels....273
Where and how Corks are cut....273
New Books and Publications....257
Inventions Patented in England by Americans....258
Answers to Correspondents....258
Recent American and Foreign Patents....258
U. S. Supreme Court....270
List of Patents....259

Special Notice to Advertisers.

The circulation of the SCIENTIFIC AMERICAN has become so large that we are compelled to put it to press one day earlier in the week. Advertisements must be handed in before Friday noon, to insure their publication in the issue of the succeeding week.

AN ANGLO-AMERICAN TURKISH BATH.

Reader, you have, without doubt, heard something about Turkish baths. You have probably read more or less about them; but did you ever take one? *We* have. The "gentle spring's etherial mildness" had given us a cold. The cold brought with it a daily headache. Not one of those attacks which, though severe for a short time, yield to a cup of tea, and a nap on the sofa; but a lurking treacherous ache, that came unannounced, always accompanied with a qualm at the stomach, and then left, to return again when least wanted—if it be possible to suppose degrees of desire for that which is utterly undesirable.

"The Turkish bath is the thing for you," said a friend who has tried it extensively, and who—having probably never been sick in his life—has been cured of everything by this universal remedy. We took his advice, and the ticket with which the advice was accompanied, which in due time secured the bath.

Presenting our ticket at a little ante-room of the building in which the Anglo-American Turkish bath is administered, we were presently shown into a little stall, in which privacy was secured by a thick curtain. This would hardly seem necessary, unless it is to carry out the general principle of graduation, which underlies the administration of a Turkish bath, as the subsequent operations and manipulations constituting the entire process, gradually increase in vigor, until they arrive at a pitch where feelings of delicacy, having decreased in precisely the same ratio, nearly vanish.

We found in our stall a long linen towel, which we were directed to wrap round our loins, when we had completed our disrobing. This towel is an embarrassing affair to a novice, who has not inventive talent to adjust such primitive costume in a permanent manner. Having wrapped it about us as well as we could manage it, we fell to wondering what would be the next step in this new experience. Thrusting our head out at one side of the curtain, we found a swarthy Mongolian standing sentinel at the door of our cell. This individual had a pleasant expression of countenance, but his clothing was as meager as our own; though so much more gracefully and securely adjusted, as to make us blush for our own want of taste in matters of dress. We immediately put ourselves under instructions, and succeeded in getting the thing on, in a manner that we fancied would not wholly disgrace a primitve barbarian.

We were then inducted by the man and brother who had us in special charge at this stage of the proceedings, into—Whew!—a room heated to 120° Fahrenheit, where we felt as though we would at once expand and burst open, like a roasted oyster.

With what gratitude we looked upon our Mongolian friend, who at this instant relieved us of all our oppressed feelings by clapping upon our head a large sponge, filled with tepid water, which ran down our beard and o'er our scanty robe, now sadly in need of re-adjustment, but not so extensive in its environment as to absorb much time in the operation.

In this room we took a seat, and put our feet in a small tub of hot water, opposite a small boy, young in years, but much older than ourselves in experience of the Anglo-American Turkish bath. This old boy informed that he "took it offun." We inquired had he rheumatism? "No." Had he gout? "No." Did he take the baths to relieve the system of former mercurial treatment? "No. He took them for pleasure." We looked at his feet. They resembled infant boiled lobsters. We looked at our own; they appeared like large boiled lobsters. Nevertheless, we experienced a sort of pleasure in inspecting them, analogous to that experienced in youth, when reading of martyrs compelled to walk over red hot plough-shares. We came to the conclusion that the sufferings of those martys had been mentally exaggerated. We now deemed it quite possible to encounter anything in the way of heat without much pain.

At this instant appeared at the door another barbarian, clad in a pair of calico pantaloons of the latest cut, only extremely short at both ends. We judge the legs could not have been more than eight inches in length. He was a grim and gaunt barbarian with a mustache, and an eye that seemed to glow with eager anticipation. Like the spider in the fable, this attendant invited us into his parlor, and like the fly in the fable, we accepted his invitation. We found the tesselated marble floor of this apartment so hot that we could not rest our feet upon it, but the barbarian placed under them a wet towel, which felt good and comfortable.

Glancing at a thermometer which hung near, we found it marked full 140°. The barbarian turned down an hour glass, of the extreme accuracy of which we feel some doubts, and left us to watch it and the thermometer. Whether the labor of this watching was so severe, or whether it was because the room was so warm, we soon found ourselves dripping with perspiration from millions of pores. We tried to recall our physiology, and to speculate upon the source from which all this fluid was drawn, but found ourselves capable of nothing but watching the thermometer and the hour glass.

From this not unpleasant Inferno, barbarian No. 2 took us into a little room where we saw the last of our primitive raiment. Here we were placed prone and shampooed. That is, we were rubbed and scrubbed by the barbarian; were pulled and hauled and toused and pumped upon by a hose in the hands of the barbarian; were soaped, brushed and kneaded; our limbs were stretched and twisted, and our head was rubbed until consecutive thought was an utterly impracticable achievement.

Pop! went an explosion like a Kentucky rifle, at which we jumped up in alarm. We were reassured by the barbarian, who explained how the thing was done. This he did experimentally on his own person. The hand is held so as to form a sort of cup, which is filled with suds. Brought suddenly down upon the flesh it makes a loud crack, but does not hurt much. Down we laid again, and the barbarian fired a successive volley, ending in general firing, all along the line of our spine. Then we were again drenched by a discharge of hot water from the hose, and plunged into a large vat of pure water at 70°. We found the power of consecutive thought at once fully restored by this plunge, and immediately analyzing our sensations, found them to be wholly Oriental.

We felt an intense longing for fleet horses, and tents in the desert; for flocks, and herds, and opium pipes, and harems and sherbet and coffee; for loose trousers, and shoes with pointed and turned up toes, and a turban. We tried a word or two of Arabic, but whether it was from our ill pronunciation, or whether the barbarian was such only in the matter of his skin and dress, we could not make him comprehend us.

The free use of towels having removed the moisture from our cuticle—that is, the rudimentary cuticle which the Anglo-American Turkish bath permits to remain—we began to resume delicacy and dress in the form of a linen wrap, which we folded about our person, and we were then led to the cooling and drying room, where we were placed in an easy chair with a support for our feet, and abandoned to rest and dreams. Opium and coffee are not served, which is considered an improvement upon the Oriental custom, but a refreshing drink of hot lemonade is furnished in the first stage of the sweltering process.

From a period of blissful rest we were aroused to resume our every day dress and revisit the earth, which we were all the more ready to do from a feeling of intense hunger experienced at the moment.

Issuing from the establishment, we heard the bells striking 6 P.M., and could almost imagine the voice of the *muezzin* calling to prayer from distant minarets, and perfumes of "Araby the blest" blending with the less aromatic odors of our metropolitan atmosphere.

STEAM BOILER INSPECTION.

It seems to be a settled fact that consumers of steam, cannot be relied upon to keep steam boilers in such a state of repair as to render them approximately safe. If any proof of this is wanted, let the reader search the files of any daily newspaper for records of boiler explosions, during the past year, and their causes, so far as ascertained. We avow that no intelligent man, who understands the nature of steam, and the common causes of boiler explosions, can make such an investigation without adopting the view that ignorance and avarice are still so powerful in their influence upon the acts of mankind, that no dependence can be placed upon individual effort to secure life and property from the danger arising from impaired and unsafe boilers.

It also seems to be generally admitted that, in order to secure such safety as is attainable under the conditions pertaining to the general employment of steam as a motor, some system of inspection is necessary; but there are conflicting views as to the best method.

It is maintained by some that the most effectual mode would be to vest the power of inspection in those interested to discover faults. Thus it has been proposed in Chicago to give the matter of inspection over to the care of a boiler insurance company. A petition has been signed in that city by many respectable owners of boilers, praying that the inspection performed by the company mentioned may be legalized. Whether the company desire to be clothed with this additional power we are not informed; but in any case the change proposed seems to us impracticable, and unsuited to secure thorough and impartial performance of duty.

Inspection, to be valuable, must be general in its application, and particular as to each boiler, without fear or favor, on the part of the inspector, whose powers must necessarily be somewhat arbitrary. A liberal salary ought to be paid each inspector, so that not only men competent for the position can be obtained and retained in office, but so that the office of inspector may be rendered sufficiently valuable to secure the honest performance of duty. The office should, moreover, be permanent, and only to be vacated by resignation or impeachment for by neglect, or the too arbitrary exercise of duty.

The system of boiler insurance is deservedly increasing in popularity, and has done a great deal of good from the dissemination of knowledge in regard to the real causes of explosion and modes of prevention. We think, however, a direct blow would be struck at the usefulness of boiler insurance, were the officers of companies of this kind legally authorized to perform inspection and make arbitrary requisitions upon boiler owners.

A system, whereby thorough and honest inspection can be secured, is very much needed, and we believe will never be attained except by the payment of liberal salaries to fully competent inspectors.

PRINCIPLE OF THE LEVER.

The lever may be defined as a straight or bent beam, reating upon a fixed support at any point between its extremities. When it is bent, the same general law applies to it as when it is straight; viz., that when the product of the length of a perpendicular drawn to the fulcrum, from the line of direction in which the power acts multiplied by the power, equals the product of the length of a perpendicular drawn to the fulcrum from the line of direction in which the resistance acts, multiplied by the resistance, the power and resistance will be in a state of equilibrium.

This may be expressed in a more general manner by the enunciation of the old doctrine of virtual velocities, which applies to all elements of machines, as well as to the lever This law may be stated as follows: When two forces are so situated that upon the addition of any increment of force to either, the respective distances through which the original forces will act, multiplied into their respective magnitudes, form equal products, the original forces will be in a state of equilibrium. We may add that the forces do not on that account fail to produce an effect. To suppose this, would be to suppose a cause without an effect. Now supposing two forces or weights to be balanced upon a lever, what is the effect produced by those forces? Certainly not mass motion; since it is the absence of mass motion by which the equilibrium is indicated.

Since we are debarred from the supposition that no effect is produced by the application of a force, the effect sought will be more likely to be found in the lever itself than elsewhere.

If we examine the lever, we shall see that the condition of equilibrium is attended with an alteration in its shape, which alteration is an exact measure of the forces applied. In other words, the deflection of a lever is the result or effect of the forces in equilibrio. But deflection implies change of molecular position. If the limit of elasticity in the material of which the lever is composed be not exceeded, it will resume its original form, upon the removal of the forces which deflect it, and the original molecular relations will be restored.

It would seem, then, that the true exposition of the doctrine of virtual velocities is to be found in the study of the molecular changes which take place in bodies, employed to establish that relation between forces.

Professor Norton of New Haven, whose experiments upon the laws of deflection we recently noticed, seems to have been studying this relation with much success; and he shows, we think, satisfactorily, that from two admitted principles of molecular action, together with the principle of the parallelogram of forces, may be deduced the law, that the intensities of forces applied to a lever are inversely proportional to their lever arms.

The two principles of molecular action involved, are thus stated by Professor Norton.

"1. If two integrant molecules of a solid body, which lie within the range of reciprocal action, be forcibly separated from each other a minute distance, a mutual attraction or repulsion will be brought into operation; and if they be urged nearer to each other by an equal minute distance, an equal opposite force of repulsion or attraction will come into play.

"2. The intensities of the forces thus originating, are proportional to the amount of the relative displacement of the two molecules, on the line connecting them."

At the eighteenth meeting of the American Association for the Advancement of Science, Professor Norton read a paper giving a mathematical demonstration of the properties of the lever, as deduced from the principles enunciated, which is too abstract, as well as too lengthy, to be adapted to our columns. We may however say, in conclusion, that his paper will do much to extend the belief, that in mass motion and molecular motion, we may find all the causes of existing natural phenomena, so far as those causes can be recognized and comprehended by the human mind.

THE WEST SIDE ELEVATED RAILWAY.

The construction of what is known as the West Side Elevated Railway, extending from the Battery to Thirtieth street, New York, has been a difficult piece of engineering. As our readers have hitherto been informed, the track is raised to the level of the second story of the buildings along the line, and is supported upon iron pillars of peculiar construction, the pedestals of which are embedded in the earth below the action of frost.

The pillars are not arranged in pairs, but are placed in single file on the central line of the road. They are branched at the top, and support continuous girders upon which the rails are laid.

The cars are propelled by endless wire ropes, actuated by a stationary steam engine and drum. The rope carries travelers placed at proper intervals, and rolling upon small rails. The travelers are composed of four miniature car wheels, and carry projecting studs, which, engaging with a lever arm on the car make the connection. The connection is broken by a lever movement when it is desired to stop the car.

The jar caused by the impact of the stud on the traveler is taken up by wire ropes wound upon spring drums, much after the manner of the main spring movement of watch-work.

Some experimental trips have been made over the road during the past week, at one of which we assisted. The trip from Cortlandt street to Twenty-ninth street—about three miles—was accomplished with ease in fifteen minutes, to the general satisfaction of the party present.

The Company are entitled to great praise for the perseverance with which they have met and surmounted difficulties, and a large proportion of the cost of the road, as it now stands, has accrued from costly and elaborate experiments. It is estimated that the expense of constructing the present section has been about one million of dollars.

It is proposed, we understand, to continue the road to Yonkers, about fourteen miles up the Hudson from the Battery. The present section of the road will, however, when opened to traffic, be sufficient to determine the financial success of the enterprise, and we should think it probable the future extension of the road to the proposed distance would be postponed until the working qualities of the present section can be fully demonstrated.

Our impression is, that the rapidity with which the transit from the lower to the upper part of the city can be made will render the road very popular, and the current expenses of working must certainly be much less than that of the horse car lines for the same amount of traffic.

As to the safety of the road to passengers there can be no doubt; in fact, there seems even less danger than in the horse cars, as the elevated railway cars are exempt from all danger of collision.

The engineer under whose direction the work has been done, is Mr. Charles E. Harvey, of this city.

THE PARIS OBSERVATORY.

The Director of the Paris Observatory cannot complain of want of work. The following is the programme of his duties as given by Louis Figuier:

"Unremitting direction of all the labors relative to pure astronomy involving the use of the meridian circle and equatorial; calculation of all the astronomical observations and publication of the results; organization of the geodetic survey; recording and publishing all observations made in the observatory relating to the meteorology and physics of the globe; reception, calculation, and classification of the meteorological observations coming from different points of Europe; editing and printing daily charts and bulletins giving a *résumé* of all observations, to be forwarded the same day to correspondents and to all the ports of France; direction of the observatory at Marseilles and constant relations with the observatory at Greenwich; and, finally, active participation in the labors of the bureau of longitude. Such is the programme, truly frightful, and such the tremendous responsibility devolving upon the direction of the Imperial Observatory at Paris."

The former head of the observatory was the famous Leverrier, but he contrived to render himself so obnoxious to all of the subordinates that they petitioned to have him removed, and were finally successful. He was summarily dismissed, and M. Delauny has been appointed in his place.

For a long time efforts have been made to get rid of Leverrier, but he was so popular with the Emperor and Empress that the ministers were afraid to move in the matter, and he was a man of such violent temper that everybody kept out of his way. They tried to keep him in check by appointing a board of advisers, without whose consent and recommendation nothing could be done. There was not a member of the board with whom Leverrier was on speaking terms. He refused for six months to have anything to do with this body; but finding that this would not do, finally, on the seventh month, attended a meeting. It is said that this meeting ended by three of the advisers kicking M. Leverrier out of the room.

All of the meetings he attended ended in a row, and the scientific men began to be very tired of such a state of things, and all of the assistants employed in the observatory sent in their resignations, accompanied by the worst accusations and complaints that could easily be imagined. There was nothing left after such an exposure but a summary dismissal.

A gentleman, of New York city, who had occasion to go to the observatory in Paris to carry a present to M. Leverrier of the superb photographs of the moon, taken by Mr. Rutherfurd, relates his experience on the occasion. He was informed by the gatekeeper that M. Leverrier was within, and was directed to the proper stairway. He rang the bell, and instead of asking for Leverrier, sent for one of the assistants to whom he had cards of introduction. The assistant came, and when it was proposed to speak to Leverrier, so many objections were raised, and the assistant appeared so frightened that the visit was abandoned on condition that the photographs were to be handed in due time to Leverrier. Other copies properly directed were also left for Foucault and Faye.

The impression left on the mind of the American gentleman was that the assistants, all of whom he saw, were as afraid to pass Leverrier's study door as good Christian was to go near the castle of Giant Despair.

The visitor was entreated not to speak so loud and the place had the air of a prison rather than of a scientific establishment. But the worst picture of the affair remains to be told. Leverrier bagged the photographs of the moon, and tried to make better ones himself; and it was not until nearly a year afterward, when another print was sent directly to Foucault, that the pictures were presented at the French Institute and became known to its members. They attracted immense attention, and Mr. Rutherfurd received due honor for his valuable contribution to science. M. Leverrier, who was present at the meeting, also greatly admired the photographs, but said nothing about having pocketed three copies of them a year previous. No wonder that all France is delighted at his overthrow.

SHUT YOUR MOUTH.

This piece of advice is sometimes given in an abrupt and insulting manner, and occasions an outburst of temper that produces the opposite effect from the one intended; but when given kindly and on scientific grounds, it ought to be attended to and followed by all persons. Professor Tyndall has just told us of the dust particles, the spores, life germs, fevers, and miasms, that float in the air, and has said in tones of warning "Shut your mouth!"

The Board of Health, of this city, through one of its accomplished officers, Dr. R. C. Stiles, has published a most important report upon the dangers that lurk in closed rooms and crowded halls, and have also said to us "Shut your mouth!"

Finally, Mr. Catlin, author of "Notes of Travels among the North American Indians," has given us a book published by Wiley & Son, called "The Breath of Life," in which the same advice is freely given, sustained by ample facts and startling illustrations, for the benefit of all mankind—"Shut your mouth."

We cannot do better than to refer to these various publications, for the purpose of calling the attention of our readers to the importance of securing proper ventilation in their dwellings, and of acquiring the habit of breathing through the nostrils rather than through the mouth.

There is no doubt that "man's own breath is his greatest enemy," and every precaution should be taken to prevent its inspiration after it has once passed from the lungs. The report of Dr. Stiles contains the result of much original research, and displays a zeal in the service of good health, and an amount of exhaustive labor that is worthy of the highest commendation, and his results and statistics ought to be published in permanent form for the consultation and warning of all classes of society. The amount of carbonic acid produced by respiration has been variously estimated, but Dr. Stiles puts it at the rate of 1,032 cubic inches, or three fifths of a cubic foot per hour. From this the ratio of vitiation of the air in a given space can be easily computed" Every hundred persons would vitiate in three hours 4,200 cubic feet of air to the extent of 4·3 per cent of carbonic acid, or 18,000 cubic feet, to the injurious proportion of one per cent of carbonic acid."

The products of respiration are more dangerous than pure carbonic acid. It has been found that while two per cent of carbonic acid evolved in a chemical way could be endured, one per cent produced from the lungs rendered the air irrespirable. The volatile organic products of respiration concentrate the poison. The report of Dr. Stiles discusses the amount of carbonic acid produced by the combustion of illuminating gas, and shows by actual experiment that a single five-foot burner can produce 2·45 cubic feet of carbonic acid in one hour.

The danger from leakage in heating apparatus, the subtile nature of carbonic oxide gas, and from coal fires in open braziers, is clearly presented. "The poison attacks the red particles of the blood, and its prostrating effect is experienced long after the occurrence of exposure."

The methods employed in the determination of the amount of carbonic acid in the air are generally of too bulky or refined a nature to admit of easy transportation, and Dr. Stiles invented a neat portable apparatus that is worthy of notice. It consists of a wide-mouthed glass flask holding 150 cubic centimeters and graduated so that each division of its descending portion holds one ten-thousandth part of the capacity of the apparatus. A delicate glass bulb, holding a cubic centimeter of a solution of caustic potash, is introduced into the graduated flask after the air to be analyzed has been transferred to it, the mouth of the flask is immersed in water—the potash bulb is broken by a smart blow against the side of the flask—the water rises in the apparatus in proportion to the vacuum produced by the absorption of the carbonic acid by the potash, and the amount in 10,000 volumes can at once be read off. Fifteen minutes are all that are necessary to perform the analysis, and the accuracy of the results was found to be sufficient for all practical purposes by comparative tests according to other methods. With this simple contrivance, Dr. Stiles collected a large number of samples of air from churches, theaters, school houses, private dwellings, and tenement houses, which he has analyzed and tabulated along with similar results obtained by Pettenkofer, Roscoe, and others.

The following are the results obtained in schools of Brooklyn by the method of analysis described above:

	Carbonic acid in 1,000	Times the normal am't.
Public School No. 1	1·00	2·0
Public School No. 1, another room	1·05	3·0
Public School No. 15, Tenth Ward	2·00	4·0
Public School No. 15, another room	4·00	8·0
Clarke's Commercial College, 16 Court street.	2·04	5·0
Clarke's Commercial College, another portion of room	0·05	1·0
Clarke's Commercial College, class room	0·75	1·5
College Grammar School, 18 Court street	2·00	4·0
College Grammar School, another portion of room	0·08	1·6
College Grammar School, another portion of room	1·33	2·7
College Grammar School, class room	0·66	1·3
Polytechnic Institute, third story	1·11	2·2
Polytechnic Institute class room	0·05	1·0
Polytechnic Institute, second story	0·66	1·3
Public School No. 13, Degraw street	3·01	6·0
Public School No. 13, another room	2·05	5·0
Public School No. 13, another room	1·66	3·3
Public School No. 27	2·07	5·4
Public School No. 27, another room	2·02	4·4
Public School No. 27, another room	1·02	2·4
Public School No. 29	1·06	3·2
Public School No. 29, another room	2·02	4·4
Public School No. 29, another room	1·04	2·8

In estimating the proportion of carbonic acid in the air of schoolrooms to that naturally existing in the atmosphere of the city, the latter is supposed to contain a constant average of 0·5 parts in 1,000.

The following analyses of the air of theaters have the credit which belongs to the distinguished experimenters against whose names they are recorded:

	Carb. Acid. in 10,000 Parts.	Times, the Normal Proportion.
LeBlanc, Opera Comique, parterre	15·04	3·76
Le Blanc, Opera Comique, gallery	28·12	7·03
Loppens, theater in Ghent, parterre	46·03	9·03
Loppens, theater in Ghent, gallery	53·06	10·07
Roscoe, theater in London, parterre	24·08	7·01
Roscoe, theater in London, gallery	30·04	8·07
Angus Smith, theater, parterre	40·00	8·00

Dr. Letheby is authority for the following averages, as given in the *Chemical News* for January, 1868:

Theaters in London	14·09	3·07
Theatres in Manchester	14·08	3·07
Theatres in Paris	33·00	8·02

The theaters examined in the course of these investigations were, in Brooklyn, as follows:

	Carb. Acid in 1,000 Parts.	Times, Normal Quantity.
Academy of Music, balcony	1·06	3·02
Academy of Music, gallery	1·00	2·00
Academy of Music, gallery	2·05	5·00
Park theater, gallery	1·04	2·08
Olympic theater, gallery	3·06	7·02
Hooley's Minstrels, gallery	3·02	6·04

In New York the following proportions were obtained:

Booth's theater, parterre	1·00	2·00
Booth's theater, parterre	0·75	1·05
French opera, 14th st., parterre	2·00	4·00
Wood's theater, parterre	0·06	1·02
Tammany theater, parterre	3·01	6·02
Bowery theater, parterre	7·06	15·02
Bowery theater, parterre	6·01	12·02
Bowery theater, parterre	2·05	5·00

The particles floating in the air and falling in the form of fine dust were made the subject of patient investigations. Specimens of dust from nearly all the places of public amusement in New York were examined by the microscope, as detailed on page 176, current volume, in a paragraph entitled "Opera House Dirt."

To avoid breathing all of this dust, Professor Tyndall recommends the use of a mouth piece of tufts of cotton, but such an arrangement, besides being unsightly, would soon become very wet and uncomfortable. Mr. Catlin's idea of keeping the mouth shut and breathing through the nostrils, is easy of execution, and more in accordance with scientific principles. Mr. Catlin states that the Indian mother presses the lips of her infant together as it falls asleep in the open air, and thus teaches the habit of breathing through the nostrils; while the careful, tender mothers of civilized life cover the faces of their infants in over-heated rooms with their little mouths open, gasping for breath; and he traces the increased mortality among infants very largely to this cause.

He says: "The air which enters the lungs is as different from that which enters the nostrils as distilled water is different from the water in an ordinary cistern or a frog pond. The arresting and purifying process of the nose, upon the atmosphere with its poisonous ingredients, passing through it, though less perceptible, is not less distinct, nor less important, than that of the mouth, which stops cherry-stones and fish bones from entering the stomach. It is a known fact that man can inhale through his nose, for a certain time, mephitic air, in the bottom of a well, without harm; but if he opens his mouth to answer a question, or calls for help, in that position, his lungs are closed, and he expires." It is a well-known fact that fishes will perish in a few moments in their own element if their mouths are kept open in any way—they must breathe through their gills or die.

Geologists tell us that at one period in the world's history, the amount of carbonic acid on the surface of the earth was vastly greater than it is at the present time; and in studying the structure of the animals of those early ages, it is found that they are provided with gills, or some special apparatus

that enabled them to live in an atmosphere of carbonic acid. The accumulation of evidence goes to show that we cannot be too careful, not only in the quality of the air we breathe but also in the manner in which we draw it into our lungs. The nostrils are provided with a natural sieve and filter, and it is possible, on the principle of dialysis and the laws of the passage of gases through membranes, that the nitrogen and carbonic acid are excluded while the oxygen is permitted freely to pass. The warning of such authorities as Professor Tyndall and Dr. Stiles ought not to be disregarded, and we are disposed to concur in the sentiments expressed by Mr. Catlin, where he says: "If I were to endeavor to bequeath to posterity the most important motto which human language can convey, it should be in these words:

SHUT YOUR MOUTH."

COMPARISON OF TURBINES WITH OTHER WATER WHEELS.

We find the following translation from *Weisbach's Ingenieur-und-Maschinen Mechanik*, in *Van Nostrand's Engineering Magazine*, for April, which sets forth the relative advantages of turbines and other wheels in a very strong light:

A great advantage of turbines compared with vertical water wheels is that they work with any fall from 1 to 500 feet (German), while the latter cannot convert into work the power of a fall of more than 50 feet. It is true that the ratio of effective work of turbines varies for different falls; for example, for small wheels it is less with high fall than with medium or low fall, because in this case the resistances are proportionally greater than with larger wheels under medium fall. On the other hand, overshot wheels obtain a modulus from high fall of from 20 to 40 feet, which cannot be reached by turbines. Equal amounts of work are to be expected from both kinds only from a medium fall of from 10 to 20 feet; but if the fall is low, then turbines in every case give a greater modulus than undershot wheels under the same conditions. Poncelet's wheel can be compared with turbines for falls of from 3 to 6 feet only.

Turbines have another great advantage over vertical water wheels, in working with equal effect under different heads, and especially in not being hindered by back water, so that they work in water as freely as in air, and in some cases with greater effect. Vertical wheels always lose power if the head varies, although in no great degree, unless the fall is low or the wheel is in the water.

On the other hand, variations in the overfall upon vertical water wheels are attended with less loss of work than is the case with horizantal wheels. In an economic point of view this fact is in favor of the vertical wheel. If it is necessary to increase the effect of a vertical wheel already in motion, especially if it is one upon which the water acts mainly by pressure, it is done by supplying more water; and to diminish the effect the supply is partly cut off; in neither case is the actual modulus greater or less. The relation is altogether different in the case of a reaction turbine. This works with most effect when the sluices are wide open and when the charge of water is the greatest; now if less work, and therefore less water, is required and the sluices are partially lowered, it happens that the work is diminished by decrease of supply, but partly by the loss of the living force of the water or by diminution of the head, so that the effective force is lessened. This destruction of living force may be compared with the braking or dragging of a wagon, which is applied in going down hill, when there is an excess of living force. Consequently, while the lowering of a gate only cuts off superfluous water from a vertical wheel, which can be used for other purposes, in the case of the reaction turbine the shutting off a part of the overplus subtracts from the living force of the other part remaining in the wheel.

In pressure turbines which do not run in water, so that the channels are not entirely filled, the modulus of work is more favorable, since the water issues through the channels without causing an eddy.

There is not a great difference between horizontal and vertical water wheels in respect to the change of the velocity of revolution; in both the normal velocity may be increased or decreased about one fourth without material loss of effect. But there is certainly a very great difference in the magnitudes of these velocities. All vertical wheels, with the exception of the undershot (Poncelet's especially), have a maximum velocity of from 4 to 10 feet, while turbines generally have far greater velocities, varying greatly according to the heads. For this reason, and because they have smaller radii, turbines generally make many more revolutions than vertical water wheels. It follows that the choice between these depends upon the number of revolutions; in other words, upon the kind of motion, quick or slow, which is required in the motor. But it must be borne in mind that rapid motion in a machine is rather injurious than advantageous, on account of the great increase of hurtful resistances, such as friction and shocks; for this reason it is often better to increase the number of revolutions by means of some machine of transmission, and to employ the vertical instead of the horizontal water wheel.

If the load of a machine is variable, as in the case of tilt-hammers or rolling-mills, the vertical wheel is to be preferred; for, though it runs slower, yet on account of its greater mass it acts more as a regulator than the turbine, whose variable motion must often be equalized by a fly wheel. But for a constant load preference must be given to the turbine in this respect; because vertical water wheels, especially if of wood, often have a so-called "heavy quarter," *i. e.*, equal parts of the circumference are not of equal weight.

In an economic point of view, turbines rank at least equal with vertical wheels; and for high and medium falls and a great overflow they are preferable because they are cheaper. In respect to durability, also, the turbine must have the preference.

On the other hand, it must be remembered that turbines require a clear overflow, and that their effect can be hindered in a very great degree by sand, mud, moss, weeds, leaves, pieces of ice, twigs of trees, etc., which do no damage to vertical wheels. Finally, it is to be considered that turbines, particularly those with guide-curves, are more difficult to construct, and that departures from the mathematical rules of construction are followed by worse results than in the case of vertical water-wheels. This is the reason that so many turbines failed in the early trials, and that they are not yet as extensively employed as their advantages warrant.

WHERE AND HOW CORKS ARE CUT.

We condense from the *Druggists' Circular* the present account of the way in which corks are manufactured.

In Europe the greater portion of corks are cut in the towns and hamlets in the immediate vicinity of the cork forests, and in the seaports of Seville, Barcelona, Oporto, Lisbon, Bordeaux, Lyons, Marseilles, and Gibraltar. In Germany the small homeopathic vial cork is largely cut, while it is safe to say that in most of the leading cities of the civilized world, cork-cutting is conducted as a branch of industry.

Throughout the whole cork-growing region the wood is cut by hand into the various sizes for use. For the common varieties, children are largely employed, while men of experience are engaged in cutting the finer qualities. After trimming the wood, slicing, and cutting into convenient-sized squares, the corks are cut, and then assorted in qualities and sizes. When assorted, they are then packed in bales varying from one hundred to three hundred and fifty gross each, and are then ready for shipment. In Germany they are frequently put up in small bails of twenty gross each. When cut in this manner the sizes must be judged by the eye, and there is consequently a lack of uniformity of size as well as imperfection in roundness of the corks. This will readily be seen by examining samples of imported hand-made corks.

Previous to 1855 all corks were cut by hand, and the exportation of corks from southern Europe was immense. Since the application of steam machinery to cutting corks in this country, the importation of foreign hand-made corks has rapidly declined.

About thirty years ago an attempt was made by an enterprising New Englander to cut corks by machinery, and an establishment for that purpose was constructed in Boston; but they failed to carry out the project successfully. As near as I could learn, the failure of the machine was in delivering the corks with smooth ends and with sufficient rapidity. In 1855 cork-cutting machines were constructed that proved successful, and since that time the trade has been revolutionized. It was soon proved that corks could be cut more uniform with less waste of material, and with vastly greater rapidity. An average day's work cutting by hand, and having the wood already cut to the proper-sized squares, would rarely exceed ten or twelve gross, though in a few cases the most expert workmen would cut nearly twenty gross; while an average day's work by machine would be one hundred gross, and a single instance was told me of a lad that had cut one hundred and eighty gross in ten hours. The number cut by machine per day will vary with the kind of machine, and the dexterity of the workmen, as also the quality of the wood. There have been quite a number of cork cutting machines introduced from time to time, but I believe they are all of two general styles. The kind most largely used (I believe) is the punching and boring machine, originally invented by J. D. & W. R. Crocker, of Norwich, Conn., and since improved by them and others. This original machine cut only straight corks. Another machine was afterwards added which cut the taper cork. There have been some modifications of the machine and adaptations by other manufacturers, but it is believed that the credit for introducing steam machinery for cutting corks is due to the Messrs. Crocker. There are others who are entitled to praise for judicious modifications, but the writer omits names lest he should do injustice to some whose names are not known to him.

The principles of the two styles of machines used may be of interest, and I shall endeavor to explain them as clearly as possible. In the punching or boring machine there is a sharp steel cylindrical knife, revolving horizontally, being propelled forward to the block of cork-wood to be cut, and backward again, as rapidly as the skill of the operator desires it. The knife cuts through the block of cork-wood, and the cork cut by the operation passes through the cylinder and is carried off out of the way of the operator. This machine cuts only a straight cork, and it is ready for sale without any further operation, except sorting out those in which the wood is imperfect. There is another boring machine which bores at one operation a taper cork, but requires a separate handling to remove the cork from the block. The tapering machine alluded to previously has either a square of cork-wood or the round straight cork inserted in an adjustable lathe (which is a part of the machine) in which it revolves rapidly; it is then presented to the blade of a flat circular knife, from 24 to 30 inches diameter, which lies flat and revolves about five or six hundred times a minute. Two or more revolutions of the cork are made, which removes a thin shaving and gives the requisite tapering shape to the cork. This tapering machine is adapted to cut either a straight or taper cork, as it needs only a very slight alteration of the adjustable lathe to cut either style of cork. There are some minor details, but a five minutes' examination of the machines would convey more information than pages of written description. It is an exceedingly interesting mechanical operation, and those who have not seen it should embrace an early opportunity to do so.

In cutting the wood into corks, it is first steamed for a short time, then by a circular knife cut into strips suitable for either the length or breadth of the cork. If the boring machine is used, the smooth side of the strips is then introduced, and the corks are at once bored out as closely together as can be done. The corks need only sorting, to reject imperfect ones, when they are ready for sale. These corks are straight. If it be a taper cork, the straight ones are now introduced into the adjustable lathe of the tapering machine before alluded to, and a somewhat conical shaving is taken off, when the corks are sorted and put up for sale. It is asserted by those using this machine, that it is the most advantageous and economical. When the boring machine is dispensed with, the strips of cork-wood are cut into suitable squares by hand, and at once cut into either straight or taper corks by simply adjusting the lathe which holds the cork.

The corks, when offered for sale, are usually designated by numbers fron one to twenty, and in addition are called straight or taper. The largest number of any one sold are those suitable for ale and soda-water bottles, while the vial corks of various sizes, except the two smallest, are in nearly equal demand. Of the other styles of corks, there are flat or specie corks of various sizes, enlarging by one-eighth of an inch.

In the manufacture of corks fully one-third of the wood is wasted. This arises from inequalities and imperfections in the wood, and the natural wastage in cutting circles out of any plane surface. This wastage has found some uses, among which the principal are in filling cushions, mattresses, the spaces between the roof and top ceiling of houses, as also the spaces in the sides of frame houses and buildings for storing of ice, while in the cork factories the coarser wastage is used for fuel.

Foreign hand-cut corks are now in a great measure being superseded by American machine-cut corks, as they are much more uniform in size and quality, and can compete successfully in price.

NEW BOOKS AND PUBLICATIONS.

THE PAINTER, GILDER, AND VARNISHERS' COMPANION. Containing Rules and Regulations in everything relating to the Arts of Painting, Gilding, Varnishing, Glass Staining, Graining, Marbling, Sign Writing, Gilding on Glass, and Coach Painting and Varnishing, Tests for the Adulteration in Oils, Colors, etc., and a Statement of the Diseases to which Painters are peculiarly liable, with the Best and Simplest Remedies. Thirteenth Edition. Revised, with an Appendix, containing Colors and Coloring—Theoretical and Practical, comprising Descriptions of a great Variety of additional Pigments, their Qualities and Uses, to which are added Dryers, and Modes and Operations of Painting, etc. Together with Chevreul's Principles of Harmony and Contrast of Colors. Philadelphia: Henry Carey Baird, Industrial Publisher, No. 406 Walnut street. Price, by mail, free of postage, $1·50.

How a work of this kind, containing such a copious mass of information, can be made and sold for the price it is afforded is one of the mysteries of book-making we are unable to solve. It is, without exception, the best and cheapest work of the kind of which we have any knowledge. The chapter on the "Principles of Harmony and Contrast of Colors" is well worth the price of the book. Were it studied by painters in general, we should have less of those hideous combinations of color, in house and ornamental painting, of which we have so often complained in these columns.

A MANUAL OF ELECTRO-METALLURGY. Including the Application of the Art to Manufacturing Processes. By James Napier, F.C.S. Fourth American from the Fourth London Edition. Revised and Enlarged. Illustrated by numerous Engravings. Philadelphia: Henry Carey Baird, Industrial Publisher, 406 Walnut street. Price, by mail, free of postage, $2·00.

This work treats of electro-metallurgy in both a scientific and practical manner. It is, as its title imports, a complete manual upon the subject. It commences with a history of the art, brought up to date. This is followed by a description of the various galvanic batteries, with their peculiarities and their applicability to electro-metallurgic operation. The miscellaneous applications of the process of coating with copper are next treated, after which follow in their order discussions of the various methods of bronzing, deposition of metals upon one another, electro-plating, electro-gilding, results of experiments on the deposition of other metals as coatings, theoretical observations, etc. The value of the book is enhanced by a copious index. So far as we can infer from an examination made with special reference to detect omissions of recent processes and discoveries, the work is brought entirely down to the present state of the art.

MODERN WORKSHOP PRACTICE. As Applied to Marine, Land, and Locomotive Engines, Floating Docks, Dredging Machinery, Bridges, Shipbuilding, Cranes, etc., etc. By John G. Winton, Engineer. Strahan & Co., Publishers, 56 Ludgate Hill, London.

This is one of Weale's Rudimentary Series, intended to treat in a popular style, and in a practical manner, the departments of mechanical engineering named in its title. These subjects are viewed almost entirely from an English standpoint, yet the book contains much valuable information to the American engineer. A valuable feature of the work is found in its tables, the use of which will save much time and labor in calculations of all kinds pertaining to proportions of boilers and engines, bridges, etc.

ELECTRO-METALLURGY PRATICALLY TREATED. By Alexander Watt, F.R.S.A., Lecturer on Electro-Metallurgy, etc., formerly one of the Editors of "The Chemist." New Edition. Strahan & Co., Publishers, 56 Ludgate Hill, London.

This work, besides treating in a plain and specific manner with the difficulties and the various modes of procedure connected with electro-metallurgy, gives much additional matter not contained in former editions, upon the production of a dead white surface on silver articles, whitening brass dials, coloring gold articles, reduction of solutions, etc, etc. This work will be found a great aid, not only to amateurs, but to the profession al electro-metallurgist.

Inventions Examined at the Patent Office.—Inventors can have a careful search made at the Patent Office into the novelty of their inventions, and receive a report in writing as to the probable success of the application. Send sketch and description by mail, inclosing fee of $5. Address MUNN & CO., 37 Park Row, New York.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

601.—MANUFACTURING YARNS AND FABRICS CONTAINING HORSEHAIR.—H. Hayward, Paterson, N. J. March 1, 1870.

609.—SUBMARINE TELEGRAPH CABLES.—James Story, Paris, Ky. February 11, 1870.

624.—GENERATING GAS.—A. I. Ambler, Washington, D. C. February 12, 1870.

840.—MACHINERY FOR SPLITTING ROCKS.—John Robb, New York city. February 24, 1870.

844.—MACHINERY FOR MAKING NAILS.—D. Reed, R. M. Bassett, and T. S. Bassett, Birmingham, Conn. Feb. 24, 1870.

849.—STEAM BOILER AND ENGINES.—F. B. Blanchard, New York city. February 24, 1870.

850.—MANUFACTURE OF NEEDLES.—R. J. Roberts, New York city. Feb. 24, 1870.

851.—WINDMILLS.—Edward Savoral, New York city. February 24, 1870.

863.—MACHINERY FOR MANUFACTURING SCREWS.—J. A. Ayres, Hartford, Conn. February 25, 1870.

864.—MECHANISM FOR ACTUATING MACHINES.—C. H. Wilcox, New York city. February 25, 1870.

868.—MANUFACTURE OF HAIR CLOTH AND LIKE FABRICS AND LOOMS THEREFOR.—I. Lindsay, Pawtucket, R. I. February 25, 1870.

892.—SEWING MACHINES.—Charles Lennig, Philadelphia, Pa February 28, 1870.

636.—RAILWAY.—D. R. Pratt, Worcester, Mass. March 3, 1870.

676.—CARPET SWEEPER.—A. J. Hapgood, New York city. March 7, 1970.

605.—RAILWAY CARRIAGE WHEELS.—H. W. Moore, Jersey City, N. J., and F. Bloodgood, C. B. Wood, and F. Wood, New York city, March 1, 1870.

631.—FLUID METER.—J. F. de Navarro, New York city. March 3, 1870.

635.—JOURNAL LUBRICATOR.—W. A. Wood, Hooslck Falls, N. Y. March 3, 1870.

663.—DEVICE FOR HOLDING LETTERS, ETC.—F. T. Ferguson, Boston, Mass. March 5, 1870.

700.—ETCHING PLATES FOR PRINTING.—J. McLoughlin, Morrisania, N. Y., and E. McLoughlin, New York city. March 9, 1870.

709.—BURNING OIL FROM PETROLEUM.—J. A. Tatro, Hartford, Conn. March 10, 1870.

725.—TYPE-SETTING MACHINE.—J. T. E. Slingerland, New York city. March 11, 1870.

744.—WATER INDICATOR AND REGULATOR FOR BOILERS.—R. N. Pratt and R. Berryman, Philadelphia, Pa., and F. A. Pratt and S. Colt, Hartford, Conn. March 14, 1870.

Answers to Correspondents.

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

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as 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. G. B., of Pa.—The effective horse power of steam engines is determined by the dynamometer. The absolute horse power, or indicated horse power, by multiplying the mean effective pressure in the cylinder, by the velocity of the piston in feet per minute, and dividing the product by 33 000. The nominal horse power of ordinary condensing engines is found by multiplying the square of the diameter of the cylinder in inches by the velocity of the piston in feet per minute, and dividing the product by 6,000. In the application of this rule, the speed of piston is fixed according to the length of stroke, that is, the speed for a 2 feet stroke is assumed to be 160 per minute, and speeds for other lengths of stroke to be to this speed as the cube roots of their lengths. Nominal horse power is only a conventional expression for the measure of the dimensions of an engine. It does not give any idea of the actual power of which the engine is capable. The Richards Steam Indicator is the best instrument for testing the power of steam engines.

S. H. W., of Conn.—It is evident that your logic is not able to draw any distinction between the statement that matter moves, and your own statement that it moves itself. You will doubtless admit that the earth moves constantly in its orbit. Because you make that admission, we shall not consider it legitimate to charge you with believing that *it moves itself*. You admit the existence of matter, which admission of course allows the existence of the essential properties of matter. What violence is done to just logical inference by supposing that matter was originally endowed with motion, as it was endowed with impenetrability? Such a supposition does not imply self-creation, or power to endow itself with motion, as you illogically assert.

O. S. M., of Va.—The protection afforded against the injurious effects of white lead in grinding would at best, we think, be so partial as not to render it of great practical value. The injury resulting from this substance has been much reduced by modern modes of manipulation. There is no other harmless white pigment known, that could be generally used as a substitute for lead and zinc white. Oxide of zinc, however, is now largely used as less injurious than white lead, and not turning black by the action of sulphureted hydrogen.

H. W. S., of Ohio.—According to Dalton's investigations, it appears that when different gases are mixed, they only act mechanically to retard each other in their occupation of a given space. Thus, if a gallon of oxygen be placed in a jar, a gallon of any other gas that will not chemically combine with it may be introduced into the same jar, and still a third gallon of some other gas, etc. The experiment could not be performed with air and oxygen, as air contains oxygen.

S. & S., of Ohio.—Much obliged for the club of subscribers you have obtained among the workmen in your establishment. Similar efforts on the part of heads of other establishments, would, without doubt, result in mutual benefit. Your first query is answered at length in an article on "Mean Effective Pressure," which will shortly appear. Friction is a variable quantity even in the best constructed engines. No two will agree in this particular.

M. C., of Mass.—Carbonic oxide gives out but a small proportion of heat in its combustion, compared to that produced by the burning of carbon. We do not think it could be applied to brazing, etc., with advantage, and never heard of its being specially prepared to be used as fuel. In ordinary coal stoves a certain amount is generated, which is consumed in those stoves known as gas-burners.

A. P., of N. Y.—The mixture named would not injure leather in any way. On the contrary, we think it would undoubtedly act to preserve it. The different materials have been used, but we do not think they have all been used in a similar combination. We judge the mixture is patentable. Sugar cannot be made in the way you propose.

E. G. S., of Minn.—Water inevitably hardens in a new cistern lined with water-lime cement. You may soften it by adding a little quick lime in the form of milk of lime, see article on page 217, Vol. XXI., of the SCIENTIFIC AMERICAN.

W. M. L., of Pa., wishes a solution of the following problem. Given the length of belt, distance between the centers of two cone pulleys, and *ratio* of their diameters to determine the diameters.

C. B. F., of Brockport, N. Y., will find the information he desires in the Encyclopedia Britannica, Vol. XVI., page 54; also, by a visit to the Morris & Essex canal at Rockaway and other points.

J. M. E., of Pa.—What is generally understood by the term atmospheric engine, is one in which the piston is actuated by steam on one side and air on the other.

B. C., of N. H.—A gas, or mixture of gases, absorbs as much heat in expanding after compression, as it evolves when compressed.

A. F. H., of W. Va.—The metallic appearance of the mineral you send is due to the presence of iron pyrites.

Business and Personal.

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

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

Steel Makers' Materials—Wolfram ore, oxide manganese, Spelgel iron, borax, titanium, chrome, lubricating black lead, for sale by L. & J. W. Feuchtwanger, 55 Cedar st., New York.

For the best Alarm Money Drawer, address Robbins, Frontz & Co., Hughesville, Pa. Agents wanted.

Machines for manufacturing Screw Bolts and Nuts of all kinds. Makers will please send price lists and other information to C. G. Berryman, Saint John, N. B.

Superior Lacing made under Page's Pat't. Address J. Sweetman, Utica, N. Y.

Missouri Globe Valve—Best in use. Can be ground tight at any time. Send for circular. J. W. Brown, Manuf'r, Baltimore, Md.

Egg Hatching.—Parties having any device, patented or not, for hatching eggs, will address C. C. Runyan, Mansfield, Ohio.

Astronomical Transit, second-hand, and perfect, wanted by T. & E. Dickinson, 334 Main st., Buffalo, N. Y.

For Sale—A Roper Caloric Engine, 1-Horse Power. Nearly new. Address C. F. Werner, Orange, N. J.

Spools of all kinds, and spiral shade tassel molds made by H. H. Frary, Jonesville, Vt.

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

Millstone Dressing Diamond Machine—Simple, effective, durable. For description of the above see Scientific American, Nov. 27th, 1869. Also, Glazier's Diamonds. John Dickinson, 64 Nassau st., N. Y.

Harry Hammond Augusta, Ga., wishes to communicate with parties who furnish devices for sinking wells.

Jno. A. Hafner's (Commerce, Mo.,) Pat. Eureka Coil Spring for Horse-powers will save 20 per c. power and 90 per c. breakage, positively.

Wanted to buy—A good 2d-hand Band Sawing Machine, in good order. Address C. W. Hyde, Springfield, Mass.

Kelly's Eclipse Hay Elevator—Best in use. Rights for sale cheap. Apply soon. Address T. C. Kelly, West Liberty, Pa.

Manufacturers of Calf and Lamb Roller Skins, Roller and Clearer Cloths. Please send address to P.O. Box 3,736, Boston.

Belting—See advertisement of Page's Patent Tanned Belting on page 278. Page Brothers, Franklin, N. H.

Wanted—Four good second-hand milling machines. Address Thos. H. White & Co., 28 Canal st., Cleveland, Ohio.

Wanted—A Situation by an electro gold and silver plater. Address Box 178, Waterbury, Conn.

An experienced mechanical and railway engineer wishes a position as Master of Machinery, or Manager. Address "Engineer," Station "G," Philadelphia, Pa., Postoffice.

Bartlett's Street Gas Lighter. Office, 569 Broadway, N. Y.

For description of the best lath and blind slat sawing machine in use, address W. B. Noyes, Gen'l Ag't, P. O. Box 558, Manchester, N. H.

Important advance on the draft and easement of carriage. See Jackson's Patent Oscillating Wagon, with tests of draft, models, etc., No. 149 High st., Newark, Essex Co., N.J. See Scientific American, Sept. 25, 1869.

Kidder's Pastilles.—A sure relief for Asthma. Price 40 cents by mail. Stowell & Co., Charlestown, Mass.

Needles for all sewing machines at Bartlett's, 569 Broadway, N Y.

Pat. paper for buildings, inside & out, C. J. Fay, Camden, N. J.

For Sale—An old established Malleable and Gray Iron Foundery, doing a large trade in hardware. Cause of selling, failure of health of the proprietor. Address "Malleable Iron," Newark, N. J.

Brick and Tile Drain Machine—First Premium in Ohio, Indiana, and Missouri; also Fair of American Institute, New York. Address Thos. L. Cornell, Derby, Conn.

Asbestos—Wanted by J.N.Clarke, 126 Dearborn st., Chicago, Ill.

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

For first-quality new 14, 17, and 20-in. screw lathes, milling machines, and one-spindle drills, at small advance from cost, apply to Geo. S. Lincoln & Co., Hartford, Conn.

Hackle, Gill Pins, etc., at Bartlett's, 569 Broadway, New York.

Portable Pumping or Hoisting Machinery to Hire for Coffer Dams, Wells, Sewers, etc. Wm. D. Andrews & Bro., 414 Water st., N. Y.

Keuffel & Esser, 71 Nassau st., N.Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves

For tinmans' tools, presses, etc., apply to Mays & Bliss, Brooklyn, N. Y

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

Two 60-Horse Locomotive Boilers, used 5 mos., $1,300 each. The machinery of two 500-ton iron propellers, in good order, for sale by Wm. D. Andrews & Bro., 414 Water st., New York.

To ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's manufacturing news of the United States. Terms $4·00 a year.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

Pictures for the Parlor.—Prang's Chromos, sold in all art and bookstores throughout the world.

Caveats are desirable if an inventor is not fully prepared to apply for a patent. A Caveat affords protection for one year against the issue of a patent to another for the same invention. Patent Office fee on filing a Caveat, $10. Agency charge for preparing and filing the documents from $15 to $12. Address MUNN & CO., 37 Park Row, New York.

Recent American and Foreign Patents.

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

SCROLL SAWING MACHINE.—Eliphalet A. Tripp, Newark, N. J.—This invention has for its object to furnish an improved scroll-sawing machine simple in construction, easily and conveniently operated, and effective in operation.

WASHING MACHINE.—James D. Royse and John Royse, Cane Valley, Ky.—This invention has for its object to furnish an improved washing machine simple in construction, strong, and durable, which will not rub the clothes and which will, at the same time, wash them quickly and thoroughly.

COTTON SEED AND CORN PLANTER.—Joshua B. Godwin, Williamston, N. C.—This invention has for its object to furnish a simple, convenient, effective, and accurate machine for planting cotton seed and corn, which shall be so constructed and arranged that it may be easily adjusted for work in either capacity.

TIN CAN.—John Joseph Burkert, New York city.—This invention has for its object so to construct the covers and fastenings of sheet-metal cans, that such covers, after having been cut open, shall not have become entirely useless.

MONEY SAFE.—Philipp Schreyer, New York city.—This invention relates to a new manner of constructing iron safes, and to a novel method of applying the same to articles of furniture. The invention consists in so constructing a safe of an outer and inner metal case, that the two cases are only connected by a bolt or bolts, passing through their bottoms, no other fastening being required. The invention consists, also, in constructing such safes so that they can be applied as supports or central standards to tables.

PICTURE NAIL.—John H. Squiers and Ezra J. Warner, Newark, N.J.—This invention relates to a new device for fastening the porcelain knobs to the ends of nails or screws, which are used for suspending pictures, and for other purposes. The invention consists in the application of wire-spring fastenings to the porcelain knobs or heads, the springs being so formed as to catch readily over the heads of the nails or screws, to which they are to secured.

MULTIPLE SPONGE.—Hamilton Erastus Smith, Newark, N. J.—The object of this invention is to make small sponges more useful, and to increase their value. At present, large sponges, such as are used for washing coaches, etc., are very expensive, the value increasing with the size, while small sponges are comparatively useless. This invention consists in uniting a suitable number of small pieces of sponge into one large sponge by means of fastening devices, which are entirely concealed. The entire sponge surface of this multiple sponge is, therefore, applicable to use.

COMBINED COUNTER AND SHOWCASE.—L. F. Vienot, New York city.—The object of this invention is to reduce the cost of counters and show cases by combining them, and thereby saving the expensive counter tops.

PHOTOGRAPHIC PRINTING APPARATUS.—J. H. Hamilton, Sioux City, Iowa.—This invention relates to improvements in apparatus for making mezzotint photographs, and consists in the employment of a large box containing several square tubes, and supported on pivots, in a frame mounted on casters, so that it may be adjusted in vertical and horizontal planes to cause the tubes to receive the rays of light from the sun in the lines of their axis at all times and so as to fall on the negative perpendicular to it, the negative with the printing frame being placed at the bottom of the tubes.

TUG FASTENING FOR WHIFFLETREES.—L. A. Johnson, Candor, N. Y.—This invention relates to improvements in fastenings for connecting the tugs to whiffletrees, and consists in the combination with the tug hooks projecting from the ends of the whiffletree, of slides preferably arranged in grooves in the rear sides of the whiffletrees to slide forward and back, and having bent up ends provided with holes coinciding with the ends of the hooks to receive the said ends when slided inward to prevent the escape of the tug, and strengthen the said hooks. The said slides are provided with spring stops, which hold them in the open position for the reception of the tugs, or in the closed position for retaining them.

SAW PITMAN HEAD.—L. Morrison and A. G. Harms, Allegheny City, Pa.—The object of this invention is to simplify and render more convenient the mechanism connected with a muley saw, having more especial reference to the pitman head, but applying also to the buckle of the saw; and it consists in the method of adjusting the rivet pin of the pitman head, and in the construction of the buckle of the saw.

COVERING FOR STEAM BOILERS, STEAM PIPES, ETC.—James E. Sharp, Eleazer Ainsworth, and F. A. Sabbaton, Troy, N. Y.—This invention relates to a new and useful improvement in the mode of protecting steam boilers, steam pipes, or other articles from the effects of cold air, preventing thereby the condensation of steam and loss of heat.

COLUMNAR MATTRESS.—H. E. Smith, New York city.—This invention has for its object to furnish an improved mattress, which shall be so constructed that the air may pass through it freely to keep it pure; and which shall at the same time, be very elastic and comfortable as a bed.

ROCK DRILL.—Samuel Lewis, Williamsburg, N. Y.—This invention has for its object to improve the construction of an improved drill, patented June 15, 1869, and numbered 91,332, so as to make it more convenient in use and more effective in operation, enabling the length of stroke to be regulated at will, and any one of the drills to be raised and detached without disturbing the operation of the other drills.

KNIFE SCOURER.—J. Q. Adams and S. R. Goodsill, Brooklyn, N. Y.—This invention relates to a new and convenient improvement for cleaning and scouring the blades of table knives. The invention consists in the use of a cylindrical box, which has a perforated bottom and is combined with an annular cork, secured against the bottom.

WOOD PULP MACHINE.—S. C. Taft, Mendon, Mass.—This invention relates to a new machine for reducing wood to a pulp, to prepare it for the manufacture of paper.

STEAM GENERATOR.—Michael Ritchey, Paterson, N. J.—This invention relates to a new steam generator, which is so constructed that the water, before it enters the steam boiler, will be thoroughly heated, and that, when the pumping ceases, a complete circulation may be kept up in the same.

TONGUEING AND GROOVING MACHINE.—B. J. Barber, Ballston Spa, N. Y.—This invention relates to a new manner of arranging the cutters on the heads of tongueing and grooving machines, with a view to preventing the tearing of the wooden fiber, and the consequent cracking of the wood, which is frequently occasioned on the ordinary machines now in use.

EASY CHAIR.—William Charles Poppendieche, New York city.—This invention relates to a new adjustable easy chair, which can be so set and adjusted that its back and foot rest will be more or less inclined, and the arm rests extended, at the will of the person using it.

COMBINATION TOOL.—W. A. Sharp, Tama City, Iowa.—This invention comprises the combination in one tool, of a sliding hook, or gage, level plumb, compass, calipers, try square, bevel, foot rule, edging plane, rabbet plane, screw driver, tape measure, and marking gage.

COUNTERSINKS.—Asa Wheeler, Brattleboro, Vt.—This invention relates to countersinks, and in the mode of making them. The bit is formed in the shape of a hollow eccentric cone, with an angular slot at the line from the point to the base of the cone, where the sides of the parts with the greater and lesser radii meet. The base of the bit is united to the handle by a section representing about half, or a little more than half a cone, having its base connected to the inverted base of the bit.

MACHINE FOR STAMPING LACE PAPER.—Ambroise Giraudat, New York city.—This invention relates to a new machine for stamping lace paper either in long strips or circular pieces, and has for its object to do away with the ordinary tedious manual process, and to permit the employment upon the same piece of a number of hammers. Thereby the process of stamping will be greatly facilitated, and less labor required for the purpose.

HAND DRILLING MACHINE.—James E. Hunter, North Adams, Mass.—This invention relates to a new and useful improvement in hand drilling machines, whereby the same are adapted to all the various purposes for which hand drills are used; and it consists in so constructing and arranging the parts that the drill may be used as a ratchet drill, with an intermittent motion, or with a continuous crank motion, and so that the drill head may adjusted to drill holes at any angle.

STRAW CUTTER.—John S. Jones, Covington, Ind.—This invention has for its object to improve the construction of straw cutters, so as to make them more convenient and effective in use, enabling them to cut the straw or hay entirely off, and to feed the said straw or hay forward automatically.

SHOVEL HANDLE.—George C. Choate, Wyoming Station, Wyoming Territory.—This invention has for its object to furnish an improved shovel handle, which shall be so constructed and arranged that its end may be used as a tamping iron, or rammer, in leveling and raising railroad ties, in setting fence posts and telegraph poles, and for other purposes where a shovel and rammer are both required.

MOPS, MATS, WIPING CUSHIONS, ETC.—Hamilton Erastus Smith, Newark, N. J.—This invention has for its object to make sponge applicable to the rough usage which mops, mats, wiping pads, or cushions, or similar articles are subjected. The extreme porosity of the sponge makes the same particularly useful for the purposes of absorbing moisture the weakness, however, has thus far disqualified it for the rough usage, as thereby it would be too rapidly destroyed. The invention consists in strengthening the sponge by inclosing it in porous fabric, whereby it will become durable without losing its porous quality.

CLOTHES WRINGER.—Allen Magowan, Trenton, N. J.—This invention relates to improvements in clothes wringers, and consists in an improved arrangement of the pressure springs in connection with the sliding roller. Also in an improved arrangement of the support for the brackets holding the set screws by which the wringer is attached to the tube, or other support.

BELT SHIFTER.—W. E. Leighton, Pembroke, Ill.—This invention relates to improvements in belt-shifting apparatus, and consists in the application to the belt of a pair of clamping pulleys or rollers capable of clamping the belt between them, and of being turned obliquely to the line perpendicular to that of the belt either way, whereby the belt will be caused to move laterally, either to the right or left, as the said clamping pulleys are turned.

TYPE FOR PRINTING "TYPE RIBBON."—Henry Stephenson, William Thompson, and Wm. G. Blake, Sheffield, England.—This invention relates to a new and improved arrangement of type, whereby "type ribbon," so called, may be printed in various forms by type set up in forms the same as printing type. Th invention consists in a set of type of peculiar construction, which, when arranged together in a form, and with a thick and a thin brass or other metal rule, will represent the reverse of a design of "type ribbon," that is, a ribbon arranged in space and folded back and orth so as to present two or more rows of plain surfaces, with intervals between, one above another, with diagonal parts between the rows and terminating with waving ends, on which plane surfaces advertisements may be printed by ordinary printing type set up the forms with these improved type.

STREET CAR.—James A. Morrison, Brady's Bend, Pa.—This invention relates to improvements in street cars, and consists in an improved arrangement of means for applying hand-power for propelling them; also in an improved application of track-sweeping or clearing apparatus.

TUBE WELLS.—William R. Hamilton, Oakland, Pa.—This invention consists of semi-elliptic springs attached lengthwise, by means of sliding rings to the tubings of an artesian well, for the double purpose of steadying the tubing in the well, and sustaining, by their pressure against the sides of the bore, part of the weight of the tubing; and further in combining with the tubing, a pipe passing vertically downward for the purpose of conveying hot water to the bottom of the well in order to melt the thick oleaginous matter which always collects there and obstructs the lower orifices of the tubing.

MANUFACTURE OF ICE AND THE REFRIGERATION OF AIR AND SUBSTANCES.—D. L. Holden, New Orleans, La.—This invention relates to the manufacture of ice, and refrigeration of air by means of cold produced by the vaporization of chimogene, or other volatile hydrocarbon, in a vacuum, the vapor drawn off in the production of the vacuum being returned to the receptacle again in a liquified form.

SAW-FILING CLAMP.—Platt Merrill, Port Sanilac, Mich.—This invention elates to a new and useful device for holding saws in the process of filing them, whereby files as well as much time and annoyance is saved.

WASHING MACHINE.—Hamilton Erastus Smith, Newark, N. J.—The object of this invention is to provide a rotary machine for washing large quantities of clothes by the employment of a washing cylinder within which the clothes are contained.

CORN PLOW.—M. C. Buffington, La Harpe, Ill.—This invention consists of certain improvements in the construction and management of parts of corn plows.

CONTINUOUS SELF-FEEDING COTTON GIN.—Jules Alfred Chaufourier, New York city.—This invention relates to improvements in machinery for ginning cotton, by means of which a continuous and self-acting feed is obtained. The machine is of simple construction, and is arranged so as to prevent breakage of the fibers of cotton, and does not require and particular attention; one man may easily manage several machines at one time.

UNITED STATES SUPREME COURT.

The United States ex rel. A. O. Bourn vs. *Charles Goodyear, Executor.*—Appeal from the Circuit Court for the Southern District of New York.

This suit is commenced in the name of the United States for the purpose of setting aside the Goodyear patent on the ground of fraud in the procurement of its extension; and the question presented is, whether the alleged fraud in the procurement of the extension can be investigated and the patent canceled and declared void, in a proceeding instituted in the name of the United States, at the relation of one of its citizens directly for that purpose.

It has been decided in other branches of the Goodyear patent litigation that a patent or the extension of a patent cannot be attacked in any collateral proceedings, except in certain cases provided for by the act of 1836.

A demurrer was interposed below in this case, on the grounds of want of equity in the relation, want of jurisdiction of the subject matter, the Statute of Limitations, and the expiration of the term of the patent before commencement of suit.

The demurrer was sustained *pro forma* without argument, and an appeal taken to this Court.

The appellee insists, that as the appellant consented to the making of the decree appealed from, he is precluded from questioning it, or reviewing it by appeal. After presenting at length the points of the demurrer, it is submitted that the law makes the Commissioner of Patents the judge of the merits of the application for the extension. The relator concedes that the Commissioner is judge, except in cases of fraud, and contends that in such a case the Courts have jurisdiction to set aside the patent so obtained. It is urged that as the action is brought to declare void the patent, and not to review the action of the Commissioner, in any manner, the Statute of Limitations does not apply.

Injury in his business, suffered by the relator, it is submitted, sufficiently qualifies him as a party complainant in the suit. As to the expiration of the patent, it is alleged it has not expired in point of fact; but, if it had, the argument is, if the extension was fraudulent, it was void *ab initio*, and is as though it had not issued. All that can grow out of it, or come from it, is tainted with fraud.

The expiration of the term cannot prevent the patentee from recovering unpaid bounties and tariffs, or damages for infringement. Yet if the extension was obtained fraudulently, all these claims of the patentee are wholly unfounded, and his right to recover anything absolutely gone.

J. H. Parsons, A. Payne, and Caleb Cushing for appellant; E. W. Stoughton and Wm. E. Curtis for appellee.

James C. Stimpson vs. *Charles T. Woodman.*—Error to the Circuit Court for the District of Massachusetts.

This was an action to recover for the infringement of a patent to Woodman for an improvement in ornamenting leather. The description filed contained two distinct claims. One pertaining to raising the table so as to produce certain contact between the roller and the bed on which the skin rests when the pebbled impression is made. The other consists in combining a short metallic roller, having the required figure engraved upon its periphery with the propelling and operating machinery whereby the roller at the end of the radial arm is brought in contact with the table of a curvature corresponding to the arc described by the roller in its vibrations on which the leather is placed for pebbling, and is rolled over the leather with suitable pressure to produce the required impression.

The defense was, that long prior to Woodman's invention the pebbling roller was a well-known currier's tool, effectively used in hand devices and leather-finishing machines, interchangeably with other figuring tools; that Woodman's machine was fully anticipated by the machine of one Green, which had been used to operate not only non-rotating figured cylindrical tools, but a rotating cylindrical tool differing from the pebbling roller only in having a smooth instead of a figured surface; that the introduction of the pebbling roller into the Green machine was not a matter of invention, but of common knowledge and skill, and that the machine of Stimpson is substantially the same as the Green machine.

Under the charge of the Court the verdict was for Woodman, and the plaintiff in error brings the case here, contending that the introduction of an old mechanical device into an old machine, in the same mode, and for the same purpose that it had been previously introduced into an analogous machine, is not a patentable novelty; and that, viewed as a combination of old elements, it is not new within the meaning of the patent law, and that viewed as a process or mode of operation, it is only what is known in law as a double use of the device on the one hand, and of the machine on the other, and therefore not the subject of a valid patent. It is contended, therefore, that the Court should have submitted to the jury the questions whether the pebbling roller itself was old, and had been used in prior machines; whether the other machinery, apart from the pebbling roller, was not old, and whether the mode of introducing the pebbling roller was not substantially the same as in prior machines, and was within the common knowledge and skill of mechanics; and it is claimed that had these questions been found in the affirmative, then under the rulings of the Court, as matter of law, the claim of the patent must have failed.

B. R. Curtis and George L. Roberts for the plaintiff in error; T. L. Wakefield, for the defendant.

Official List of Patents.

Issued by the United States Patent Office

FOR THE WEEK ENDING April 12, 1870.

Reported Officially for the Scientific American.

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101,698.—KNIFE SCOURER.—J. Q. Adams and S. R. Goodsell, Brooklyn, N. Y.
101,699.—DOOR BELL.—Wm. Allport, New Britain, Conn.
101,700.—STREET SPRINKLER.—J. A. Bancroft, Worcester, Mass., assignor to L. F. Bancroft and Andrew B. Yetter, New York city.
101,701.—CUTTER HEAD FOR PLANING MACHINE.—B. J. Barber, Ballston Spa, N. Y.
101,702.—TRUCK FOR MOVING BUILDINGS.—Jesse Barlow, Van Meter, Iowa.
101,703.—INKING APPARATUS.—Henry Barth, Cincinnati, Ohio.
101,704.—FIRE KINDLER.—Charles Batcheller, Des Moines, Iowa.
101,705.—HAY LOADER.—J. M. Boorman, Scarborough, N. Y.
101,706.—CORN PLOW.—M. C. Buffington, La Harpe, Ill.
101,707.—TIN CAN.—J. J. Burkert, New York city.
101,708.—APPARATUS FOR SEALING PIPE JOINTS.—William Cassidy, New Bedford, Mass.
101,709.—SELF FEEDING COTTON GIN.—J. A. Chaufourier, Paris, France.
101,710.—ROTARY SPADER.—James Chenoweth, Shelbyville, Mo.
101,711.—SHOVEL HANDLE.—G. C. Choate, Wyoming Station, Wyoming Territory.
101,712.—CLOTHES DRYER.—J. V. Clark, Camden, N. J.
101,713.—FANNING MILL.—Barnard Cortrite, Norwalk, Ohio.
101,714.—WASHING MACHINE.—W. H. Cox, Knox county, Ill.
101,715.—SASH HOLDER.—T. H. Davis, St. Joseph, Mo. Antedated April 6, 1870.
101,716.—MOP HEAD.—Hezekiah Dodge, Albany, N. Y. Antedated April 4, 1870.
101,717.—EARTH CLOSET.—J. A. Drake and W. R. C. Clark, New Orleans, La.
101,718.—BASE BURNING STOVE FOR A STEAM HEATING BOILER.—W. B. Dunning, Geneva, N. Y.
101,719.—HARVESTER.—Rudolf Eickemeyer, Yonkers, N. Y.
101,720.—SULKY CULTIVATOR.—Frank Farnsworth, Frankfort, Ill.
101,721.—CORN HARVESTER.—Henry Flesher, Springfield, Ill.
101,722.—HAIR MEDICINE.—A. J. Fletcher, Red Bluff, Cal.
101,723.—LAMP.—S. W. Fowler, Brooklyn, N. Y.
101,724.—CAR SPRING.—Carlos French, Seymour, Conn.
101,725.—WATER WHEEL.—J. L. Frisbie, Hillsdale, Mich.
101,726.—SWIVEL FOR TEMPER SCREWS.—Thomas Graham, Samburg, Pa.
101,727.—WASHING MACHINE.—John A. Hall, Newburg, Canada.
101,728.—PHOTOGRAPHIC PRINTING APPARATUS.—James H. Hamilton, Sioux City, Iowa.
101,729.—DITCHING PLOW AND HEDGE GRADER.—Daniel Harmon, Coles County Ill.
101,730.—CORK-CUTTING MACHINE.—E. F. Harrington, Boston, assignor to himself and John I. Munroe, Woburn, Mass.
101,731.—POTATO SEPARATOR.—Richard Haviland (assignor to himself and Charles Ware), North Branch, Md.
101,732.—MACHINE FOR COLORING PAPER HANGINGS.—John Heist (assignor to himself, C. Zink, and H. Spoehrer), New York city.
101,733.—HEATING STOVE.—M. C. Hull, New York city.
101,734.—PICKER FOR LOOMS.—Joshua Hunt and Albert Stockwell, Providence, R. I.
101,735.—APPARATUS FOR EXTRACTING MADDER.—James Hunter, Philadelphia, Pa.
101,736.—MACHINE FOR SEPARATING FLOUR FROM BRAN.—W. W. Huntley and Alpheus Babcock (assignor to W. W. Huntley and Frank Swift), Silver Creek, N. Y. Antedated February 22, 1870.
101,737.—MANUFACTURE OF GLASS.—C. H. Jenkins, Boston, Mass.
101,738.—TUG-FASTENING FOR WHIFFLETREE.—L. A. Johnson, Candor, N. Y.
101,739.—VIBRATING COLTER FOR PLOWS.—J. S. Johnston, Rockford, Ill. Antedated April 1, 1870.
101,740.—FAN ROCKING-CHAIR.—Geo. R. G. Jones, Memphis, Tenn.
101,741.—STRAW CUTTER.—J. S. Jones, Covington, Ind.
101,742.—TREMOLO ATTACHMENT FOR REED OR PIPE ORGANS.—Michael J. Kerigan, Boston, Mass.
101,743.—SPLINT FOR FRACTURED LIMBS.—George S. King, Washington, D. C.
101,744.—SINK APPARATUS FOR DRAINING CELLARS.—Adam Knacker, Meadville, Pa.
101,745.—BELT SHIFTER.—W. E. Leighton, Pembroke, Me.
101,746.—ROCK DRILL.—Samuel Lewis, Williamsburg, N. Y.
101,747.—STEAM ENGINE.—G. E. Long, Harrisburg, Pa.
101,748.—LAMP.—E. E. Lyon, Worcester, Mass.
101,749.—CLOTHES WRINGER.—Allan Magowan, Trenton, N. J.
101,750.—MACHINE FOR CORRUGATING SHEET METAL.—Wm. Mann, Newcastle, Pa.
101,751.—RAILWAY.—E. G. Markley, Sunbury, Pa.
101,752.—HORSE HAY RAKE.—R. W. McClelland, Springfield, Ill. Antedated April 4 1870.
101,753.—RAILROAD CAR STOVE.—Samuel Meredith (assignor to himself, John Wood, and C. B. Dodd), West Philadelphia, Pa.
101,754.—SAW CLAMP.—Platt Merrill, Port Sanilac, Mich.
101,755.—RAILWAY CAR SEAT.—Ezra Miller, New York city.
101,756.—FEED-WATER REGULATOR AND LOW-WATER ALARM.—A. W. Morrell, Niles, Mich.
101,757.—TRACK CLEARER FOR STREET CARS.—J. A. Morrison, Brady's Bend, Pa.
101,758.—TABLE FOR CHANGING GAGE OF RAILWAY CAR TRUCKS.—G. F. Morse, Portland, Me.
101,759.—GRAIN DRYER.—I. Y. Munn, Chicago, Ill.
101,760.—CIRCULAR SAW MILL.—Peter Neeb, Buffalo, N. Y. Antedated April 5, 1870.
101,761.—TANK FOR STORING OIL.—Person Noyes, Lowell, Mass.
101,762.—BOILER FEEDER.—S. J. Parker, Williamsport, Pa.
101,763.—MACHINE FOR BURRING AND CLEANING WOOL, ETC.—Ziba Parkhurst, Milford, Mass.
101,764.—EASY CHAIR.—W. C. Poppendieche, New York city.
101,765.—GATE.—Fitch Raymond, Cleveland, Ohio.
101,766.—PLOW FEEDER.—Joseph Richardson, Ballston Spa, N. Y.
101,767.—STEAM GENERATOR.—Michael Ritchey, Patterson, N. J.
101,768.—WASHING MACHINE.—J. D. Royse, and John Royse, Cane Valley, Ky.
101,769.—STREET LAMP.—W. G. Schmidlin and J. W. Driscoll, New York city.
101,770.—MONEY SAFE.—Philipp Schreyer, New York city.
101,771.—REGULATING DEVICE FOR GAS BURNERS.—Henry Schultz), assignor to himself and Henry C. Bentley), Milwaukee, Wis.
101,772.—STORE AND HOUSEHOLD GRAPPLE.—John Seltzer, Philadelphia, Pa. Antedated March 28, 1870.
101,773.—IMPLEMENT.—W. A. Sharp, Tama City, Iowa. Antedated April 7, 1870.
101,774.—TUBULAR WELL.—J. Shaw, Bridgeport, Conn. Antedated April 4, 1870.
101,775.—ROOFING TILE.—George Shove, Yarmouth Port, Mass.
101,776.—MULTIPLE SPONGE.—Hamilton E. Smith, Newark, N. J.
101,777.—MOP, MAT, AND WIPING CUSHION.—H. E. Smith, Newark, N. J.
101,778.—WASHING MACHINE.—H. E. Smith (assignor to Mrs. Mary Jane Smith), Newark, N. J.
101,779.—MECHANISM FOR OPERATING THE FEEDING WHEEL IN SEWING MACHINES.—Friedrich Spoehr, Philadelphia, Pa.
101,780.—APPARATUS FOR MOVING THE CARS.—E. Springer, Davis, Ill.
101,781.—PICTURE NAIL.—J. H. Squier and E. J. Warner, Newark, N. J.
101,782.—VENEER CUTTER.—William Steele, Sistersville, W. Va.
101,783.—MANUFACTURE OF SUGAR AND ALCOHOL FROM LICHENS.—Sten Stenberg, Stockholm, Sweden.
101,784.—MILK CAN.—A. Sunderland, Madison, Ohio.
101,785.—WOOD PULP MACHINE.—Stephen C. Taft, Mendon, Mass.
101,786.—PAPER FOR CHECKS, DRAFTS, NOTES, ETC.—G. F. Thomae, Jr., Brooklyn, N. Y.
101,787.—DUST ARRESTER FOR RAILROAD CARS.—W. M. K. Thornton, Rolla, Mo.
101,788.—SCROLL-SAWING MACHINE.—E. A. Tripp, Newark, N. J.
101,789.—FRUIT AND EXTENSION LADDER.—Melzer Tuell (assignor to himself, Lewis D. Young, and B. F. Fenner), Penn Yan, N. Y. Antedated April 9, 1870.
101,790.—COUNTER AND SHOW CASE.—L. F. Vienot, New York city.
101,791.—RAILWAY CAR BRAKE.—Edward P. Vining, Grand Rapids, Mich.
101,792.—PISTON PACKING.—Ellery A. Walker, Hyannis Mass.
101,793.—COAL DIGGING APPARATUS.—William Ward Pittsburgh, Pa.
101,794.—SHIRT BOSOM AND WRISTBAND COMBINED.—E. H. N. Warner, New York city.
101,795.—GRATE BARS FOR STEAM GENERATORS.—Marshall D. Wellman, Allegheny county, Pa.
101,796.—COUNTERSINK.—Asa Wheeler (assignor to Geo. B. Wheeler), Brattleborough, Vt.
101,797.—DISH STAND.—H. C. Wilcox, West Meriden, Conn., assignor to Woods, Sherwood & Co., Lowell, Mass.
101,798.—SLATE FRAME.—W. A. Wilde, Malden, Mass.
101,799.—STOVEPIPE SHELF.—Joseph W. Wilder, Leominster Mass.
101,800.—MACHINE FOR TWISTING AND CURLING HAIR.—P Wisdom, Brooklyn, and J. H. Wilcox, New York city.
101,801.—Chas. B. Withington.—Suspended.
101,802.—ROCKER FOR CHAIRS.—Wilhelmina J. Zakrzewska Berlin, Prussia.
101,803.—PADLOCK.—A. M. Adams, Washington, D. C.
101,804.—WOODEN BOX.—Olif Abell, Wolcott, Vt.
101,805.—WOODEN BOX.—Olif Abell, Wolcott, Vt.
101,806.—APPARATUS FOR LIGHTING AND EXTINGUISHING GAS.—A. N. Allen and R. H. Dewey, Pittsfield, Mass.
101,807.—OIL CUP.—A. C. Ancona, Evansville, Ind.
101,808.—ATTACHING KNOB TO SPINDLES.—M. Andrew, Melbourne, Colony of Victoria.
101,809.—CORN HUSKER.—L. Augustus Aspinwall, Albany, N. Y.
101,810.—CHURN.—Mahlon B. Atkinson, Georgetown, D. C.
101,811.—CLOTH-STRETCHING MACHINE.—Solomon H. Austin, Providence, assignor to W. J. Austin, Smithfield, R. I.
101,812.—APPARATUS FOR TANNING BY INFILTRATION.—J. G. Baker, Wilmington, Del.
101,813.—STAND FOR TEA AND COFFEEPOTS.—J. H. Bigelow Worcester, Mass.
101,814.—AUTOMATIC RELIEF VALVE.—A. M. Black, Providence, R. I.
101,815.—TUBULAR SHAFT FOR CLOCKS.—G. H. Blakesley, Bristol, Conn.
101,816.—WIRE WORK FOR RAILINGS, ETC.—W. R. Boerner, (assignor to himself and C. R. Boerner), Chicago, Ill.
101,817.—MECHANISM FOR STOPPING THE SHUTTLE IN LOOMS.—S. Boorn, Lowell, Mass.
101,818.—BRAKE BLOCK FOR WAGONS.—Wm. H. Bradt, New Scotland, N. Y.
101,819.—HORSE COLLAR BLOCK.—E. L. Brazenor (assignor to Richard Brazenor), Birmingham, Great Britain.
101,820.—SPECTACLE FRAME.—Chauncey Buckley (assignor to Charles Parker), Meriden, Conn.
101,821.—SPOKE SOCKET FOR CARRIAGE WHEELS.—A. J. Carleton, Springfield, Mass.
101,822.—COTTON AND TOBACCO PRESS.—Nash Cheek, Chapel Hill, N. C.
101,823.—INDIARUBBER CARPETING AND EMBOSSED MATTING.—John H. Cheever, New York city.
101,824.—COMBINED PULLEY AND CLAMP.—Milton W. Clark Worcester, Mass.
101,825.—SEAT AND CAP FOR TIE AND SILL PLATE.—P. S. Clinger, Conestoga Center, Pa.
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101,966.—BEER FAUCET.—Felix Manz, Allegheny City, Pa.

REISSUES.

3,910.—RAILROAD CAR VENTILATOR.—H. D. Carroll, Robert Hitchcock, and J. H. Hare, Springfield, Mass., assignees of Robert Hitchcock.—Patent No. 67,877, dated August 20, 1867.
3,911.—MACHINE FOR MAKING NEEDLES.—C. O. Crosby, of New Haven, Conn.—Patent No. 51,150, dated November 28, 1865.
3,912.—STRAW CUTTER.—Warren Gale, of Peekskill, N. Y., and B. B. Belcher, of Chicopee Falls, Mass., assignees of Warren Gale.—Patent No. 31,001, dated December 18, 1860; reissue 1,977, dated May 30, 1865; reissue 2,127, dated December 19, 1865
3,913.—SEEDING MACHINE.—F. H. Manny, of Rockville Ill., assignee of Wm. Workman.—Patent No. 28,934, dated June 26, 1860.
3,914.—TRACE HOLDER.—D. B. North & Co., of New Haven, Conn., assignees of Stephen Stout.—Patent No. 78,154, dated May 19, 1868.
3,915.—SASH FASTENER.—The Judd Manufacturing Company, New Haven, Conn., assignees of Morton Judd.—Patent No. 39,032, dated June 30, 1863.
3,916.—FELTING MACHINE.—J. T. Warring, of Yonkers, N.Y., assignee of Rudolph Eickemeyer.—Patent No. 87,763, dated March 16, 1869.
3,917.—STREET SPRINKLER.—L. F. Bancroft, of Worcester, Mass., and A. B. Yetter, of New York city, assignees of L. F. Bancroft.—Patent No. 53,557, dated April 3, 1866.
3,918.—WRENCH.—Loring Coes, of Worcester, Mass., assignee of G. C. Taff.—Patent No. 88,230, dated March 23, 1869.
3,919.—RAILWAY CAR WHEEL.—Gustavus Natorp, of New York city.—Patent No. 83 722, dated November 23, 1868.
3,920.—CONVERTING IRON INTO STEEL.—The Barron's Patent Steel Manufacturing Company of New York city, assignees of Thomas J. Barron.—Patent No. 60,823, dated January 1, 1867.

DESIGNS

3,963.—ADJUSTABLE COUNTING-HOUSE CALENDAR.—S. S. Coe, Cleveland, Ohio.
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EXTENSIONS.

METHOD OF COOLING AND VENTILATING ROOMS.—Azel S. Lyman, New York city.—Patent No. 14,510, dated March 25, 1856.
SHIRT COLLAR.—Polly Hunt, Jersey City, N. J., and Geo. W. Hunt, Newburgh, N. Y., administrators of Walter Hunt, deceased.—Patent No. 4,376, dated July 25, 1854; reissue No. 1,828, dated November 29, 1864.
HEAD AND TAIL BLOCKS FOR SAW MILLS.—E. H. Stearns, Erie, Pa.—Patent No. 14 700, dated April 15, 1856.
PRESSURE BELLS.—M. L. Barton and C. A. Buell, Chatham, Conn., administrators of Jason Barton, deceased.—Patent No. 14,593, dated April 8, 1856; reissue No. 1,798, dated October 25, 1864.
CULINARY BOILERS.—Edward Whitely, Cambridge, Mass.—Patent No, 14,622, dated April 8, 1856; reissue No. 2,058, dated July 28, 1868.

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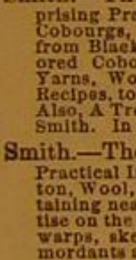
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SCIENTIFIC AMERICAN

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

Vol. XXII.—No. 18. [NEW SERIES.] NEW YORK, APRIL 30, 1870. $3 per Annum [IN ADVANCE.]

Improved Stall Floor for Horses.

In the construction of stables, there has been a great need for some plan whereby the floors may be rendered impervious to the urine of animals, and at the same time admit of its being rapidly and thoroughly conducted away, so that its decomposition will not load the air with foul gases.

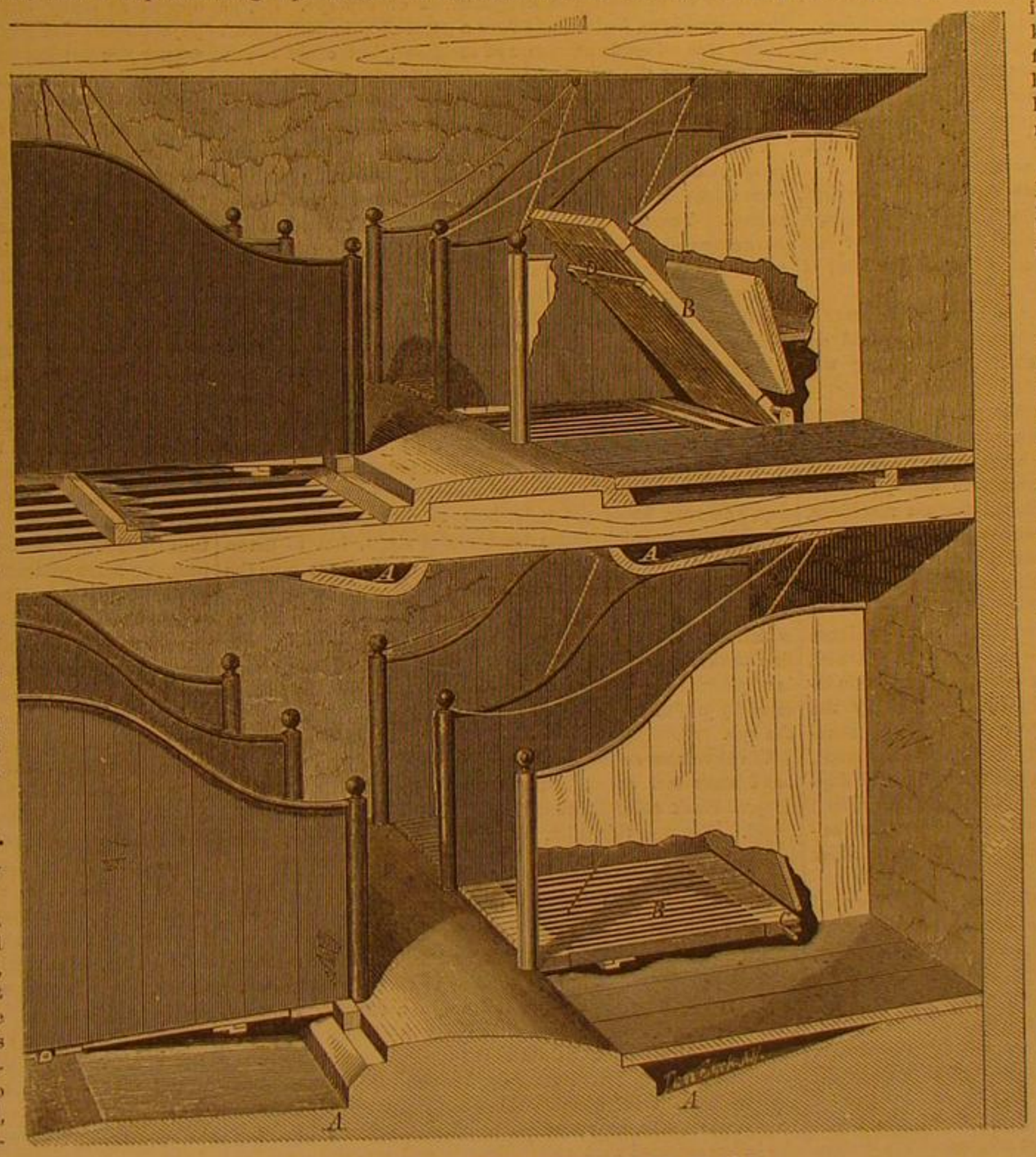
The construction adopted in the device herewith illustrated, seems to make provision for all the necessities of the case. The animals, instead of standing upon a continuous flooring, stand upon a wooden grating as shown at B, so constructed that any one of the bars may be taken out independently of the others, and so arranged that by means of a cord and pulley, the whole grating may be lifted, like a trap door hinged at one side, when it is desired to get access to the water-tight gutters A, underneath the grating.

This construction admits of tiers of stalls being placed on one floor above another, as shown in the engraving, without any inconvenience arising from dripping. The form of the gratings is shown at B. The ends of the bars are slotted, as shown at C, a rod passing through them all in common. This allows any one to be withdrawn when the opposite end of the grating is raised. This is a convenience in replacing such as become worn sooner than others, as will be the case in the middle of the grating.

The gutters A are made with a lining of cement on the lower story; but under the upper tier of stalls they are made of wood and lined with zinc. They thus conduct away the urine, and when it is necessary, they may be thoroughly washed out by the use of a hose.

The gratings are raised by means of cords and pulleys, acting upon a cross-bar D, which underlies the bars as shown.

Patented, June 8, 1869, by William M. Bleakley, Verplank, N. Y., whom address for State, county, or town rights.



BLEAKLEY'S IMPROVED HORSE STALL.

To Prevent Decay of Shingles.

The following is said to effectually prevent the decay of shingles:

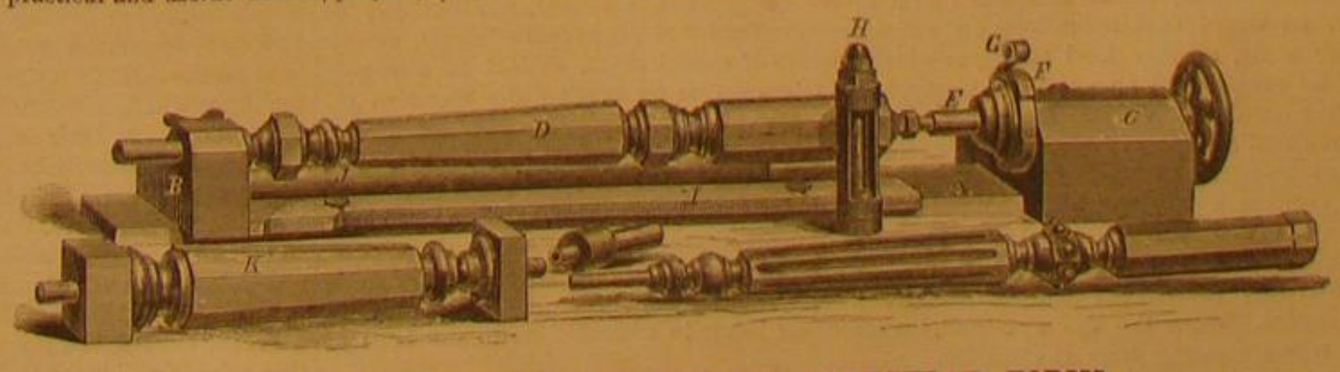
Take a potash kettle, or large tub, and put into it one barrel of lye of wood ashes, five pounds of white vitriol, five pounds of alum, and as much salt as will dissolve in the mixture. Make the liquor quite warm, and put as many shingles in it as can be conveniently wet at once. Stir them up with a fork, and when well soaked, take them out and put in more, renewing the liquor as necessary. Then lay the shingles in the usual manner. After they are laid, take the liquor that was left, put lime enough into it to make whitewash, and if any coloring is desirable, add ocher, Spanish brown, lampblack, etc., and apply to the roof with a brush or an old broom. This wash may be renewed from time to time. Salt and lye are excellent preservatives of wood. It is well known that leach tubs, troughs, and other articles used in the manufacture of potash, never rot. They become saturated with the alkali, turn yellowish inside, and remain impervious to the weather.

Improved Machine for Cutting Irregular Forms.

We illustrate herewith a very practical and useful device for cutting irregular and ornamental forms, such as table legs, balusters, etc., by which a great deal of work can be done in a short time and in a very exact manner.

The main features of the device are, the attachments for holding, adjusting, and feeding the pillars, balusters, etc., to be cut into irregular forms or plane sides, on a table past a rotary cutter. The invention may be said to consist of a bed, with centers, for holding the blank; one of the centers being adjustable longitudinally, and furnished with a dividing plate for adjusting the blank to the cutter, and a pattern for governing the action of the revolving cutter upon the blank. In the engraving, A is the bed upon which are placed the spindle or centering heads, B and C; B being adjustable vertically, and either having a spindle for holding the blank, or a hole for the turned end of the blank. The head, C, has an adjustable spindle, E, and is itself adjustable along the bed to receive different lengths of blanks. The spindle, E, carries a templet or dividing plate, F, with spacing notches, which dividing plate is removable to permit interchange of plates variously divided for various kinds of work. The notches of the dividing plate engage with a spring catch, G, which holds the plate in the desired position while the cutting is performed. H represents a rotary cutting tool rising through the table of the machine. A guide plate, I, or pattern adjustably attached to the bed, A, serves to direct the cutting. The operator takes hold of the baluster, at B, with his right hand, and with his left hand on a hand rail, J, pushes the machine from him, and at the same time against the mandrel; the machine is then pulled or drawn back, and lifting the spring catch, G, with the left hand, and turning the baluster with the right, one space, another side is presented to the cutting tool, thereby dressing the sides all alike, and making a thousand pieces exactly similar. After the required number have been shaped the straight bits are removed and properly shaped ones take their place, and the guide pattern is changed for one corresponding to the desired ornamental design. When this is effected, one man can do the work of twenty men, and with greater neatness and accuracy than can possibly be done by hand. At the same time the hands of the operator are perfectly safe from injury. For dressing stuff like the piece, K, with squares at both ends, the center pin, seen at the end of the piece, is inserted in the hole through the centering head, B. This machine is capable of dressing not only balusters and chair, table, desk, and counter legs, but can be used to dress hay-rake and grain-drill spokes; and stuff that has to be thrown away when finished by hand on account of knots and curls (the handsomest when finished), is dressed almost as readily as straight-grained wood. Any workman knows the disadvantages he labors under in dressing such work as seen in the engraving, on account of the turnings being larger than the neck of the baluster, most of it having to be done with a drawing-knife, chisel, or rasp. We are informed that one of these machines has been in use eight months, and has given perfect satisfaction. State rights, or machines, will be sold.

Patented, through the Scientific American Patent Agency, January 4, 1870, by Franklin Keagey, of Chambersburg, Pa., whom address for further information.



KEAGEY'S MACHINE FOR CUTTING IRREGULAR FORMS.

The Trial of the Pyx.

The trial of the Pyx is the formal testing of the coin of the realm of England, to insure its being of the requisite weight and fineness. The name is derived from the Pyx, or chest, in which the coins selected for the purpose are contained. The first trial of the Pyx took place in the ninth and tenth years of Edward I. And as the last observance of this ancient ceremony was held during the past week, a few brief notes may not be without interest.

The authority under which the trials were made varied considerably. First, the members of the King's Council, then the Barons of the Exchequer constituted the court, King James I. presiding at one trial. The court now consists of several members of the Privy Council, under the presidency of the Lord High Chancellor and a jury selected from the Hon. Company of Goldsmiths.

Last week the high officers of the Mint assembled at the Treasury, and in their presence the Lord Chancellor charged the jury to examine the coin of the late Master of the Mint, Thomas Graham, F.R.S., and to ascertain whether it was within the latitude of "remedy" allowed by law.

This remedy amounts to 12 grains on each troy pound of gold coin, or to 0·257 grain on each sovereign, and 24 grains on each pound troy of silver coin. Portions cut from standard test plates were handed to the jury, who adjourned to Goldsmiths' Hall. They then opened the Pyx-chest and tested the coin by weight; having done this, a certain number of gold coins were melted into an ingot, which was then assayed; the same process being adopted with the silver coin. In the present instance the Pyx represented a coinage of fourteen millions gold and one million of silver coin; the verdict of the jury being, that the coin, both as to weight and fineness, was within the remedy allowed by law. The details, however, were most favorable to the late illustrious Master, who has so lately passed away.

An adverse verdict would probably have been followed by no more serious penalty than the forfeiture of the Master's sureties, but it is interesting to note that in the reign of Henry I. the money was so debased as to call for the exemplary punishment of the "Moneyers," while in Anglo Saxon times the chief officer or Reeve would have been punished by the loss of his hand should he fail to clear himself of the charge of producing false coinage.—*Nature.*

INFERIOR taste prefers rounded periods to sense and force

LIGHT AND VISION--MORE ESPECIALLY HOW LIGHT IS CONVERTED INTO THOUGHT.

[Being one of the Cooper Union Lectures for the Advancement of Science and Art, delivered in the Great Hall of the Cooper Institute, in New York, on the 26th of February, 1870.]

BY H. KNAPP, M. D.

[Concluded from page 264.]

We have now two things to consider more closely: first, in which way the rays of light pass through the eye, and secondly, what becomes of them after their arrival at the retina.

The capsule of the eye has a beautiful transparent window, the cornea, for the entrance of the rays of light. Its anterior surface is the most important of the whole refractive apparatus. It was, therefore, considered of high scientific interest to determine its physical properties, above all, its curvature. At first, the method was very imperfect. Two hundred years ago, a French physician of great renown, S. L. Petit, endeavored to ascertain the curvature of the cornea by applying to frozen eyes taken from the cadaver, pieces of card board into which he had cut circular notches, fitting them upon the cornea as nearly as possible. This procedure could give only an approximate measurement.

In a similar way the curvature, thickness, and position of the crystalline lens, the second part of the refracting apparatus, was examined.

But the minute parts, with their delicate structure, appeared so infinitely beyond the scope of the imperfect methods of investigation, that a great many properties of the eye, requisite for discharge of its functions as an optical apparatus, had to be supplied by hypothesis, that is, imagination.

The less instructed a man, the more he is given to admiration and superstition. Is it astonishing, therefore, that the eye was supposed to be the most perfect optical apparatus, quite beyond the reach of our comprehension? God being the Creator, how can it be possible that there are short-comings and defects in one of His most wonderful works?

For a long time all investigators were convinced, *a priori*, that an analytical study of the eye could only reveal its perfection. This preconceived idea, however, was forced at last to give way to the unambiguous results of exact methods of inquiry.

As every new truth, overturning an old prejudice, carries with itself the remedy for the prejudice, so the optical defects of the eye were detected, and no religious feeling was wounded.

If, on earth, there be a power, it is the progress of science. Religion, the search of the human soul after the divine, pursues the sublimest object; but has always had too many egotistic exponents, who led the multitude astray; threw the noblest minds into prison; employed torture machines, and all the horrors of the Inquisition, only to gratify the sway of their own hierarchy. The history of science has no such horrors to record; all its conquests have been ennobling steps of civilization.

In our day, a scientist, arriving at a conclusion at variance with orthodox creed, can no longer be tortured or imprisoned, or burned as a heretic; but in most countries, this one included, he may incur persecution, not by law, but by the zealots of society. Germany at the present time, is the country where the greatest religious liberty exists. No scientist, by declaring openly his dissension on certain points of dogmatic Christianity, or orthodox Judaism, will loose a minimum of his social position. Therefore, pure and independent science now flourishes more in Germany than in any other country of the world.

The progress of our knowledge of the healthy and diseased eye, during the last decades, is nearly exclusively the work of German genius and labor. Holland, a sister country, having one prominent investigator.

The greatest name in natural science, of the present age, is that of Helmholtz, Professor in the University of Heidelberg. His discoveries and inventions count by the dozen. For the study of the eye, he is the originator of a new epoch. Relating to the point under consideration, I here show you an instrument devised by him, on the principle of the heliometer of astronomers, wherewith the curvature of the cornea can be determined on the living eye with wonderful accuracy. By his researches, and those of other observers, a great many irregularities of the eye have been detected, demonstrating beyond doubt its imperfections as an optical instrument. The curved surfaces of the cornea and crystalline lens are far from being perfect in form, they are, even in the best eye, unsymmetrical, the system is not central, not achromatic, nor aplanatic either; all of which are shortcomings a good optician now-a-days knows how to avoid. You say, be that as it may, the eye is nevertheless an admirable instrument, adequate to all the purposes of common life, and more is not needed. This seems, at first glance, very plausible, but we must consider that the purposes of life are suited to, and governed by the power of the organs of our body. And this power is limited. If we could fly, we would need no railroads; if our eyesight were more acute, another kind of writing would exist, and you may be sure, to cite an example, that the *N. Y. Herald* would be printed still worse. As it is, its type is just on the verge of visual acuteness, perhaps a little beyond it, to be read for any length of time without injuring the eyes, and therefore it deserves a premium from oculists.

The irregularities of the dioptric apparatus of the eye have one defect common to them all; they prevent the rays of light from being regularly refracted. Were the eye a perfect optical apparatus, all the rays emanating from one luminous point, would be united in one point again on the retina. But this does not take place even in the best constructed eye.

The most conspicuous imperfection of the normal eye is its want of symmetry. The meridians differ in curvature, and, therefore, in refractive power.

This is the cause that the pencil of refracted rays has a peculiar shape, being what mathematicians call a skew surface, for instance like a winding staircase. I have represented the peculiar shape of the way the rays of light take within the eye by a model of silk threads. It will interest you, furnishing a tangible illustration how far exact science, guided by mathematics, may penetrate the mysteries of nature.

At the first dawn of science, the investigator is overpowered by the discovery of a general law, which he then represents by a diagram. So it is with the eye. The law of refraction was found, and the eye called a living camera-obscura of unimpeachable perfection and diagramatic regularity. Astronomers having found the general law of gravitation, immediately had a diagramatic system of the world built up. This undoubtedly was correct, but then came the perturbations in the orbits of the celestial bodies, which had to be accounted for, and they were accounted for by the progress of astronomical research. The same development took place in the science of the eye. There were disturbances of vision, unexplainable as long as the organ of sight was supposed to be perfect. The onward march of science found means to discover the causes of these disturbances and instruments to measure them to one-thousandth of an inch. Some years ago, while experimenting on these subjects, I told a certain mathematician, that we are now able, not only to recognize, but also to measure the irregularities of the eye. He, as many wise men, had always been a great skeptic with regard to the true scientific character of medicine, but could appreciate so fully the value of these investigations, that he exclaimed: "Then sir, you command all conditions to introduce astronomical accuracy into your researches."

Many persons who like to hear themselves, called practical people, but who in reality are only slow thinkers, do not like pure scientific questions, the noblest that can ever be discussed. These would-be practical persons ask what is the advantage of such obscure investigations? People had better devote their time, they say, to more useful pursuits than to scrutinizing the imperfections of nature. I answer these practical people, that the discovery of every truth, of what kind soever it may be, is the most useful fruit of human labor. This subject we have just been considering, proves this conclusively. You can easily imagine, that if all eyes have irregularities, some will have them exaggerated to such a degree as to diminish the power of sight. Such eyes are weak, and not capable of performing the duties our present state of civilization demands of them. The educated of today, however, know not only how to discover the optical irregularities which cause weakness of sight, but to determine their nature and degree with such nicety, as to give the practical optician directions, in what manner he has to grind a new kind of spectacles—I mean cylindrical—by the aid of which thousands of weak eyes are now enabled to do any fine work, as well and as long as perfect eyes. I think this is a splendid reward to the scientist who invented the instrument by which we are able to measure the irregularities of the eye.

We have now accompanied the rays of light into the eye, but I have not mentioned that wonderful opening of the deepest black color in the middle of the iris, I mean the pupil. Through this inlet, all the rays of light must pass before they reach the retina. How is it that this ray of light is so black?

This question, again seemingly impractical, was much discussed some 30 years ago in German Universities, and resulted in one of the most brilliant and beneficial discoveries of modern science. The first impulse to these investigations was given by a sad and criminal deed, in a country town of the kingdom of Saxony, by a clergyman in discord with one of his parishioners. One dark night the minister on his way home was attacked and severely beaten. Being convinced that the perpetrator was no other than the man with whom he was at enmity, he entered a complaint against him, but the judge objected that self-testimony and moral conviction although they might do very well in religious matters, could not be taken as evidence in courts of law. Whereupon the priest, who was well versed in legendary and scientific lore, replied: "During the affray I received a severe blow upon the eye which caused a brilliant light to flash out of it, so that I could recognize the features of the assailant, who was the man I accuse." The judge was so surprised by the novelty of this assertion and the positiveness with which it was uttered, that he declared himself incompetent, and appealed to the opinion of experts. The question was brought before the forum of the medical faculties of the Universities of Leipsic and Berlin, and was studied profoundly by the celebrated physiologist Johannes Müller. The result of his researches was a most valuable acquisition to science, the discovery of the so-called specific energies of the nerves of sense, according to which a nerve of special sense, excited in any way whatever, invariably answers by causing the sensation peculiar to it alone. The optic nerve, when pricked, burnt, cut, hit, electrified, etc., will invariably cause a sensation of light, but this light is subjective, due to an abnormal condition of the nerve, and not in the least capable of being perceived by another person, or illuminating the objects around the irritated eye Any one can repeat on himself the truth of these statements. Therefore the complaint of the priest was dismissed, his assertions being in contradiction to the laws of nature.

This celebrated case was the starting point of scientific inquiries into the cause of the darkness of the pupil of the eye, and the peculiar condition under which the pupils of certain animals, and sometimes also of men, may become luminous. After a good deal of preparatory labor Prof. Helmholtz solved the problem and invented the ophthalmoscope, or eye-mirror, an instrument by which it is possible to look into the depth of a living eye and see its marvelous interior structure in all its details and brilliancy, as if it were a picture spread out before us. The optic nerve expanding into the retina, with its wonderfully ramifying net of arteries and veins, on which you can see the pulsation of the blood as well as you can feel it on the wrist; the choroid with its shades of pigmentation and intricate interlacing of blood vessels; nay, even the miniature images of outward objects can be seen portrayed on the retina, and their reversal, for centuries a topic of lively discussion, directly observed on the back-ground of the living eye.

This was a triumph of science so great and important in its results as the instrument itself is small, and of admirable simplicity. It was at once made practical by the combined efforts of many illustrious physicians who discovered with it a great number of diseases hitherto unknown, and which, as soon as they were recognized, became amenable to treatment. The little instrument proved not only a mirror for the eyes, but revealed many of the other evils which flesh is heir to. It did not only inaugurate a new epoch for the study of the organ of sight, which in the short interval of two decades has become the most cultivated, reliable, and beneficial of the various branches of medicine, but led to the study of other organs in the same way. Mirrors for the ear, the throat, and other parts of the body, opened so many fertile fields for the progressive labor of physiologists and physicians. There may be hardly any one among you but has been, or will be, benefited by the practical results of these investigations. Even the French, the proudest of all nations—the present company as representing the American, of course, excluded—recognized the value of the ophthalmoscope, by giving it the highest praise a Frenchman is capable of. A French reviewer naively said: "The ophthalmoscope is such an admirable German invention that it deserves to be a French one."

It takes a certain time to render a great name popular, but the name of Helmholtz as a creator of new science, will live as long as the names of glorious Newton and Humboldt, and as that of a benefactor of mankind, it will be unsurpassed even by the blessed names of Dr. Jenner and the one over whose ashes this country is still weeping, George Peabody.

But let us continue, that we may see how waves of light are converted into nervous fluid and ultimately into thought. We followed them to their collection in the image upon the retina. This membrane has a very complicated structure, which again, has been investigated nearly exclusively by German anatomists. Of the many layers which compose the thin transparent retina, one, the outer, is distinguished by a peculiar arrangement and utmost subtilty of its elementary parts. These are called rods and cones, and each of them posseses an inner and outer portion. Three years ago these details were at the limit of the power of the strongest microscopes; but the invention of a new system of lenses, the immersion system, adds so much magnifying power, while preserving good illumination, to the former microscopes, that it is now possible to distinguish further details in the rods and cones. The surface of the minute staves is covered by infinitely fine nervous fibers, finer than have been observed anywhere else in the animal organization. The outer portion of the little staves consists of extremely delicate disks, cemented together by a glue, the refractive power of which differs from that of the disks. In, around, or between these disks—which, is not yet clearly made out—terminate the delicate nervous fibers which run over the surface of the inner portions of the little staves. Until within the past two years, nobody had definite ideas how the nerve fibers were acted upon by light.

Physiologists contented themselves with the knowledge that the outer layer of the retina contained the percipient elements. Now it is supposed, or rather on the way to be proved, that the waves of light enter the little staves and are repeatedly reflected in the little disks. A remarkable coincidence exists between the size of these disks and the length of the light waves. The latter vary between ·00003 to ·00008 mm., according to the different colors, and the thickness of the retinal little disks lies between the same limits. You all know that the different colors which compose the sunlight, are due to ether waves of different length, and may be isolated by means of a prism. If now a ray of light, the undulations of which are of a certain length, say ·00005 mm., meets on its way a substance composed of different layers, the thickness of which is equal to, or a simple multiple of the length of the light wave, the latter will not proceed in its course, but be repeatedly reflected from the two surfaces of the layer corresponding in thickness to the length of the light wave. Waves thus repeatedly reflected are called standing waves, and possess a much greater force than the simple passing or flowing waves. Standing waves are, therefore, fit to impart far greater commotions to the nerve fibers in or on the disk, than the flowing waves. It is evident that the latter will be converted into standing waves only in disks corresponding to their length. They will only excite the nerve-fiber of these disks, having passed the others without acting upon them. Suppose, for instance, the light wave of blue color, being ·00003 mm. in length, enters a little retinal staff, then it will pass undisturbed through the disks of other dimensions than ·00003 mm., but after having once penetrated this one, it will be repeatedly reflected. Thus special nervous fibers are excited, and the definition of natural philosophers, that color is nothing but the sensation of ether waves of a specific length is accounted for. Here the light wave ends; it does not die however, but is transmitted to the ether-zones enveloping the molecules of the optic nerve. Usually this transmission is called absorption of light.

Natural science has of late discovered a law of the greatest fundamental importance, the law of preservation and correlation of forces. This law shows that force can neither be created nor destroyed, it can only be transferred, and manifest itself under other phenomena. Light can be converted into electricity, and the nervous current is very much akin to the electric current. It moves the magnetic needle, and has many properties in common with the electric currents. They are, however, not identical, since the velocity of the nervous current, as Helmholtz was the first to show, is only 61 mt. in a second, while that of the electric current is not far from 300,000 miles in the same time.

Thus far we are able to accompany the light wave: it has united with the nervous fluid, and will thereby be transmitted to the central organ of the nervous system, the brain, where it is ultimately converted into thought.

But here, science in its present state, stands on the confines of an apparently unfathomable mystery, to penetrate which another mirror must be invented. I have, however, faith in the power of science, and am convinced that nothing is impenetrable to the eye of the human mind.

The history of civilization shows a slow work, and frequent disturbances by political convulsions. Europe, especially Germany, where scientific investigation is so generally appreciated and liberally encouraged, may be crushed with the downfall of the untenable forms of personal government; but this country, although still betraying many deficiencies of youth, is the bright star that will usher in an epoch of higher culture.

In regard to the last problem of our subject, the formation of thought out of visual impressions, centuries may pass, before a brain mirror will be invented. But so sure as science is ever progressive, so sure it is that another Helmholtz will will come to invent this mirror, and as the course of civilization and human progress is westward, let us hope that he will be—an American.

MAMMALIAN FOSSILS.---A FACETIOUS REVIEWER.

Mr. J. P. Lesley contributes to *Old and New*, a review of the recent work of Dr. Leidy on "Mammalian Fossils of North America," which is worth reading for its humor as well as the scientific information it contains. It is so seldom that scientific discourse is relieved by wit, that it is refreshing to meet occasionally with an essay which happily blends learning with fun.

Mr. Lesley says:

The long expected and truly magnificent work of Dr. Leidy, on the mammalian remains in the rocks of Nebraska and Dakotah, with a synopsis of all the mammalian fossils as yet discovered in North America, has at length appeared. It forms an entire volume of the quarto "Journal of the Academy of Natural Sciences" of Philadelphia, and is illustrated with plates excellently well done. These plates show the teeth, jaws, heads, and limb-bones of the American fossil mammals, either life size, or on a reduced scale. Dr. Hayden prefixes to the book a geological description of that remarkable part of the United States, where the greatest treasures of this sort have been preserved for our astonishment and study. Creatures lived there, strange enough to test the credulity of the most superstitious—hogs that chewed the cud, deer that had solid hoofs like horses, or horses with cloven hoofs like deer; tropical pachyderms feeding at the swampy margins of vast fresh-water lakes, from the shores of which arose ranges of the Rocky Mountains in 45° north latitude.

North America in pre-human times was provided with every kind of mammal excepting man—horse, deer, cow, sheep, elephant, rhinoceros; and the smaller kinds were not forgotten—except the hippopotamus. That would have been a little too absurd. The red Indian and the mastodon together?—that is all right. But the corn-planter and the river-horse of the Nile and Niger!—not if you please.

Such at least were our reflections, until a Friday night, a few weeks since, we were destined to hear Professor Cope inform the members of the American Philosophical Society, that he had just discovered an unmistakable hippopotamus' molar tooth in a bed of Miocene Tertiary marl in New Jersey, and that a learned friend of his had collected other teeth, from a similar position in the series of rocks in Maryland, which he identified generically with hippopotamus. But the two species were different: that of the New Jersey locality having been no larger than the common hog, and distinguished by certain tuberculous processes studding the crown of the tooth, from which feature Mr. Cope should construct its specific name.

We ask, what does all this raree show of Palæontology mean? Who gets up those strange and varied forms? Was there no trick of humor in these shapes? Are we to call them tentative inventions, of a busy, ever busy mind, never satisfied with the result, but ever changing the combination, ever reaching toward a higher pitch of success? Or do we see a slow eternal growth—form expanding into form—form budding out of form—as in some vast circumplanetal coral reef, filled by one family of life, fed by one gulf stream of vital force, energetic, but half conscious, and as improphetic for itself of its own culmination in man, as the British savage was of the appearance of his children, the Newton and the Faraday?

The books say that no mammal has ever been found in rocks older than the Tertiary. Some years ago—a good many years ago, in fact, for it was in those early days of the Philadelphia Academy, made brilliant with the presence of Wilson, and Nuttall, and Say, and McClure, and Bartram, and Ord, and the Abbé Da Serra, and the wild Rafinesque, and the enthusiastic Vanuxem—Dr. Bartram found in the cretaceous green sand marl of New Jersey, a vertebra, which he so labeled (libeled is the proper word here), and placed it in the Academy's museum. Some time afterward, Dr. Leidy pronouncing it the vertebra of some extinct whale, and the European palæontologists being startled at the thought of a cretaceous whale, Sir Charles Lyell wrote over to Mr. Conrad, to look up the spot and verify the rock. He did. The marl was not cretaceous—but Middle Tertiary. Europe fell back in its easy-chair and lit another cigar, with "Infernal American pretension," *sotto voce*.

But the cigar was hardly lighted, when it was flung again into the grate. Dr. Emmons had found a mammal in the—Europe sprang to its feet with a thundering "What?"—in the Trias of North Carolina. This was rather too bad. In the Old World—that land of precedent and vested privileges—they could find no precedent for suckling babies which went back or down, lower than the Tertiary. The American cretaceous pretense had been squelched. No one thought of the Oolite. It was folly to suggest Lias. Madness alone could dream of babies at the breast in the age of the Muschelkalk, Keuper, or Rodte-todt-liegende. Their very names were against it. One might as well go recklessly two steps deeper—Permian—Carboniferous, and dig extinct sucking-pigs out with anthracite coal.

But how vain are the assaults of prejudice against the gates of Truth! A fact envelops us like a nightmare—or the cool night air—however we may rage or rhyme. Emmons found two perfect little one-side jaw-bones, about an inch and a quarter long, and so smooth and perfect that a lens could detect no fracture anywhere, and he found them in that iron-ore bed which lies between the two layers or benches of the Deep River coal-bed, at Egypt, in North Carolina. This stratum of iron ore is only two feet thick; and each layer of coal, above it and below it, is about two feet thick. But the ore contains millions of teeth of reptiles and fishes belonging to extinct genera and types of Triassic age.

Dr. Leidy examined both the specimens found by Dr. Emmons, and received one as a gift for the Academy's museum. They were alike. They belonged to a little mammal no bigger than a field-mouse, but with elongated jaws; for it fed on the numerous insects of that period! Dr. Leidy has now explained to the Academy the most remarkable deduction to be drawn from these little waifs of a by-gone world. Until their discovery it was taken for granted that all jaws of mammals were provided with knuckles, knobs, or condyles, at the upper hinder end, articulating into a socket in some form of temporal bone, attached to the other bones of the skull. All other known mammal jaw-bones were single bones, armed with a condyle. Shall we say that this poor little old-fashioned Triassic mouse's jaw-bone wasn't worth a condyle? Or, more probably that condyles hadn't been invented then? Its little jaw ends, backward, in a broad, smooth, nearly straight edge, chisel-shaped. How it was attached thus to its poor little head, or whether it had an auxiliary bone with a condyle on that, to articulate into the head, are questions, like many others, waiting fortunate discoveries to be answered. Reptile jaws, instead of being simple, are made up of several pieces; first, the long bone for the insertion of the teeth, a splint bone laid along its base inside, a triangular bone at its back end, a large bone on top of that, and an articulating bone (in lieu of a condyle) capping that again. We see in our poor little mouse, a praiseworthy attempt to free itself from this horrid reptilian style of getting up (resembling the feminine coiffure of the day), without attaining to the dignity of wearing a condyle.

Probably the mouse was in the intellectual posture of that member of the London Royal Society, who, in 1776, when Paine patented the crank for the steam-engine, wrote a memoir to show that the crank was inapplicable to the steam-engine; and another and more distinguished British engineer followed his brother member's assertions, with a conclusive mathematical demonstration, to the same effect. It is soothing to believe that in Triassic, Liassic, and perhaps through Cretaceous ages, the dislocation of the jaw was a casualty unknown to mammals. All jaws as yet were many-hinged, ligamentous, and capaciously flexible. The bird-like kangaroos of the Connecticut River Valley—the enormous Hadrosaurs of New Jersey—could worry down gentry of half their own size. They had the cheek to do it.

[For the Scientific American.]

THE COCOA PALM.

BY J. CANTINI.

A brief sketch of one of the principal palm trees may be of interest to many of our readers, especially at this particular season of the year, when the leaves form such an important article of commerce, and an object of general adoration in the Christian world. In some places, especially in Catholic countries, the palm leaves are largely imported from the southern coast, and an extensive business is carried on, though only for a short time.

The inhabitant of the North, who has never visited the tropical countries, has but a faint idea of the actual beauty and grandeur of these plants, which, even in the South, amidst eternal verdure, are ever an object of admiration. From our earliest childhood we hear the word "palm" in connection with every thing that is beautiful and poetical. We speak of the "palmy days," when we think of times of happiness; and we say, "he has carried off the palm," when we allude to glory. It would be difficult to say how long the palm has been associated with religion and sentiment, as the word "palm" itself is an expression of comparatively modern times. The Romans called a tree which grows on the shores of the Mediterranean the "Fan Palm," probably on account of the resemblance of its leaves to the palm of the human hand (*palma*).

One of the loftiest of the palms is the cocoanut tree (*Cocoa nucifera*), which grows to a hight of from sixty to a hundred feet. According to some naturalists, it is a littoral plant, but Humboldt and Bonpland assert that they met with it inland (in Mexico), though of a growth somewhat inferior to those of the sea shore. The tree prefers a sandy, arid soil, and it is rare that much vegitation is found growing around it. The cocoa-palms adorn the otherwise desolate beach or the low islands. Gliding along the shore in a boat, the attention of the traveler is aroused by the doleful, wailing sound which the wind causes in waving to and fro the long leaves. There is something solemn and almost ghost-like in the appearance of an avenue of cocoanut trees, when seen by the peculiar moonlight of the tropics, especially when there is a strong breeze blowing. The leaf-crowned summit forms, everywhere, an object of truly intertropical scenery, and the palms well deserve the name given to them by Linnæus, "Kings of Vegetation."

Various, nay, "hundredfold," as the natives express themselves, are the uses of this plant, and its propagation may be considered as a never-failing source of progressive national prosperity, for it will furnish, with but little trouble, clothing, food, and habitation.

Almost every particle of this tropical production can be used. The trunk serves to build the huts; the rind or husk, which is fibrous, is used, everywhere, for matting, brushes, etc. The leaves, which measure some twenty feet in length, are, also, of great utility. The finest roofs are made of the plaited cocoanut leaves. Screens, baskets, hats, and many other domestic articles are made of them. The heart or young leaves, called "cabbage," is an excellent vegetable, which can be prepared in many different ways. The dried leaves are sometimes used as torches in dark nights, while the washer-women often burn the foliage for the sake of its alkaline ashes. In the East Indies, the leaves of the cocoa palm, like those of the Palmyra, serve the natives in lieu of paper, upon which they write with a stylus. It is not unusual that letters, written upon these leaves, neatly rolled up, and sealed with a little gum lac, pass through a postoffice.

The most important part of the tree is the nut, which grows in bunches of twelve or more in number. In some parts, the fruit can be gathered four and five times a year. The liquid or water, or, as it is generally and improperly termed, the "milk," is, in the young nuts, a most delicious draft, as it is always cool, more particularly early in the morning. It is slightly effervescent, and, if mixed with Madeira wine or brandy, it makes an excellent beverage, though many consider it unhealthy. The natives ascribe many inestimable properties to this liquid; amongst others, they pretend that, if used as a wash, "it clears the face of wrinkles and imparts to it the rosy tints of youth."

The milk is made of the kernel itself by grating it and pouring warm water over it, after which it is pressed, yielding a whitish liquid. This milk is almost indispensable in the tropics, and fully takes the place of animal milk. Bread and pastry, prepared with it, are most delicious, and retain an almost imperceptible taste of cocoanut. The albumen of the young nut is quite soft, and can be removed with a spoon, and might appropriately be termed "a vegetable blanc mange."

Another valuable and important article of commerce, obtained from this nut, is the oil. The natives all understand how to extract it from the kernel by a most simple process. They remove the kernel from the shell and boil it in water, after which they pound it in a mortar and then press it. The milk or liquid is then put over a slow fire. The oil or fat will soon float on the top and can easily be skimmed off. Two quarts of oil are usually obtained from fourteen fresh nuts. This oil, when fresh, is excellent for cooking purposes, and for frying fish and plantains; but, not being rectified, it soon turns rancid, thus giving a most disagreeable taste to the food prepared with it. The natives everywhere lavish it upon their persons, as a preventive against the sting of insects, or to give to their skin a glossy appearance. In cool weather, or even over night, it becomes quite hard, and requires melting before it can be used for burning. Cocoanut oil is, with the exception of the Cohune oil, the only article in use among the Indians of America to burn in lamps and torches.

The much-relished "toddy" is also obtained from the cocoa palm by tapping the trunk. This beverage is slightly stimulating, and, when fermentation has set in, it is intoxicating. During the state of fermentation, this liquid can be used as yeast, and the bread made with it is remarkably light and spongy.

These are the general uses which are made of this valuable plant; but the inhabitant of the tropics will discover many more, which are, however, of value only to those who live there and are able to make use of the numerous medicinal and other properties attributed to this tree.

HOW TO CLEAN PAINT.—There is a very simple method to clean paint that has become dirty, and, if our housewives should adopt it, it would save them a great deal of trouble. Provide a plate with some of the best whiting to be had, and have ready some clean warm water and a piece of flannel, which dip into the water and squeeze nearly dry; then take as much whiting as will adhere to it, apply it to the painted surface, when a little rubbing will instantly remove any dirt or grease. After which wash the part well with clean water, rubbing it dry with a soft chamois. Paint thus cleaned looks as well as when first laid on, without any injury to the most delicate colors. It is far better than using soap, and does not require more than half the time and labor.

DUGDALE'S UNIVERSAL CLOTHES WASHER.

The operation of hand washing is not only one of severe labor, but it also entails—when performed in the ordinary way—injury and great discomfort to the hands, which need constantly to be plunged in an alkaline liquid which attacks and dissolves the cuticle, acting with the friction to often remove the skin entirely from the more exposed parts. The water employed cannot in the ordinary way be raised above that point which the hands can endure, and it will be obvious upon a moment's consideration that could the friction be aided by a higher temperature than that commonly employed, and the consequent greater solvent power of the suds, the work of the laundry would be much lessened.

The accompanying engravings illustrate a device whereby

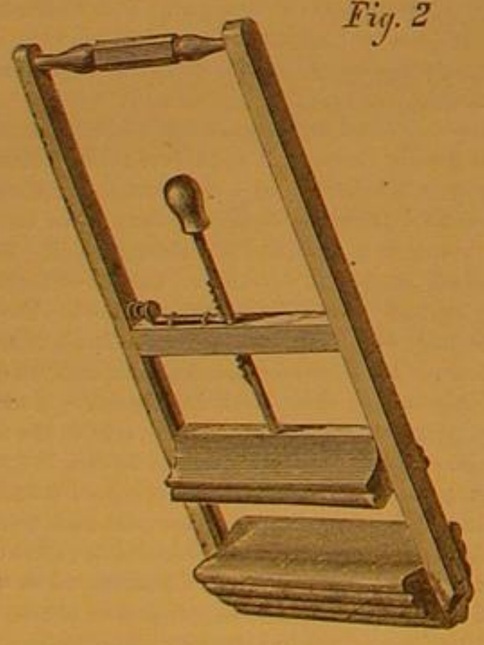
Fig. 1.



the hands are spared the discomfort and injury referred to, and the temperature of the suds may be maintained as high as is possible in an open tub.

The device is shown in detail in Fig. 2. It will be seen, it is simply a rubber, consisting of two parts in a suitable frame, which clasps the clothes when it is in use. The two parts when brought together present a rounded form, the exterior being fluted like a washboard, and the interior being made concave as shown, so that buttons, hooks, etc., may be clasped without damage.

Fig. 2



The upper part of that portion of the device which clasps the clothes, slides in grooves made in the side pieces of the frame, and is raised or opened by pressing back the bolt which locks it to its place, and pulling it upward by a knob or handle provided for that purpose.

The clothes are fastened in by pushing the knob down. Common tubs and zinc wash boards are used; the wash board is temporarily fastened in the tub, upon which the clothes are alternately drawn, and pressed down against the bottom of the tub; and they may be rubbed when required by applying one hand to the middle cross piece. This invention enables the operator to use suds hotter than the hands can bear, which dissolve the grease and dirt much more rapidly than suds at a lower temperature.

The device is very light, weighing only three pounds, and it is sold for introduction at a price within the reach of all.

Patented, January 18, 1870, by James K. Dugdale, of White Water, Indiana, who may be addressed for further information, and to whom orders for the universal clothes washer may be sent.

Artificial Ivory.—Tables for photography are made by mingling finely-pulverized sulphate of baryta or heavy spar with gelatin or albumen, compressing the product into sheets and drying it.

Improved Diamond-Pointed Steel Drill.

We have on various occasions called the attention of our readers to the great efficiency of opaque diamonds when applied to the cutting of hard materials. No existing substance can resist their action, and their durability when thus employed is very remarkable.

An annular drill used on the machine, which forms the subject of the present article, was recently employed in a tunnel of the Consolidated Bullion and Incas Silver Mining Company, Colorado, the tunnel having been at the time driven 600 feet into the mountain. This drill cut horizontally through 417½ feet of very hard quartz and feldspar rock; the expense for diamonds in drilling this distance being only thirty dollars.

This is only one of the daily accumulating proofs of the wonderful industrial value of the opaque diamonds, or—as they are more commonly called—carbons, and the great economy secured in their use for cutting and abrading the hardest materials.

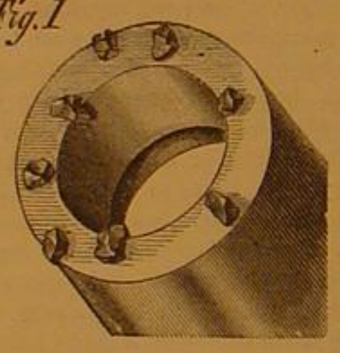
We cannot, perhaps, place the defects of percussion drilling in a stronger light than by quoting from the report of the Commission to the Paris Universal Exposition.

The Commisson, after describing M. Sommeilier's machine—which has its solid steel drill attached direct to the engine piston, and conceding its manifest superiority over other percussion borers, proceed to say:

"Let us now inquire if this apparatus has answered the expectations of its author, and if this system of percussion will really render the service expected of it. We do not hesitate to express the opinion that it has not; and the following data will, we think, prove beyond a doubt that a percussion machine is not the one that should be employed in this kind of work.

"If we examine the staff employed in repairing the percussive tools, then used at the Mont Cenis tunnel, we remark that in 1863, for eight machines working there were sixty in the shops. At this time (1867), when the work is carried on both from the French and Italian sides, the number of engines working is sixteen, and the number of those in the workshops repairing is two hundred.

Fig. 1



"Twenty-four men were constantly employed in repairing eight machines."

The Commission proceed to say, that, even admitting the possibility of constructing machines so that excessive repairing might be avoided, the percussion system is still liable to the objections that it makes an extravagant demand upon motive power, and that it cannot, on account of the great vibration be made to drill a circular hole to any great depth, which is a serious obstacle to the use of cartridges in blasting. They further express their conviction that the percussion system must eventually give place to the rotary system of drilling rocks, and warmly indorse the latter system as represented by the Leschot diamond annular drilling machine at the Exposition.

From the study of the imperfections of the system of percussion drilling, M. Leschot conceived the idea of setting diamonds in an annular cutter, the general form of which is shown in Fig. 1.

In the report of the Paris Exposition, before alluded to, the Commissioners make a comparison between the power required to penetate rock by means of this annular cutter, and that required by those drills which pulverize the rock to the full width of the hole, and pronounce the same to be in the proportion of 61 to 204.

This fundamental part of the device has, however, been improved upon since the introduction of the machine into this country. The diamonds are now securely fastened, and are set so as to give ample clearance, for the free descent of the drill, and the movement of the core through the tubular stem of the ring-cutter.

Great improvement has also been made in the various working parts of the apparatus. The original French machine only admitted the rotation of the drill at a speed of one fourth that now employed. The feed gear has also been greatly improved, so that the cut of the diamond tool may be, without delay, changed from the one hundredth part of an inch to the four hundredth part of an inch at each revolution of the drill; and this gear is now so constructed as to automatically adjust the feed to varying hardness of the rock through which the drill successively penetrates, giving slower feed when hard *strata* are encountered, and resuming its rapid feed when the hard *stratum* is penetrated.

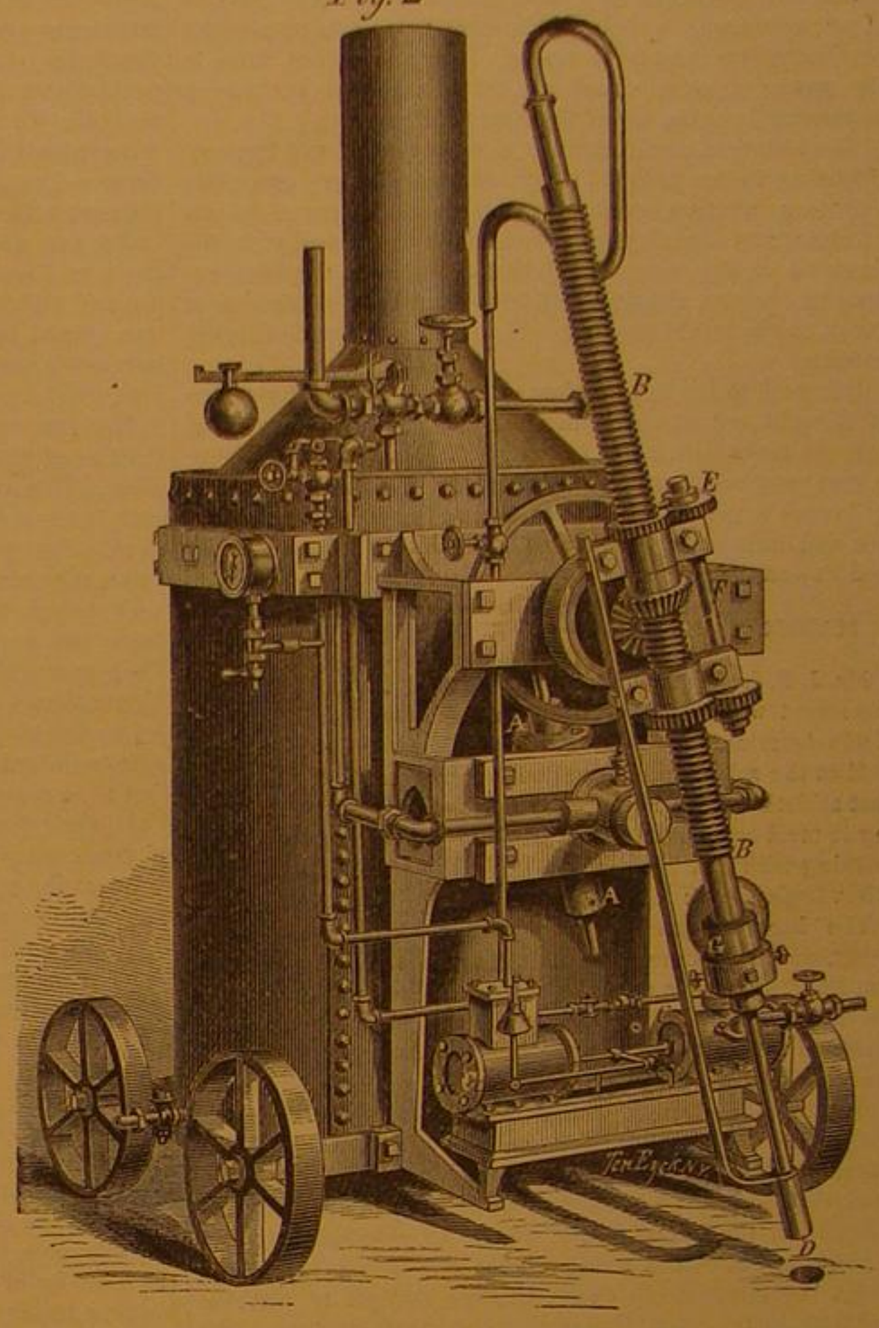
The oscillating cylinder engine has been substituted for the fixed cylinder engines, and is specially constructed to adapt it to this purpose; securing superior speed, lightness steadiness, and durability.

A swivel head has also been added, by which the drill may be pointed in any direction; and the drilling may proceed at any possible angle with the vertical axis of the entire apparatus.

The hollow screw shaft is also an American improvement, which, added to the numerous other minor improvements, renders the machine, as we herewith present it, in the accompanying engravings, almost unrecognizable as the offspring of the original French machine.

The machines used in driving tunnels bore from three to five holes simultaneously, each in a different direction if desired.

Fig. 2



LESCHOT'S DIAMOND-POINTED STEEL DRILL.

Fig. 2 represents a "No. 1 Prospecting Drill," so called because of its general use in testing the character and value of mines and quarries. It consists of a small, upright boiler, to one side of which is firmly bolted the cast-iron frame which supports the engine and swivel drill-head, gears, and screw-shaft, as shown in the engraving. The engine—an oscillator of from five to seven-horse power—is shown at A. B is the screw-shaft with drill passing through it. This shaft is made of hydraulic pipe from five to seven feet in length, with a coarse thread cut on the outside. This thread runs the entire length of the shaft, which also carries a spline by which it is feathered to its upper sleeve-gear. This gear is double, and connects by its lower teeth with the beveled driving-gear, and by its upper teeth with the release-gear, E. This release-gear is feathered to the feed shaft, F, at the bottom of which is a frictional gear fitting the lower gear on the screw shaft, which has one or more teeth less than the frictional gear, whereby a differential feed is produced. This frictional gear is attached to bottom of feed shaft, F, by a friction nut; thus producing a combined differential and frictional feed which renders the drill perfectly sensitive to the character of the rock through which it is passing, and maintains a uniform pressure upon the same. The severe and sudden strain upon the cutting points, incidental to drilling through soft into hard rock, with a positive feed, is thus avoided.

The drill proper (passing through the screw shaft, B), consists of a tubular boring bar, made of lap-weld pipe, with a steel bit or boring-head, D, screwed on to one end. This bit is a steel thimble about four inches in length, having three rows of black diamonds in their natural rough state firmly bedded therein, so that the edges of those in one row project forward from its face, while the edges of those in the other two rows project from the outer and inner peripheries respectively.

The diamonds of the first-mentioned row cut the path of the drill in its forward progress, while those upon the outer and inner periphery of the tool enlarge the cavity around the same, and admit the free ingress and egress of the water as hereafter described. As the drill passes into the rock, cutting an annular channel, that portion of stone encircled by this channel is of course undisturbed, and passes up into the drill in the form of a solid cylinder. This core is drawn out with the drill in sections of from 8 to 10 feet in length

The sides of the hollow bit are one fourth of an inch thick, and the diamonds of the inner row project about one eighth of an inch, so that the core or cylinder produced by a 2-inch drill (the ordinary size for testing) is one and a quarter inches in diameter.

Inside the bit, D, is placed a self-adjusting wedge which allows the core to pass up into the drill without hindrance, but which impinges upon and holds it fast when the action of the drill is reversed—thus breaking it off at the bottom and bringing it to the surface when the drill is withdrawn.

In order to withdraw the drill it is only necessary to throw

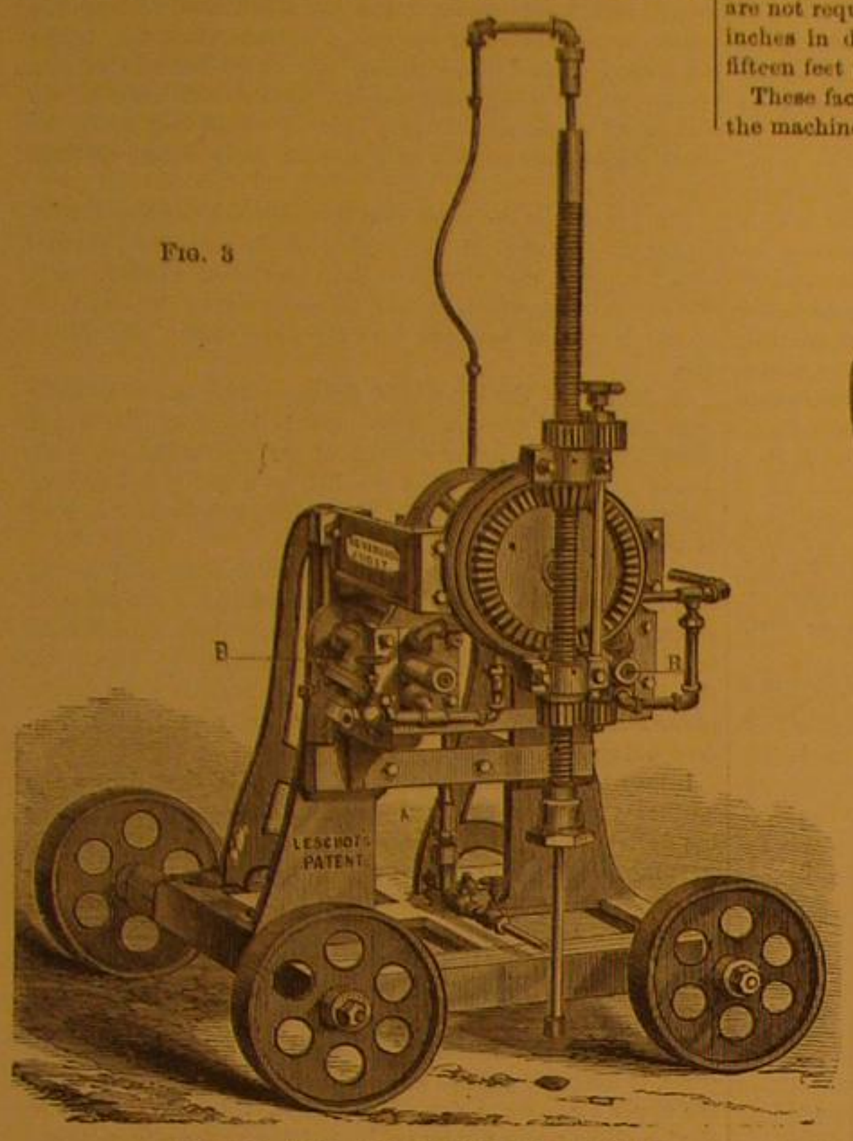


FIG. 3

OPEN CUT OR QUARRY DRILL.

out the release gear, E, by sliding it up the feed-shaft, F, to which it is feathered, when the drill runs up with the same motion of the engine which carried it down, but with a velocity sixty times greater; that is, the speed with which the drill leaves the rock, bringing the core with it, is to the speed with which it penetrates it as 60 to 1—the revolving velocity in both cases being the same.

The drill rod may be extended to any desirable length by simply adding fresh pieces of pipe. Common gas pipe is found to serve admirably for this purpose, the successive lengths being quickly coupled together by an inside coupling four inches long, with a hole through the center of each to admit the water. The drill is held firmly in its place by the chuck, G, at bottom of screw shaft.

The small steam pump, C C, is connected by rubber hose with any convenient stream or reservoir of water, and also with the outer end of the drill pipe, by a similar hose having a swivel joint, as shown in the cut. Through this hose a ¼-inch stream of water is forced by the pump into the drill from which it escapes between the diamond teeth at the bottom of the bit, D, and passes rapidly out of the hole at the surface of the rock carrying away all the grit and borings as fast as produced. Where water is scarce or difficult of access, a spout is laid from the mouth of the hole to the tank or reservoir and a strainer attached to the connecting hose, so that the same water may be used over and over again with but little loss.

This pattern rotates the drill from 300 to 360 revolutions per minute.

Figs. 3, 4, and 5 represent, respectively, drilling machines of various kinds, designed for particular uses, but identical in all essential points with the one described.

Fig. 3 is an open-cut or quarry drill, designed for blasting and gadding purposes. It is also extensively used for railroad grading, surface mining, well-boring, etc., where it is necessary to have the boiler at a distance from the drill, or to connect with a stationary boiler on the premises. This machine is adapted to rotate its drill from 900 to 1,000 revolutions per minute.

Fig. 4 represents a single-drill tunnel machine, constructed to work in tunnels of any hight, from four to sixteen feet; boring holes at any required angle, as near to the top or bottom of the heading as desired, and close to either side wall.

Fig. 5 exhibits the heaviest prospecting and well-boring machine. This machine bores holes from two to four inches in diameter, and to any depth within one thousand feet. We have personally witnessed the working of the drill, as herein described, and can say that nothing like its efficiency and rapidity of work, has been manifested by any other rock-drilling apparatus we have seen. A machine, like that shown in Fig. 2, cut through Hell Gate rock (very hard) at the rate of eight and one half inches in four and one half minutes, and through brown sandstone at the rate of thirteen inches in two and one fourth minutes in our presence, notwithstanding that its operation was retarded by the bad quality of the oil used for its lubrication, and want of sufficient steam to run at maximum speed.

In very hard trap-rock quartz or granite, eight feet per hour is found to be fair average rate of boring, where holes are not required to be over one hundred feet deep and two inches in diameter; while in sandstone, marble, slate, etc., fifteen feet per hour is easily bored.

These facts, together with the simplicity and solidity of the machinery, obviating the vexatious delays and expensive repairs incidental to percussion drilling, place these machines in the front rank of labor-saving inventions.



FIG. 4

SINGLE DRILL TUNNEL MACHINE.

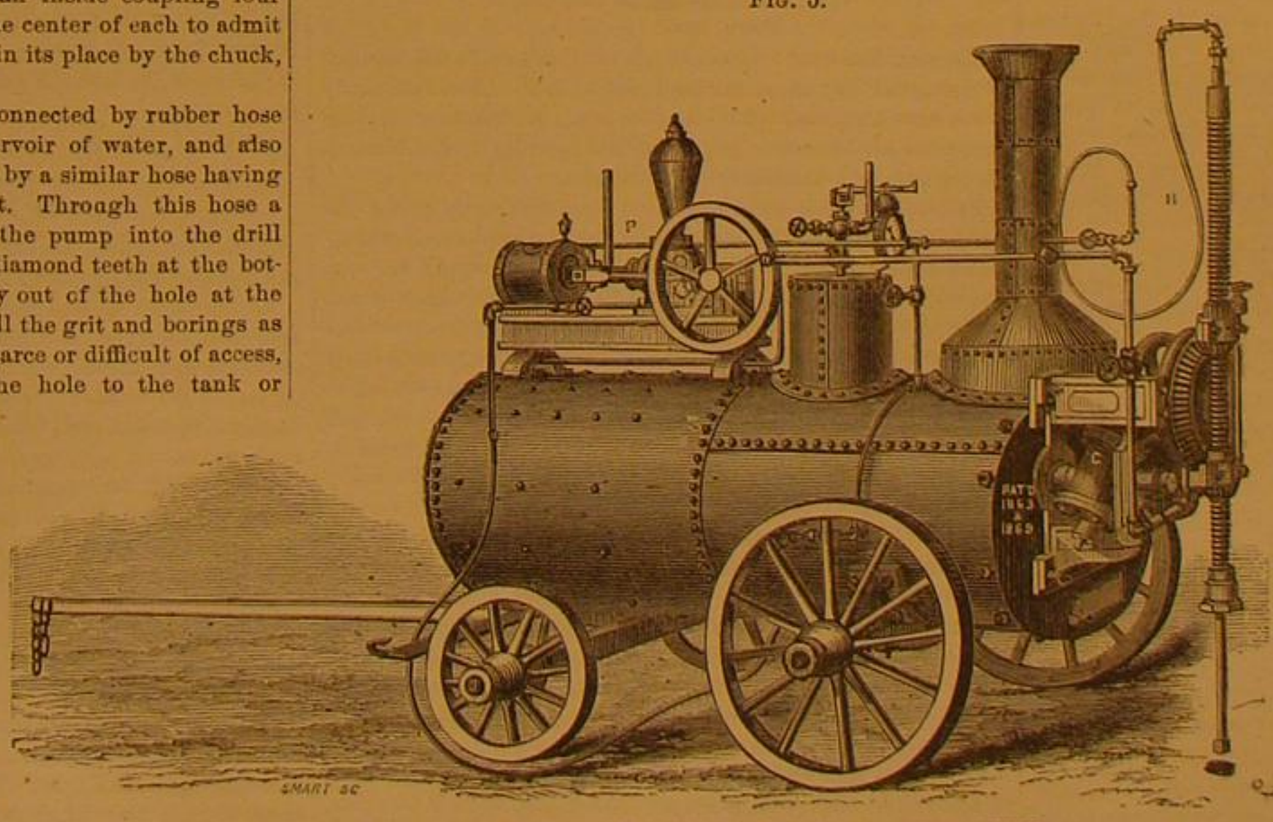
The first patent issued in America for this application of the diamond was granted to M. Leschot, July 14, 1863, and reissued to Messrs. A. J. Severance and W. T. Holt, Feb. 16, 1869, and October 26, 1869.

A second patent, covering the various mechanical devices employed in operating the tool, was granted to W. T. Holt and John North, June 22, 1869.

During the past two years—within which time the invention came into the hands of its present proprietors—all the above-mentioned improvements over the French machines have been made, and the drill successfully introduced into the principal Eastern, Middle, and Western States, and the Southern States of Maryland and Virginia.

For further information as to rights and machines, address Severance & Holt, 16 Wall street, New York.

FIG. 5.



HEAVY PROSPECTING AND WELL-BORING MACHINE.

The Future Supply of Bituminous to the Eastern Markets.

A brief glance at any geological map of the coal regions of Pennsylvania, which cover nearly one-third of the entire area of the State, will be sufficient to convince any one of the vast future importance of our bituminous coal-fields and the magnitude of their boundless resources; but only when compared with the insignificant areas of our anthracite coal-fields, can we appreciate the value of those immense deposits of the most available of fuels.

We possess, says the *Miners' Journal*, considerably less than 500 square miles of anthracite coal formation, and even this limited area has been ruinously encroached on and curtailed by wasteful and improvident mining. Yet those little basins now produce over 15,000,000 tuns of coal annually, or more than two-thirds of the entire coal production of the State.

We may live to see the time when the coal-fields of the State shall produce 50,000,000 tuns annually, since the yearly increase may reasonably be estimated at 2,500,000. Of course this cannot come from the anthracite mines. Our bituminous coal-fields must furnish the largest portion of the annual increase of the coal trade. Anthracite will, moreover, become too scarce, expensive, and valuable for use, when the bituminous will answer the same, or even a better purpose. The royalty on anthracite is, and will be, a large item of its economy, while the cost of mining is, and must be, greatly in excess of the comparative cost in mining bituminous coal. The relative distances from markets, or places of consumption, are in favor of the anthracites in the East, while in the North, Northwest and West, the distances are in favor of the bituminous; but generally the advantage will, in future, be more and more in favor of the latter and against the former, except in favored localities.

With 16,000 square miles of bituminous coal-fields, and less than 500 of anthracite, we must draw largely on the one to save the other in the future. Providentially, we find in bituminous coal the elements needed by science, pre-eminently, for the advancement of the industrial arts of the age.

A pure and rich bituminous fuel is adaptable to all the wants of society for the production of light, heat, and force. It may, or can take the place of anthracite in almost, if not every case, where fuel is required, but anthracite cannot so generally take the place of bituminous coal.

All coals undergo destructive distillation in their combustion, but anthracite, being mainly solid carbon, will only yield its gas, or ignite and burn, under a high temperature. But bituminous coal is readily converted into gas, ignites easily, and burns under a comparatively low temperature, and gas, however produced, will yield greater results in heat than can be obtained from any crude mineral fuel; while the gas is clean and pure, which can scarcely be said of our best coals in their raw state.

In the Siemen's and other similar processes, for the production of cheap gas as a fuel, from ordinary bituminous coal, and its application to the manufacturing arts, we must recognize a scientific improvement of great practical value, adaptable to an almost unlimited extent, and available, not only where intense heat and a pure fuel is required, but also in nearly all cases where coal is scarce and dear, and economy is a consideration.

We find in the statistics of the coal trade for the past year, that the production and consumption of bituminous coal is increasing in a greater ratio than the anthracite. This must continue in the future, until the bituminous column, which a few years ago was insignificant in amount, will lead the coal trade in Pennsylvania. It is now used in our rolling mills and forges, even in the midst of the anthracite mines. This seems like "carrying coals to Newcastle," but is nevertheless a fact; while for the production of illuminating gas, a rich bituminous is the only coal at present made use of.

Anthracite is a monopoly. It is limited and invaluable for certain important purposes, for use in the blast furnace, for domestic uses generally, and many other cases, where bituminous coal cannot come into competition in the Eastern markets; but the tendency of innovation is against the latter and in favor of the former. Bituminous coal may substitute anthracite in many cases, but anthracite will rarely replace bituminous in future.

Faraday's Titles.

Faraday had ninety-five titles and distinctions conferred upon him. One of them, namely, that of F. R. S., was

sought for; all the rest were spontaneous expressions of respect and good-will from the societies named; but, after all, his best title was that of a true gentleman. All men spoke well of him. Although of humble birth, he never sought social distinctions; although born poor, he never coveted riches. In this respect he was very different from Sir Humphry Davy, who had vast ambition, and was eternally pining after rank. According to Sir Wm. Thomson, "Faraday had great kindness and unselfishness of disposition, clearness and singleness of purpose, brevity, simplicity, and discreetness—sympathy with his audience or his friend—perfect natural tact and good taste—thorough culture, and an indescribable quality of quickness and life."

Correspondence.

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

Do Locomotives Ever Die?

Messrs. Editors:—From what I have seen I am led to believe that locomotives are kept in use till they are killed. Their weak and corroded shells are unable to withstand the pressure put upon them, and they finally explode, killing and wounding the attendants. Then the responsible parties are wont to put on an innocent and mysterious cast of countenance, and ejaculate "What an unaccountable mystery are these steam boiler explosions!" About three years ago a locomotive boiler exploded on the Richmond and Petersburg railroad. It had been in use *only* about eighteen years. Soon after one on the Virginia and Tennessee road *only* about sixteen years old. Two years ago I saw one within five minutes after it exploded, in Chattanooga, Tenn. The break was along the edge of the lap in the center sheet of the bonnet, and on the bottom at this point the iron was only about one eighth of an inch thick, with deep blotches of corrosion up to the water line, but deeper and clearer near the bottom. This boiler had been in use *only* about sixteen years. I have since seen another that exploded on the Virginia and Tennessee road. In this case the engineer refused to go longer on the machine knowing that it was unsafe. He was discharged and a green engineer put in his place. The result was that, within an hour, he and his fireman and the engine were torn into fragments. It is hardly necessary for me to write that the superintendent of motive power was not tried for murder, and this scrap heap was *only* about eighteen years old. Within a few weeks an engine exploded on the Chesapeake and Ohio road; the first point of rupture was along the edge of the longitudinal seam of the center sheet at the bottom of the bonnet; the piece taken out increased in width to the top, along the first point of rupture. The iron was not over the eighth of an inch thick, with deep blotches and furrows of corrosion; the boiler had been in use nearly eighteen years; the stay bolts were badly worn; the fire-box in none too good a shape; and yet the boiler is being repaired by putting a new bonnet to the old fire-box.

I hope others of your many readers will communicate the facts bearing on this subject, with a view to ascertain at what age of continuous use locomotive boilers are dangerous by reason of corrosion. E. A. Dayton.

Richmond, Va.

Suggested Improvements in Sawing Lumber.

Messrs. Editors:—The lumber system of the United States presents one of those curious problems that can only be accounted for by the bounteous provisions of nature, which has given us enough to use with a large surplus to waste. At least 25 per cent of the stuff after being "squared" goes into sawdust and shavings, making a direct waste of one fourth the timber, to say nothing of the cost of reducing it to shavings and sawdust.

Let us look into this system, and see if there is not some reform demanded, and where the remedy lies. In most other countries lumber is brought to market in squared logs or heavy planks, and, after seasoning, or partial seasoning, is reduced to special dimensions by re-sawing. In England, planing mills and all wood-working establishments, saw their stuff to order—forest-cut stuff of all sizes or thin boards is not known. Here lumber is sawed green, reduced to boards and stuff of all imaginable sizes, in the forest, and then brought to market to be worked on planers without seasoning. Let us consider the two systems, and see if there is not some way of saving stuff and reducing the cost of working it.

Under our American system, as before stated, the lumber is sawed into boards and scantlings when green, in the forest mills. An ordinary lumber mill makes a kerf one fourth inch wide, which in manufacturing inch boards, turns *one fifth* of the squared stick into sawdust. Then again to compensate for irregular seasoning and warping of the stuff, the deviation of the saws, etc., at least another tenth is wasted, making a total of three tenths of the stuff. This extra thickness mentioned has, with the exception of the shrinkage, to be planed off when the stuff is worked—planed off from a surface covered with grit, dust, and dirt of transportation. Stuff that has been rafted in our western rivers after being sawed into boards, almost defy the planing and other lumber-dressing machines, until the "crust is off."

Another evil of our lumber system is the large amount that our yards have to keep on hand to make an assortment; few of them have the appliances for "cutting out" a bill of stuff. Rafters, studding, joists, beams, etc.—in fact everything but the thinnest boards—have to be searched for among the forest-cut stuff. If a customer wants a lot of special pieces, his only resource is to go to the log mill, and get it green.

The attention of the writer was called to the difference between our own and the English plans of preparing lumber, by the character of the machines used for planing. While the English tools for re-sawing are much heavier than ours, their planers we would call toys, in fact, there are not made at this time in England any planers that would work our American lumber; the width of the belts (which may be taken as an exponent of their capacity) is about one half our standard, and yet they do all that is required of them; the secret being that they *saw* their stuff, we *plane* ours. To compare the two plans on a basis of economy in either material or power, would be superfluous. Their deal frames, as they are called, have gang saws of from 14 to 16 gage, making a kerf of about one-sixteenth inch in width; and the cost of re-sawing planks into deals or boards on their machines, is amply compensated for by the saving in the amount of timber consumed, to say nothing of what is gained in planing or shaping it afterwards.

The want of efficient machines for re-cuttting, that could be set up in our planing mills, has been the great hindrance to re-sawing in this country. A reciprocating saw with a single blade (which is generally used) makes re-sawing expensive, while nothing but permanent earth foundations will prevent them from jarring the buildings. It is to be hoped that the band saw mill will take their place and fill this want, and that our forest mills will in time stop the manufacture of any kind of lumber but planks and squared beams from the green log.

Philadelphia, Pa. J. R.

A Magic Square.

Messrs. Editors:—The accompanying magic square is sent to you, not because it is formed on any new plan, but because it is different in some particulars from the more ordinary magic squares, and may be of interest to your readers.

The numbers used are 1 to 100. The whole square is a magic square, having the number 505 as the sum of its lines,

90	14	12	100	84	93	4	96	10	2	
16	66	36	37	63	22	80	81	19	85	
92	39	61	60	42	75	25	24	78	9	
7	59	41	40	62	23	77	76	26	94	
88	38	64	65	35	82	20	21	79	13	
18	55	50	54	43	27	73	72	30	83	
86	45	52	48	57	70	32	33	67	15	
3	44	53	49	56	34	68	69	31	98	
6	58	47	51	46	71	29	28	74	95	
99	87	89	1	17	8	97	5	91	11	

files, and diagonals. If the margin is disregarded, as indicated by the continuous line, the square will still be a magic square, having now 404 as the sum of its various lines. And if this square be divided into quarters, as indicated by the double lines, the four resulting squares will each be magic squares, having 202 as the sum of their lines.

Philadelphia, Pa. Pfeil.

Free Rail Joints.

Messrs. Editors:—I know not to what extent this method of laying railway track has been adopted, but I have certainly never seen a railway which had a more satisfactory appearance after an extended use, than that portion of the Nashua road which is constructed upon this plan.

No chair is used, and there is no sleeper directly under the rail joints; but in addition to the usual simple and strong four-bolted "fish joint," two broad faced sleepers are employed, close together, and so as to bring the ends of the abutting rails between them. This arrangement insures a free and open joint by allowing all dirt and clogging material to fall out, which of course leaves the opening free to its legitimate purpose, the expansion of the rails. The base of each rail is notched about midway for the reception of a spike to hold the track in its true longitudinal position, and to bring the expansion of the rail each way from its center.

One of the chief causes of the derangement of railway track is doubtless the clogging up of rail joints; rails will expand and contract, and whatever opposes such expansion and contraction sufficiently will throw the track out of line.

The mere action of sun and frost causes a variation of about three feet in the length of every mile of rail; hence the importance of this provision for the unobstructed play of the rails endwise.

If track is laid during very warm weather, one sixteenth of an inch at each joint is ample; but if laid in cold weather, three sixteenths of an inch is not too much to allow at each joint or for each rod of track. F. G. Woodward.

Australian Climate.

Messrs. Editors:—I should be glad if you could give some information on the following subject. Perhaps Capt. Maury will explain it to us.

I am unable to understand the cause of the dry climate of extra-tropical Australia in its summer season. It is long since I read Maury's excellent book, the "Physical Geography of the Sea," but I think it omits an explanation of this; and I have never seen one, that I am aware of. On the Bay of Bengal, the China Sea, and the Pacific, off the Philippines, the dry northeast monsoon, which is equivalent to the moisture-absorbing northeast trade, blows from October to March. This, by Maury's theory, should rise about the equator and then blow, as an upper current of air, toward the southeast, above the southeast trade of the southern tropics. Then, as in the case of the trade winds, descending about the latitude of thirty degrees south, it ought to give summer rain, say, from November to April, in the southern half of the Australian continent.

I notice, however, in maps of physical geography that the northeast monsoon does not cease at the equator, but blows into the southern hemisphere, still as a surface wind, of course changing its direction and blowing from northwest. It rises and becomes an upper current only on reaching the latitude of the northern limits of Australia. Then, it may be, having gone so far south before rising, it does not again descend from the upper atmosphere and become a surface wind, till, in its southward course, it has passed the usual latitude of this change, or, till it is almost beyond the southern limits of the Australian continent. In this case it would only make the ocean region southwards of Australia rainy during its summer months.

But I notice by the maps that the southern parts of Australia are not included in the region of the southeast trades; and I suppose, may therefore have northwest winds in their warmer months, which should be supplied by the moist air of the northeast monsoon from the East Indian and China seas.

In the case of the hot winds the air would seem to come from the central deserts. This must be replaced, one would think, by this wet upper current of air descending on these desert parts. They may be too hot to allow of its raining there, but on the wind going to the southwestward, in rear of the hot wind, it might rain.

Are the hot winds of southeast Australia thus followed by rain? Perhaps even the south of Australia is too warm in summer to condense this moisture. Should these suppositions be correct, it must follow that, during all the dry season, in the southern half of Australia the upper regions of its atmosphere must contain plenty of moisture, only prevented from descending by local peculiarities.

It may be the heated surface of Australia that draws the northeast monsoon as a surface wind across the equator, as the deserts of central Asia are supposed to cause the southwest monsoon during the other half of the year. Could the surface of the country be covered with any vegetation to prevent the reflection of heat from the bare ground—especially in the north and west central deserts—the monsoon might rise about the equator and descend again, about thirty degrees south, as a rain giving wind to all the land south of that.

But might not merely planting forests in the southern parts, to keep the ground and air cool, induce the moisture of the upper air to come down? Even in this wet district of Ceylon there seems a very evident difficulty for rain to begin to fall again after the ground has got well dried and hot. Could not the rain be brought down by any means in the shape of thunder showers? In this country, though the rain is mainly, and clearly, distributed in accordance with Maury's theory, still a great deal falls in the shape of thunder showers in the valleys in rear of the hills. Hills often, at this time, get less rain than the low valleys; the thunder showers seeming, in great measure, to avoid the hills. The moisture for these thunder showers seems to come down daily from the higher regions of the air.

I fear I have made this too long, and must stop at once. I would say that the great rains of Australia in winter are as much a puzzle to me as its dryness in summer. I should be glad to see an explanation of both by an able hand. If my explanation, so far as it goes, be wrong, I should be glad to see it corrected. J. Taylor.

Island of Ceylon.

The Darien Canal.

The New York *Journal of Commerce* enumerates the advantages of the proposed Darien Canal as follows:

As compared to the route *via* Cape Horn to Calcutta, there would be a saving of 9,600 miles; to Canton, 11,900 miles; to Shanghai, 11,600 miles; to Valparaiso, 8,100 miles; to Callao, 10,000 miles; to San Francisco, 14,000 miles; to Wellington, New Zealand, 2,620 miles; to Melbourne, Australia, 2,830 miles.

The saving, in comparison to the Cape of Good Hope route, would be, to Calcutta, 4,100 miles; to Canton, 8,900 miles; to Shanghai, 9,600 miles; to Wellington, 5,260 miles; to Melbourne, 3,340 miles.

For the English trade to India, the Suez Canal would offer better inducements, but the time and expense of English vessels to China, Japan, and Australia, would undoubtedly be abridged by the Darien Canal; at all events, the canal may be expected to take a share of England's traffic which now comes and goes through the Suez Canal. All American vessels trading with Japan, China, and Australia, and, of course, those bound to and from the Pacific coast, will seek the American Isthmus Canal. It advantageous effect upon American commerce and national prosperity would be immense.

Improvements in Locomotion.—Sir Joseph Whitworth, at a recent dinner of the Foremen Engineers, deprecated the use of horse tramways as unsuited to the times. He further intimated his opinion that "mechanical engineers have a right to enter their protest, considering the many obstructions there have been for many years past to the employment of road locomotives." Sir Joseph thinks it quite possible to produce a small, light locomotive, which would work quietly and effectively for use on roads; but, as a preparatory condition, he recommends that the roads should be better made, and kept in a proper state of surface by the use of steam-rollers, steam-sweeping machines, and other appliances.

GENTLEMEN GLASS-MAKERS.

According to the testimony of several authors, the general opinion admitted even in the present day is that formerly the mere trade of a glass-maker carried nobility with it; in a word, that every common glass-maker was ennobled by the mere fact of the nature of his trade.

Since such a prerogative—however impolitic it must have been, by doing the most flagrant and unmerited injustice to other important branches of industry—has been, and is still admitted as an historical fact, let us examine for a moment, as briefly as possible, on what ground this nobility rests, if it ever existed, and what could have been the origin of the error.

The two principal offenders, in our opinion, are a poet and a celebrated potter; the first (Frangois Maynard, French poet, born at Toulouse in 1582, and died 1646), by saying in his epigram against the poet Saint Amand, "Your nobility is puny, for you are not descended from a prince, Daphnis; *gentleman of glass*, should you fall to the ground, then farewell to your dignity;" and the second (Bernard Palissy, born in the diocese of Agen, about 1510, died in Paris, 1589), by employing this phrase in his immortal work, "Glass-making is a noble art, and those engaged in it are noble."

First, we undertake to establish that we are far from believing that a common glass-maker, more than any other manufacturer, ever merited or even ever obtained letters of nobility. Passing over these very rare exceptions, we are concerned here only with the corporation as a whole; in short, we shall endeavor to prove that, in France, the condition, the art even, if you like, of the glass-maker did never of necessity confer nobility on every one practicing it.

As regards the two authorities antagonistic to our opinion, we give the text of one of numerous decrees which were issued against the plebeians on all occasions when they attempted to lay claim to nobility.

Here is the text of a decree of the *Cour des Aides*, at Paris, in September, 1597.

". . . from the mere fact of working and trading in glass-ware, the glass-makers could not claim to have acquired nobility or right of exemption; nor, on the other hand, could the inhabitants of the locality assert that a nobleman was doing anything derogatory to his title by being a glass-maker."

From this enactment, repeated on each new attempt at usurpation, the natural consequence is, that the ordinary glass maker did not acquire nobility, and that the nobleman did not forfeit his by devoting himself to the glass trade. A still more recent proof is found in Article 2 of the privilege granted to Du Noyer, by Louis XIV., 1665, to found the manufactory at St. Gobain, "Du Noyer may take as co-partners, even nobles and ecclesiastics, without it being derogatory to their nobility."

In support of our assertions, let us further cite an article of a decree issued by the Venetian senate, which certainly of all past governments is that which has accorded the greatest number of prerogatives to glass-makers.

"The Senate decides that the marriage of a nobleman with the daughter of a glass-maker is contracted with the condition that the title of nobility be transmitted to their issue."

Nobility then is for the son of a noble; but as is seen, plebeian rank is still for the father-in-law.

The question of plebeians not having a right to nobility, as well as that of non-forfeiture for the noblemen being thus clearly settled, let us see what advantages accompanied the privileges generally conferred on noblemen, a favor of which we will shortly mention the cause.

These privileges are all mentioned in the letters patent of November 24, 1598, conferring on Balthasar de Belleville, applying equally to him and his brother nobles, the permission to establish a glass-house in Normandy, and declaring them exempt from all excise, subsidies, imposts, customs, taxes on land, barriers, highways, tolls, commissions, *bandage, robinage*, district, passage, and bridge and river dues.

In a word, the gentlemen glass-makers were then released from all existing imposts, which it is evident were rather numerous.

Was this favor—monopoly even, if you like—granted to nobility, prejudicial to plebeian glass-makers, as several writers have affirmed? We believe the contrary. While allowing even that the nobles profited by the labor of the plebeian, it is to the nobleman alone that the common glass-makers owed their establishment and afterwards their fortune.

In order to discover the origin of this association, we must go back to that remote period when the nobleman readily sold his castle in order to support the dignity of his escutcheon in a tournament; or even to those warlike times when every subject hastened to place at his king's service the vassals on his domain, both great and small, armed and equipped at his own expense. We shall then see many of them returning to these domains covered equally with glory and debt, that is, ruined.

This condition, sad for any one, was disastrous to the nobility, for it is known that the law formally excluded them, and that under pain of forfeiture of title, from commerce, by which alone they could have retrieved their fortune.

However ardently the kings of France might wish to abolish a law which pressed heavily on those alone who had sacrificed everything in the service of their country, this desire was paralyzed by the pride of the other nobles, who, still rich, compelled them to maintain in all its rigor a law in which, for fear of a subterfuge or oversight being found, all the trades then known were mentioned. At last this law shared the fate of everything not adapted to the times; and if it did not at once fall into disuse, a new importation, and consequently one not specified in the list of prohibited trades, glass-making, appeared, which allowed the kings, while still adhering to the ancient law, to profit by its silence relating to glass-making, and thus to open a resource as indispensable to the rising trade as to the re-establishment of the nobleman's fortune.

Such, in our opinion, is the real origin of the "gentlemen glass-makers," who, being nobles by birth, and no longer in dread of the law of forfeiture, in consideration of certain dues, delivered up their forests to the plebeian glass-makers. The latter, thanks to the nobles, found therein everything which they required, that is, space adapted to their trade, wood, without which they could not work, and still further, all the profits accruing from the exemptions, which being accorded to the lord alone, formed what in the present day would be known under the name of common capital.

From the preceding then, we conclude that, with some very rare exceptions, the title of "gentlemen glass-makers" was granted only to nobles who had the monopoly worked on their estate.—*Wonders of Glass-making.*

The Private Life of Galileo.

The account of the private life of Galileo, unlike many such accounts, does not give us much insight into the manners and customs and conditions of society at the time of which it treats, both because Galileo had so little real domestic life, and because the main correspondence which furnishes these private details took place between a nun (who of all persons can know least of the external world) and Galileo himself, and her letters to him have been preserved, while his answers to them have perished. Your great philosopher as a rule is exceedingly undomestic, and the proofs of this are so common that we need not quote a single example; the petty details of home weary them, and prevent the abstraction requisite for their labors: so the ancient Brahmins, who reasoned as profoundly as any light of Western civilization, lived in the solitudes of the forests of Ancient India; so Descartes withdrew himself from the world, and remained buried in the quiet of his country house while he produced his "Meditations."

Galileo also was by no means domestic. Of his three natural children, his son Vincenzio was a constant thorn in his side. He was a lazy fellow, who was always writing to his father for money, and who, Italian like, preferred to idle away his life in singing and lute-playing, to adopting any profession or attempting to get his own livelihood. We cannot find one good quality in Vincenzio Galileo; he was mean, selfish, inconsiderate, and unnatural in his behavior towards his father. One example of this is sufficient. He had quartered himself on his father, together with his wife and children, when the plague broke out in the neighborhood; whereupon Vincenzio deserted the old man, and went to a more healthy locality, leaving his father to take his chance with the other inhabitants of the district. Galileo's daughters Polissena and Virginia were placed in the Convent of St. Matthew, at Arcetri, in 1614, when the eldest was only thirteen years old; henceforth they became Sister Maria Celeste and Sister Arcangela. Of the latter we hear but little, but Sister Maria Celeste constantly corresponded with her father, and the greater number of her letters have been preserved, and are now in the Palatine Library at Florence. These letters contain some interesting details of convent life of the period, but of necessity they do not bear upon many of the doings of the outside world; their general tenor is the same throughout; they are full of her love for Heaven and for her "dear lord and father," as she was wont to call Galileo, and they almost invariably pass to an opposite extreme of matters exceedingly of the earth, earthy—the baking of cakes, the mending of linen, the getting up of his collars and so on. She tells her father all the minute details of her work, as: "I have been extremely busy at the dinner-napkins. They are near finished; but now I come to putting on the fringe, I find that of the sort I send as a pattern, a piece is wanting for two dinner-napkins: that will be four *braccia*." The last paragraph of this desultory letter begins, "These few cakes I send are some I made a few days ago, intending to give them to you when you come to bid us adieu;" and ends, "I thank Him for everything, and pray that He will give you the highest and best felicity;" and a postscript immediately follows this—"You can send us any collars that want getting up."

Galileo's villa was very near the convent, and a constant interchange of courtesy seems to have taken place; Galileo sent money and presents of meat and wine, while Sister Maria Celeste sent him plums, and baked pears, and candied fruits, and cakes, and mended his linen and kept his wardrobe in order. Her love for him amounted almost to worship, at least to veneration. When at length, worn out by watching in the convent infirmary, by ill health, and by the many privations inseparable from a convent life, she felt her end approaching, Galileo was in confinement at Siena, and she feared she should see him no more; but he was allowed to retire to his own house, and arrived at Arcetri in time to see his daughter before her death. Writing at this time (1634), Galileo says: "Here I lived on very quietly, frequenty paying visits to the neighboring convent, where I had two daughters who were nuns, and whom I loved dearly; but the eldest in particular, who was a woman of exquisite mind, singular goodness, and most heartily attached to me."

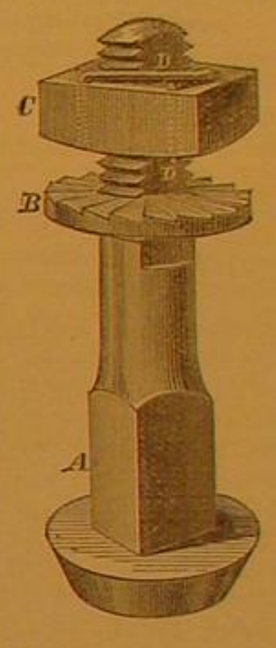
There is much in this "Private Life of Galileo" of great interest in connection with his scientific work, his books, his persecutions and trial by the Sacred College, and his condemnation; but we have preferred to keep strictly to his more private life, as the theme is so large, that if we once touched upon his scientific work and its results, we should require far more space than could be placed at our disposal here.

Galileo continued actively employed to within a few years of his death, in January, 1642. During his latter years he was a great sufferer. "I have been in my bed for five weeks," he writes to Diodati, in 1637, "oppressed with weakness and other infirmities, from which my age, seventy-four years, permits me not to hope release. Added to this, *proh dolor!* the sight of my right eye, that eye whose labors (I dare say it) have had such glorious results, is for ever lost. That of the left, which was and is imperfect, is rendered null by a continual weeping." Thus the poor old man complained, until finding that his blindness was incurable, and that his many ills were increasing, he ceased repining, and begged his friends to remember him in their prayers, till his unhappy checkered life was closed by death.—*Nature.*

LANGHORNE'S IMPROVED NUT-LOCK.

The well-recognized importance of locking nuts in all positions where they are liable to be shaken loose, has led to many ingenious devices for the purpose. The one herewith illustrated differs from many claimants to public favor, in that it may be locked and unlocked, as often as required, without injury to the device, other than the ordinary wear resulting from friction.

A is a bolt, differing only from common bolts in having one side of the portion over which the nut and washer pass, forged or filed flat. B is a ratchet washer, having its teeth formed on one side instead of on the edge, and turned toward the nut, C. The hole in the washer is made to fit to the flat portion of the bolt, to prevent turning. The nut, C, has attached to it a spring pawl, D, which is riveted at one end to the nut, and the other end plays freely through a small hole in the nut, as shown by the dotted lines.



When the nut is screwed home to the ratchet washer, the pawl, D, engages with the washer, and prevents the turning of the nut, until D is raised, by thrusting the point of a screwdriver, or some other suitable implement, under that part of the pawl which lies on the top of the nut.

For all situations where it is not convenient to permanently lock nuts, and where it is desirable to have a nut readily-removable, but which cannot shake by itself loose, this invention seems well adapted.

Patented, through the Scientific American Patent Agency, February 15, 1870, by Maurice Langhorne, of Washington, D. C., who may be addressed for the entire right or for State or county rights. Correspondence is solicited from those who have facilities for manufacturing cheaply. Temporary arrangements have been made to fill orders, which may be sent to the above address.

"Feathers" in Mahogany and other Woods.

We have been asked by a correspondent, says *The Builder*, for an explanation of the so-called "feathers" in the grain of mahogany, satin-wood, etc.: thinking others of our readers who have to do with woods may be interested in the subject, we offer the following explanation:

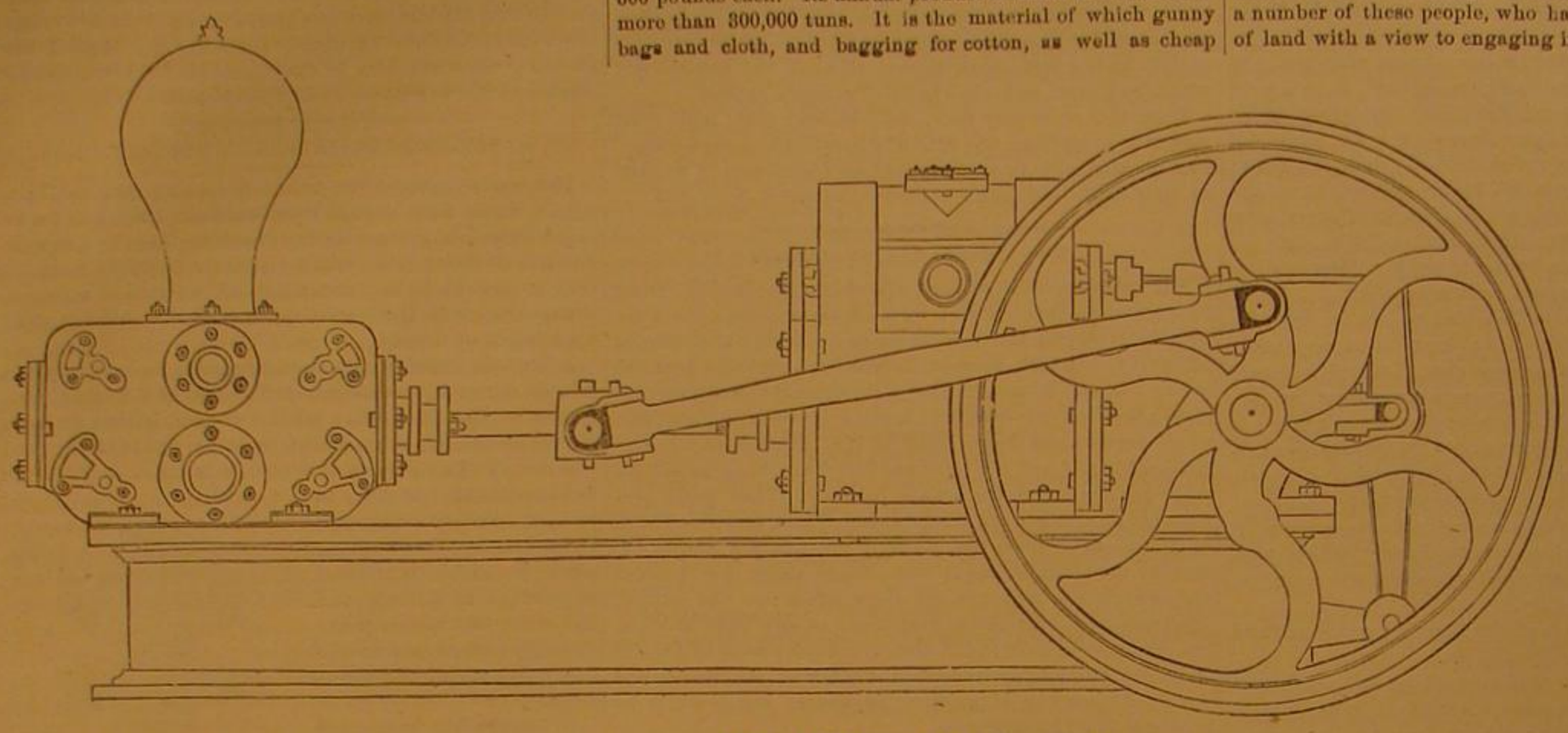
In the structure of all woods used in building, there is, firstly, a series of vessels of woody tissue surrounding the heart of the tree, having a vertical growth, and arranged in annual concentric circles; secondly, there are certain hard growths, called the "medullary rays," radiating from the heart, and consequently more or less horizontal; these vertical and horizontal growths are intimately but regularly plaited and intertwined together to give strength to the trunk, and thus far all is regularity. Now, where the branches burst through the stem, this regular arrangement is upset, and the above-mentioned woody vessels are disarranged, and pushed at different angles. When the tree is cut down and sawn horizontally across amongst these branches, these disrupted horizontal and vertical vessels (of different colors, be it remembered), are seen cut at every conceivable angle, and an ornamental "feather," more or less extensive, is the consequence. These feathers do not exist at the base of the tree, because there are no branches there to disturb the annual growths of the wood (minute feathers do indeed exist at the very heart, and these were caused by the growth of leaves and twigs when the tree was a seedling or little cutting). "Feathers" are not seen in deal because the fir is a straight-growing tree, without branches, in the portion of the trunk used in commerce. "Feathers" are seen most abundantly in "pollards," for the simple reason that after the top of the tree has been sawn off, an immense growth of branches is always induced, disturbing the tissues in every imaginable way: the action of the light on the "feathers" adds greatly to their beauty after the wood is polished.

PROF. J. W. PLYMPTON, Professor of Natural Philosophy, of the Cooper Union, was the recipient of a handsome testimonial of a silver pitcher and cup from the members of his classes, on Monday evening, April 18th, after an appropriate address by J. Pearson, on behalf of the classes, to which the Professor responded in a happy manner.

The Eclipse Steam Pump.

Two questions naturally suggest themselves to any one about to purchase an independent pumping engine, viz., whose is the best, and whose the cheapest?

The best and cheapest is evidently the one that will elevate to a given hight the greatest amount of fluid matter, for a series of years, at the least possible expense. The Lowey's patent double-acting pump herewith illustrated, is the invention of a practical hydraulic engineer, of great experience, and the pump in question is the result of his extensive practical knowledge and experience. By reference to the engravings, the reader will see that this pump is simple

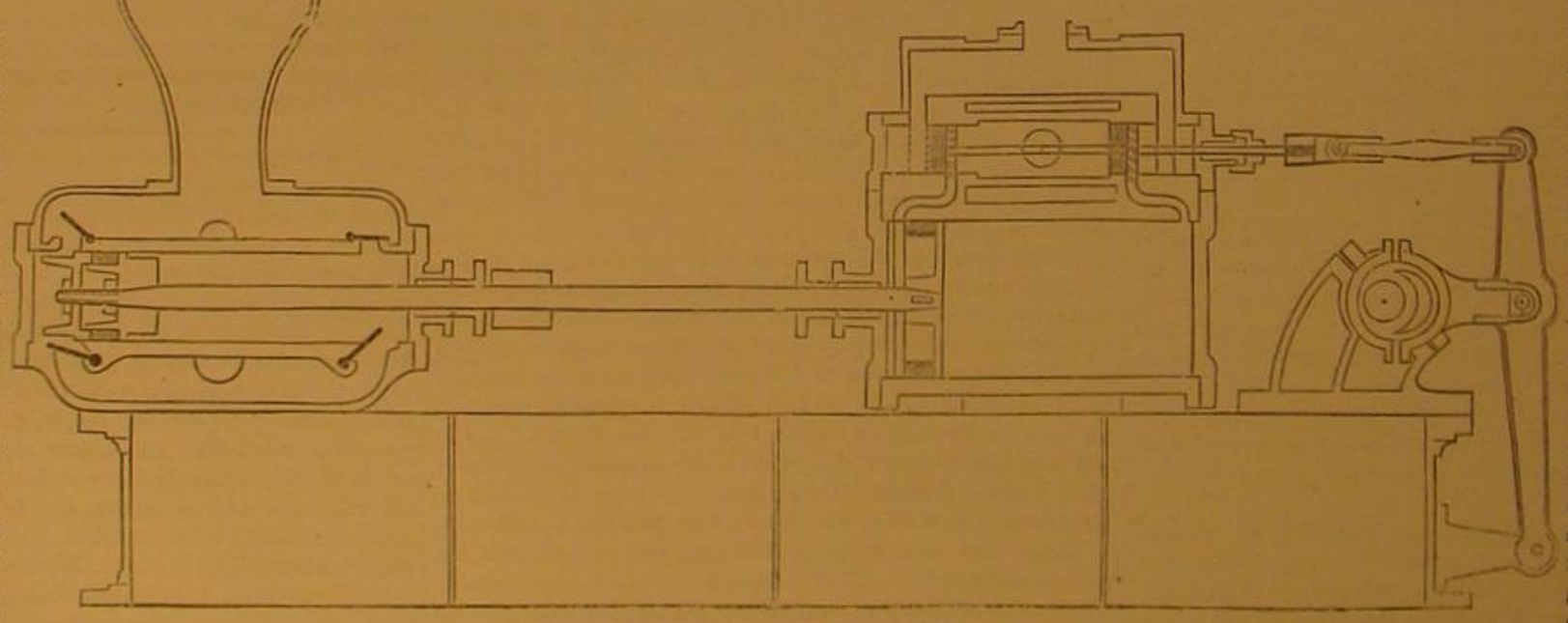


THE ECLIPSE STEAM PUMP.

in its construction; and the skillful will notice that the details are arranged to secure permanency, directness of action, ease of examination, and facility in making repairs.

Force and resistance being equal and correlative terms, it follows that if to raise 100,000 lbs. to a given hight, in a given time, it requires more than 100,000 lbs. force, the difference must be accounted for as frictional resistance, and with fluids this lost power is absorbed in friction against the walls of the pipes, according to their size, length, angles, size of openings, etc. The judicious application of the motive power, and the mechanical perfection of the working parts, act to reduce friction to its minimum. To reduce the loss of power to a minimum, has been the object sought in the construction of the Eclipse Steam Pump.

By referring to the engravings, it will be seen that the cylinder is mounted on a heavy cast iron horizontal bed, to which is likewise attached the steam cylinder and journal bearings. The work required of the pump governs the size of the steam cylinder, the pistons of which have a direct connection, and are made to work with as little friction as possible, and are likewise arranged with special reference to being kept in unmistakable good order by unskilled attendance. The steam attachments are divested of all complication, requiring but one valve, which is so constructed as to prevent unnecessary waste of steam, and balanced so as to be worked with the same ease with, as without pressure.



THE ECLIPSE STEAM PUMP.

The valves of the pump are double, so that when by long and continuous use the first surface becomes defective, they can be turned (which is only the work of a moment), and are then as good and perfect as new valves, with but one wearing surface. All the valves and openings have the same area as the pipes, the size of which is determined by the most approved hydrostatic formula; and as the movement of the piston causes a positive and continuous flow, it would seem that this pump would lift the water as high as it is possible to be lifted by vacuum, and force it as far as it can be forced by any mechanical appliance. Hence its adaptability to the requirements of the trade, including that of stationary fire engines, seems to be such as will enable it to successfully compete with any of the numerous steam pumps in market.

For further information address Phillips and Cluley, proprietors, Monongahela Brass Works, 110 Water street, Pittsburgh, Pa.

THE average depth of the Atlantic Ocean has been found to be twelve thousand feet.

The Jute Plant.

General Capron, the Commissioner of Agriculture, has imported, through the American Consul at Calcutta, a small quantity of the seed of the jute plant, with a view to introducing its culture into the extreme section of the Union south of the frost line. It is being distributed to planters in Texas and Florida, who will give it a fair trial. It is a fibrous plant, resembling coarse flax; of easy culture and rapid growth, with a comparatively large product. The crop when ripe is cut down to the roots, and after being steeped in water for a week or so the bark slips easily, and the silky fiber is detached, cleaned, assorted, and packed in bales of 300 pounds each. Its annual product in India is estimated at more than 300,000 tuns. It is the material of which gunny bags and cloth, and bagging for cotton, as well as cheap cordage, mats, and carpets, are made. Its great use, however, is for baling cotton. As it takes about six yards to wrap a bale of cotton, a crop of 3,000,000 bales would require, of course, 18,000,000 yards of bagging. The machinery for making it in India is very rude; in fact, no progress has been made in it for centuries. But jute factories of colossal size have been erected in Great Britain, some of which work up one thousand bales per week into bagging, sacking, sheeting, carpeting, duck, etc. In France some 10,000 tuns of the raw material are consumed annually; and in our Northern States its manufacture is steadily increasing. Jute is spun on machinery made on the same principle as that made for flax and hemp, but differing in size and proportion.

It is more easily worked than either of these fibers; which fact, connected with the cheapness of the raw material, accounts for the rapid progress of the jute manufacture in Great Britain, compared with linen or hemp. After being used up as bagging, etc., it finds its way to the paper mills for the manufacture of coarse papers.

The Commissioner is constantly engaged in introducing new plants for practical purposes, not only improved grains and grasses, but various hardy and exotic plants used in medicine, the arts, dyeing, and manufacturing, that cannot fail to succeed in many parts of the Union.

New Postage Stamps.

Third Assistant Postmaster General Terrell having completed his improvement of the postage stamps to take the place of those now in use, they are ready for issue. He says the gum is guaranteed to stick. The following is a description of the new stamps: One cent—Franklin, profile bust after Rubricht; color, ultramarine blue: two cents—Jackson, profile bust after Powers; color, velvet brown: three cents—Washington, profile bust after Houdon; color, milari green: six cents—Lincoln, profile bust after Volk; color, cochineal red: ten cents—Jefferson, profile bust after Power's statue; color, chocolate: twelve cents—Clay, profile bust after Hart; color, neutral tint purple: fifteen cents—Webster, profile bust after Clevenger; color, orange: twenty-four cents—Scott, profile bust after Coffee; color, pure purple: thirty cents—Hamilton, profile bust after Cerrachi; color, black: ninety cents—Commodore O. H. Perry, profile bust after Wolcott's statue; color, carmine.

Tea Growing in California.

It is unanimously admitted by those most competent to judge, that California is admirably adapted to the culture of the tea plant, the climate being especially favorable to the curing of the leaf. The opinion has even been expressed by highly intelligent Japanese now resident among us, that this State is, in every respect, better suited for growing this shrub than their native country. So confident are they of this, that a number of these people, who have already procured tracts of land with a view to engaging in the cultivation of several leading staples of Japan, will include tea in the number; satisfied that they can succeed in growing it, not only as an experiment, but render its culture commercially profitable. Over one year ago, Herr Schnell a German gentleman, who had spent many years in an official capacity in Japan, arrived in California, bringing with him a number of men, natives of that country, skilled in the raising of the tea plant and the manufacture of the leaf. These parties having since purchased an extensive tract of land in El Dorado County, will there engage in the tea culture; at first, on a limited, and, if results warrant, ultimately on a large scale, it being expected that many more of their countrymen will, from time to time, join them, or purchase separate tracts of land for the purpose of engaging in the same line of production.

Only in the item of labor will they be placed at any disadvantage, as compared with their own country. These colonists have already set out 140,000 tea plants, all of which are in a thrifty condition; and they contemplate having several chests of new tea, grown on this plantation, ready for exhibition at the approaching State Fair. These plants, set out last year, will be picked in June, and will probably afford another crop this fall. They have thus far required but little irrigation, and will probably not need any at all hereafter. From this it will be seen that the tea plant yields earlier here than in its own native country; it being probable, too, that it will prove with us far more prolific.

From this experiment it is evident that this shrub will thrive in almost any part of California, growing readily, as in China and Japan, on the slopes of the highest mountains. That it will pay to grow it here is also quite certain; first, because of the great abundance and cheapness of suitable land for its culture. Then we shall have it fresher, and more likely to be free from adulteration than the imported article. The duty of 25 cents per pound on all foreign teas, will also operate greatly in favor of the domestic grower; freights, exchanges, etc., making this protection equal to about 35 cents on the pound.

The purchaser of tea for export, in Japan, cannot make his purchase directly, even if supplied with Mexican dollars, the favorite foreign currency there, but must, under Government regulations, first convert his dollars into *kinsates*, or Government paper money, paying the banker, also a Government official, a certain discount on the same. These *kinsates* the tea merchant is obliged to accept in payment of his goods, at the peril of losing his head, a condition that, as may well be supposed, secures for them a ready circulation.—*Silk and Tea Culture, by T. A. Kendo.*

THE Ottawa *Times*, a Canadian authority, boasting that the advantages of Great Britain for manufacturing are superior to those of the United States, says: "Without some protection, the United States could not manufacture for themselves at all. England would supply them with everything they want—ships, houses, planes, saws, and even door knobs—in iron;" and, it adds, what is also true, that "the internal taxation of the United States is counter-balancing even the high protective duties, making the cost of production in England, in spite of the present discriminating tariff, less than in the United States."

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Contents:

(Illustrated articles are marked with an asterisk.)

*Improved Stall for Horses.....279
To Prevent the Decay of Shingles.....279
*Improved Machine for Cutting Irregular Forms.....279
The Trial of the Pyx.....279
Light and Vision—More especially how Light is Converted into Thought.....280
Mammalian Fossils—A Facetious Reviewer.....281
The Cocoa Palm.....281
How to Clean Paint.....281
*Dugdale's Universal Clothes Washer.....282
Artificial Ivory.....282
*Improved Diamond-Pointed Steel Drill.....282
The Future Supply of Bituminous to the Eastern states.....283
Faraday's Tiles.....283
Do Locomotives ever die?.....284
Suggested Improvements in sawing lumber.....284
A magic Square.....284
Free Rail Joints.....284
Australian Climate.....284
The Darien Canal.....284
Improvements in Locomotives.....284
Gentlemen Glass makers.....285
The Private Life of Galileo.....285
*Langhorne's Improved Nut-Lock.....285
Feathers in Mahoghany and other Woods.....285
*The Eclipse Steam Pump.....286
The Jute Plant.....286
New Postage Stamps.....286
Tea Growing in California.....286
Safety vs. Economy in the Construction of Steam Boilers.....287
The Study of Impracticabilities.....287
New Mechanical movements.....287
Metallic Hydrogen.....287
Uses of Fluor Spar.....287
The Increased Use of Cold-Rolled shafting.....288
Scientific Intelligence.....288
Morin's Experiments upon the Punching of metals.....288
The Great Union Depot on Fourth Av., N. Y.....288
Bill to Amend the Patent Laws now before Congress.....289
Electric Forces.....289
Instrument for measuring the Deflection of Girders.....289
Bread Powders.....289
Prevention of Steam Boiler Incrustations.....290
The Pneumatic Railway.....290
Destructive Insects of Foreign origin.....290
Editorial Summary.....290
Answers to Correspondents.....290
Recent American and Foreign Patents.....290
List of Patents.....290
New Books and Publications.....287

Special Notice to Advertisers.

The circulation of the SCIENTIFIC AMERICAN has become so large that we are compelled to put it to press one day earlier in the week. Advertisements must be handed in before Friday noon, to insure their publication in the issue of the succeeding week.

SAFETY VS. ECONOMY IN THE CONSTRUCTION OF STEAM BOILERS.

Two kinds of experiment are now and have been for some time in progress, having for their common object the improvement of steam boilers. These experiments are conducted by two sets of inventors, and have each done much to educate the steam consuming public. The first has for its aim the increase of the factor of safety to its highest point; the other aims at the increase of economy in the production of steam.

It is, perhaps, a little singular that those who aim at greatest safety, as well as those who aim at maximum economy, should have for the most part adopted tubular construction, with the distinction that the greater economy party use the tubes as flues through which to transmit the gases of combustion, and thus enlarge the heating surface; while the safety party put water in the tubes, and apply the heat outside, thereby securing great heating surface, while accumulated rupturing power is reduced.

Neither of these systems has proved altogether satisfactory. Unequal contraction and expansion have been a cause of manifold evils in the economy tubular system; and such boilers are confessedly not as safe as desirable. The safety tubular system, though safe, is uneconomical.

Notwithstanding this, the number of boilers constructed so as to make safety the principal point secured, are multiplying in the market, and are finding ready sale in many instances. There is without doubt a mean between these extremes, a mean that gives both maximum economy with maximum safety, so far as these can be simultaneously attained, and we believe we have seen boilers in which this mean is attained; but it is not our purpose to commend any particular boiler, however much it might serve us in illustrating our views upon this subject.

Most of those boilers in which the attainment of maximum safety is made the paramount object, are subject to the great defect of foaming, or priming, as it is called, so that the amount of water passed through them by the action of heat is no index of their true evaporative power. And as the economy of a boiler is entirely dependent upon its evaporative power, or the amount of water it can truly convert into steam per given weight of coal consumed, it may well be doubted whether the factor of safety is not too dearly purchased in this class of boilers.

Some recent experiments, to which we may refer more particularly at a future time, seem to show that in the ordinary mode of estimating the quality of steam by the hand, and its appearance when discharged into the air, very great errors in judgment are committed; and it is probable that many boilers claimed to evaporate from 12 to 13 lbs. of water per lb. of coal consumed, do not really do more than half that. It is further probable, that absolute normal steam from working boilers is much more rarely delivered to steam engines than is at present supposed.

The experiments referred to have also rendered it almost certain that the proportion of priming within certain limits is exactly as the rate at which the steam is delivered—all other things being equal—and that there is a limit to rapid delivery beyond which almost any boiler will prime, more or less, no matter how well it is constructed; and still another limit, below which no boiler will prime, no matter what its form may be. And further, these experiments indicate that boilers deemed safe when delivering wet steam may be unsafe when this delivery is so reduced as to force them to deliver dry steam; although, of course, no boiler composed of small pipes, or their equivalent, can produce such havoc by explosion, as one in which the water and steam are massed, and disruptive pressure accumulated upon an outside shell.

THE STUDY OF IMPRACTICABILITIES.

In this utilitarian age there are to be found many who are impatient of all that seems impracticable. They chafe at all propositions and attempts that do not clearly bear the stamp of practical skill and finished attainments. He who in his quiet workshop is studying for a solution to perhaps some impossible mechanical problem, and the one who timidly suggests some plan having in it elements of failure, plainly discoverable to the experienced and skillful, are as much the subjects of derision to this class of men, as those who dogmatically insist that wrong is right, and persistently parade their ignorance before the world.

The history of all improvement will show that failure has done as much to elevate the world as success. Even in the financial world, men need the instruction drawn from their failures to finally succeed. Few indeed march steadily on to wealth from the beginning of their career.

As in business, so in art and science. The artist perfects himself by the study of his faults. The scientist makes repeated failures ere he succeeds in originating some great and instructive experimental discovery. Scarcely an approach to perfection in mechanical construction exists that has not advanced by the gradual elimination of defects.

What is an improvement but the removal of impracticable elements. Who shall deny then the educating power of impracticabilities?

There is occasionally a correspondent who criticises the course of the SCIENTIFIC AMERICAN, because in its publication and illustration of new inventions, it does not deny its columns to such occasional ones as are faulty. If our views, as above given are correct, we should by making such a denial be narrowing the educational influence of our paper. We wish it distinctly understood that, while in our editorial statements we aim at scientific accuracy, and in our selections from foreign and home sources of miscellaneous contents, choose only such as we deem of general value, we do not wish to adapt our paper to skilled engineers and technical experts alone. We occupy a broader field, and believe we are doing far more good by acting as the general organ for the expression of the inventive talent of our country, learned as well as unlearned.

It is not enough that an invention has in it elements of impracticability to exclude it from our columns. Its publication proclaims a mechanical want, shows how it has been attempted to supply the want, and may suggest even by its impracticabilities how a practicable device may be constructed.

Probably no one of the readers of this journal has been called upon to study more critically and attentively the various devices illustrated and described in it, than the present writer of the descriptions which accompany the engravings. He certainly has not found that study devoid of interest, or of mental profit, albeit he has met with some of little practical merit. Judging from his own experience he now avows his belief that, of all the departments of this widely circulated and popular journal, none is of greater general value than that of the illustrated mechanical descriptions.

NEW MECHANICAL MOVEMENTS.

On page 192, current volume, we published some problems in new mechanical movements, which seem to have attracted considerable attention. We have received many so-called solutions, which, upon examination, have proved incorrect, but the incorrectness of which could scarcely be pointed out without giving a clue to the correct solutions.

We have also received diagrams of supposed new mechanical movements not called for by the problems proposed. Some of these show evidence of having never got further than the paper upon which they are drawn; and we would here remark, that it is well to scrutinize with very great care, any movement not experimentally demonstrated to be correct, before making any statements as to what it will do.

For instance, a gentleman from Massachusetts sends us a diagram of a movement by which it is claimed rotary motion can be converted into reciprocating motion, and *vice versa*. The device is neither new, nor will it do what is claimed for it. It is simply a slotted crosshead with straight slot inclined at an angle of forty-five degrees to the line of direction in which it reciprocates. In the slot slides a block through the center of which plays a crank wrist.

The device will convert a rotary into a reciprocating motion, but will not perform the converse movement. It has only the functions of the slotted crosshead placed at right angles with the line of direction in which the reciprocation takes place.

Problem second, in the article above referred to, has received but two original solutions, which we give below; we think one of these is a very ingenious one. Others have been proffered but they are old. One of these is the method described by Fairbairn. The problem was enunciated as follows: "Required to produce a variable rotary motion in a shaft driven directly by a belt from a pulley having a uniform constant rotary motion, without the use of anything but the one belt and the two pulleys; no cone pulleys or their equivalent to be allowed. All the motions to be continuous and in the same direction."

Fairbairn's method, above alluded to, is to make the driven pulley eccentric to its shaft, and use a belt long enough to accommodate itself to the eccentricity with a friction pulley to take up the slack. This does not conform to the conditions of our problem, which admits nothing but a belt between the two pulleys.

Mr. A. K. Smith, of Nebraska, Ohio, sends a solution new to us, but he says not new to himself, as he saw it many years since. The method described by him is to make the driven pulley eccentric and use an elastic belt. This is a proper solution of the problem.

R. B., a modest young machinist, of Buffalo, N. Y., shows that the elastic belt need not be used. With proper proportions an ordinary leather belt may have slack enough to compensate for the eccentricity of the driven pulley. This is also a correct solution.

Mr. L. A., of Brooklyn, N. Y., who does not seek celebrity, and therefore does not wish his name published in full, gives the most ingenious solution of any received. He accomplishes the required result by the use of two ordinary pulleys with shafts in their geometrical centers, but connected by a belt, one half of which is elastic and the other half inelastic. Whenever the elastic half of the belt is put on the stretch, it will yield so that the opposite side of the belt will be slack, the slack increasing as the elastic side receives more and more of the tension. When the inelastic half of the belt transmits the motion there will be no slack on the opposite side. The belt, therefore, alternately shortens and lengthens while transmitting the motion, thus rendering the speed of the driven pulley variable, as required. It is obvious that the greater the resistance which the driven shaft has to overcome, the greater will be the variation in the speed.

The inventor of this movement has employed it to produce some very life-like automatic movements in toy figures.

We hope to receive original solutions to the other problems in due time.

METALLIC HYDROGEN.

At a recent meeting of the Lyceum of Natural History, in New York, a paper was read by Dr. Loew, assistant in the College of New York, on the preparation of hydrogen amalgam, that deserves the attention of scientific men everywhere.

The researches of Graham, which we published at the time, went to show that hydrogen could be alloyed with palladium, and that it was also contained in meteoric iron. He condensed the hydrogen in the palladium, and came nearer proving its metallic character than any other person had done. Schoenbein, in his search for ozone, found a method for making the peroxide of hydrogen, that was simpler than any hitherto known, and which brought him to the very threshold of discovering hydrogenium. Schoenbein's experiment was this: An amalgam of zinc and mercury is violently agitated in water; the water is then filtered, and on being examined with iodide of starch and protosulphate of iron will be found to contain peroxide of hydrogen or oxygenated water. The experiment is a very beautiful one, and is now repeated in the class room. Dr. Loew has carried the investigation further, and has, instead of oxidizing the hydrogen, succeeded in combining it with the mercury. He takes an amalgam composed of not more than three or four per cent of zinc, and shakes it with a solution of the bichloride of platinum; the liquid becomes black, and a dark powder settles to the bottom. The contents of the flask are then thrown into water and hydrocuioric acid added to dissolve the excess of zinc. The amalgam of hydrogen and mercury at once forms in a brilliant voluminous mass, resembling in every way the well known ammonium amalgam. It is soft and spongy and rapidly decomposes, but without any smell of ammonia. The hydrogen escapes, and soon nothing but pure mercury is left in the dish. The experiment appears to show conclusively that an amalgam of hydrogen and mercury can be formed, and that hydrogen is really a metal. It would also throw some doubt upon the existence of the amalgam of ammonium and mercury, and offer an explanation of that compound on the basis of its being the same amalgam of hydrogen and mercury that is prepared in the way now pointed out by Dr. Loew. The smell of escaping ammonia must be traced to some other source than the existence of that radical in combination with mercury.

The question may arise, What practical value can be derived from this discovery? We may not be able to appreciate its importance at this early stage, but heretofore it is easy to perceive that the possession of metallic hydrogen will enable us to make a vast number of compounds artificially, and will give us an explanation of many phenomena that are now obscure. If Professor Graham had not published his researches, the experiment exhibited by Dr. Loew would have attracted the attention of the world; as it is, it is likely to excite much interest both in this country and in Europe.

USES OF FLUOR SPAR.

We are sometimes asked to give the applications of Fluor Spar, and as we cannot answer these questions separately, we we propose, for the benefit of all of our readers, to devote some space to an account of the properties and uses of this valuable mineral.

Its name indicates two things—first, that it easily melts or flows; secondly, that as a spar it is frequently found associated with ores in our mines, for the Germans gave the name spar to the minerals which occur with metals, as, for example, calc spar, feldspar, iron spar, manganese spar. When worked up into ornamental objects, it is known as Derbyshire spar, from one of the localities where fancy articles are made. It is sometimes found in beds, but generally in veins, and often occurs as the gangue of metallic ores.

There are many applications of fluor spar, some of which we purpose to give in this article.

ALUM FROM FELDSPAR.

The manufacture of alum and other compounds of potash from feldspar has long been regarded as a desirable thing; this result can be obtained for alum by fusing the feldspar with fluor spar and treating the mass with sulphuric acid. In this way the silica is expelled in combination with the fluorine as hydro-fluosilicic acid, and the sulphuric acid unites with the alumina and potash of the feldspar to produce alum, while the lime of the fluor spar being insoluble can be collected on filters, or removed by decantation, in the form of gypsum. Other potash salts can be produced from the alum.

HYDRO-FLUOSILICIC ACID.

Gay-Lussac observed many years ago, that when fluor spar and silica were fused together, some of the fluorine combines with the silicon in the form of fluoride of silicon, and escapes with the gaseous products of combustion. Many attempts were made to save this gas, but without success, until Tessie du Motay constructed a furnace by which, it is claimed, that 68 per cent of the fluoride is economized. Plans of the furnace were shown at the Paris Exhibition of 1867, together with a large suite of salts prepared by means of the hydro-fluosilicic acid. Among these salts we recall pure caustic potash, carbonate of potash, silico fluoride of potassium, silico fluoride of sodium, silico fluoride of barium, and caustic soda. As many of our ores contain fluor spar, and as, in the process of smelting, the fluorine is expelled, it is well worth while to save the incidental product of fluoride of silicon by conducting it into water and converting it into hydro-fluosilicic acid. This latter acid has many applications in the arts, and if we could obtain it cheaply and in abundance, it would prove of great value. It has been recommended for the decomposition of bones and guanos; for the manufacture of artificial stones; for fixing colors in paintings with soluble glass; for the preparation of pure tartaric acid, by removing the potash from tartars; to remove lime and potash from the juice of beet-root; and in some of the operations in the manufacture of pins.

HYDROFLUORIC ACID.

For etching on glass, fluoric acid has long been employed, and for this purpose it can be readily prepared by pouring sulphuric acid upon pulverized fluor spar. The operation must be conducted at a gentle heat, in a leaden or platinum retort. When required pure, the latter metal is indispensable. It is, also, sometimes customary to pass the gas through ammonia or potash to produce the fluorides of ammonium or potassium, also to be used for etching glass or for the resolution of minerals.

It is proper to state in this connection, that great precautions must be observed in handling hydrofluoric acid. The preparation of the gas is attended with great danger, as it attacks violently the organs of respiration. A drop of the acid on the skin produces fearful ulcers, and on the tongue, instant death. In a concentrated state it must be preserved in platinum bottles, and in a dilute form, can be kept in gutta-percha bottles.

FLUOR SPAR AS A FLUX.

It has been observed that lime alone occasions a loss of 5 or 6 per cent of iron, in blast furnaces, and that a small addition of fluor spar remedies this evil, as it keeps the slag more uniformly liquid, so that the iron is not caught in it, but falls rapidly through it, and the slag can, by blowing out the furnace, be more easily removed than when other flux is used. The fluor spar also prevents the formation of graphite and removes phosphorus. The proper proportion is about 50 lbs. to 100 lbs. pig iron, or 40 lbs. to 100 lbs. spiegel iron. A larger quantity might prove injurious to the walls of the furnace. In small crucible operations, fluor spar can be recommended as a valuable flux, and in blow-pipe analysis it has a similar application. [See page 229, Vol. XIX., letter of S. D. Poole, Lynn, Mass.]

PREPARATION OF ALUMINUM AND MAGNESIUM.

Metallic aluminum has been made by fusing the double chloride of aluminum and sodium with a proper proportion of metallic sodium, but the actual operation is attended with some practical difficulties, which are said to be removed by the addition of fluor spar. The mixture usually taken is composed of 100 parts double chloride of aluminum and sodium, 50 parts fluor spar, and 20 parts sodium. These substances are intimately mixed and introduced upon the hearth of a furnace previously heated to redness. The doors of the furnace are closed while a strong heat is brought to bear, and by occasional stirring the metallic aluminum will flow down to the front of the inclined hearth. By permitting the more fluid portion of the flux to run away, some fluoride of aluminum can be saved as an incidental product. Magnesium can be prepared in a similar manner by fusing 600 parts chloride of magnesium, 480 parts fluor spar, and 230 parts sodium, in a suitable crucible. The sodium must be freed from naphtha and cut into small pieces so as to be intimately mixed with the chloride and fluor spar, it is then projected into a crucible previously heated to redness, and the cover held down during the first stormy reaction by an iron weight. The magnesium will be found scattered through the slag in small bright pellets, from which it can be separated by crushing and washing.

HYDRAULIC CEMENT.

It is not an easy thing to graduate the heat in the preparation of hydraulic cement so as to prevent the formation of hard slag. By mixing fluor spar with the limestone, a greater range of heat is found to be admissible, and a second burning can be obviated and the properties of the cement are said to be improved.

An excellent cement can also be made by fusing feldspar, lime, and fluor spar together, and separating the potash by dissolving in water. This has the additional merit of securing a most valuable incidental product in the potash.

ANTOZONITE.

A variety of fluor spar has been discovered in Germany, which, on the application of heat, gives off an odor that forcibly recalls chlorine, and, twenty years ago, was supposed to contain that gas. Schoenbein considers the odor to be due to a modified form of oxygen which he calls antozone, and he names this variety of the fluor spar antozonite. A French chemist, also, takes the ground that fluor spar contains oxygen. If either of these theories could be proved by experiment, other and important uses would be opened up to this mineral.

SEPARATING GOLD AND SILVER.

The Stevens flux, for treating mineral ores, is essentially fluor spar, obtained in the treatment of cryolite for soda, and there is, consequently, nothing particularly new about it. According to experiments conducted by Dr. Chandler, of the School of Mines, Columbia College, the amount of fluor spar required in the working of gold quartz is very large, often one hundred per cent, so that the economy of the process must depend upon the cost of the fluor spar at the mines. It is doubtful if fluor spar can be economically employed on a large scale in treating gold quartz. In the working of titaniferous iron ores it now has considerable employment, and may add to the value of that class of ores.

The above are some of the uses to which fluor spar can be applied, from which it will be apparent that it is a valuable mineral, worthy of the attention of metallurgists and manufacturers everywhere.

THE INCREASED USE OF COLD-ROLLED SHAFTING.

The use of cold-rolled shafting is, so far as we can learn, steadily increasing, and its application to purposes where exactitude of diameter, superior strength and rigidity, as well as the highest perfection of finish is required, has now become very extensive.

For our own part we have certainly never seen anything in the way of shafting, superior in point of elegance of finish to this product of cold-rolling.

This beautiful finish, however, is not gained at a sacrifice of strength as might be supposed by those unacquainted with the process, as the following table of results obtained in experiments performed by Major William Wade, of the United States Department, will show.

We may also state that similar tests were made by John P. Whipple, Chief Engineer, U. S. N., and William Fairbairn, Esq., Manchester, England, with like results.

The table is a summary of the average results obtained from numerous experiments made with bar iron, rolled while hot, in the usual manner, compared with the results obtained from the same kinds of iron, rolled and polished while cold, by Lauth's patent process, as manufactured by Jones & Laughlins, of Pittsburgh, Pa., whose advertisement will be found in another column.

	Iron rolled while		Ratio of increase by cold rolling.	Average rate per cent of increase.
	Hot.	Cold.		
Transverse—Bars supported at both ends, load applied in the middle, distance between the supports 30 inches.				
Weight, which gives a permanent set of one tenth of an inch, viz.: 1¼ in. square bars.	3,100	10,700	3,451	162½
Round bars, 2 in. dia.	5,200	11,100	2,134	
Round bars, 2¼ "	6,800	15,600	2,294	
Torsion—Weight which gives a permanent set of one deg., applied at 25 in. from center of bars.				
Round bars, 1¾ in. diameter, and nine in. between the clamps	750	1,725	2,300	130
Compression—Weight which gives a depression, and a permanent set of one hundredth of an inch, to columns 1½ inch long and ¾ in. in diameter	13,000	34,000	2,615	161½
Weight which bends, and gives a permanent set, to columns 8 in. long and ¾ in. diameter; viz.: Puddled iron	21,000	31,000	1,476	64
Charcoal bloom iron.	20,500	37,000	1,804	
Tension—Weight per square inch, which caused rods ¾ in. dia. to stretch and take a permanent set, viz.: Puddled iron	37,250	68,427	1,837	95
Charcoal bloom iron.	42,439	87,236	2,059	
Weight, per square in., at which the same rods broke, viz.: Puddled iron	55,760	83,156	1,491	72
Charcoal bloom iron...	50,927	99,293	1,950	
Hardness—Weight required to produce equal indentations	5,000	7,500	1,500	50

Note.—Indentations made by equal weights, in the center, and near the edges of the fresh cut ends of the bars, were equal; showing that the iron was as hard in the center of the bars as elsewhere.

SCIENTIFIC INTELLIGENCE.

SEPARATION OF ANIMAL AND VEGETABLE FIBER.

M. Shervord has invented an ingenious method for the separation of animal fiber from vegetable. The process does not alter the structure or color of the animal fiber, and permits the use of cotton and linen fiber separated from it for numerous purposes. It is sufficient to suspend the goods in an atmosphere of nitrogen or carbonic acid, and to cause the vapors of perfectly dry sulphuric, phosphoric, or hydrochloric acid to enter the room. These fumes disintegrate the vegetable fiber and leave intact the animal—the two fibers can thus be separated and appropriated to their respective uses.

CLEANING ENGRAVINGS.

It very often happens that fine steel engravings get stained with moisture on the wall, or specked with mildew, and it becomes an important question how to bleach them. One of the best methods is to moisten them carefully and suspend them in a large vessel partially filled with ozone. The ozone bleaches them perfectly without attacking the fiber of the paper.

For the evolution of ozone the simplest way would be to clean pieces of phosphorus and place them, half covered with water, in the bottom of the jar in which the pictures are suspended. On a large scale, a Ruhmkorff coil and constant discharge of electricity would be preferable. It is somewhat surprising that this method of cleaning fibers has not been more generally applied.

INFLUENCE OF FORESTS UPON RAIN.

The London *Athenæum* contains another example of the influence of forests upon the quantity of rain. In several districts of Australia there is a perfect rage for cutting down timber, and where this devastation has been carried out, the quantity of water that falls in a year has greatly diminished; from 37 inches in 1863 it has decreased to 17 inches in 1868. In 1869, from January to July, comprising two of the wet months, there only fell 11 inches of rain.

In Victoria the want of water is becoming a serious question, and the Government has been compelled to appoint an inspector of forests intrusted with the duty of preserving the trees already existing, and to establish nurseries for young sprouts wherever admissible. By a judicious planting and preservation of forests it is anticipated that a decided improvement can be effected in the climate of the country.

The residents of New England, who permit the mountains to be stripped of their trees for the production of charcoal, would do well to consider at what a cost to the water power of the States, to the fertility of the farms, to the climate of the country, and to the health of the community, all this momentary gain is attained. While other governments are planting trees at great expense, they are cutting them down to obtain a few chaldrons of charcoal.

MORIN'S EXPERIMENTS UPON THE PUNCHING OF METALS.

General Morin, one of the ablest of French engineers, and who has given to the world one of the best treatises on mechanics extant, has been extending his investigations to the determination of the power expended in the punching of metals and plastic substances.

The results of a large number of experiments are given by him in a paper read before a recent session of the Academy of Sciences, Paris, which demonstrate that the same elements of resistance enter into the operation of punching as in that of shearing. In short, a punch and die may be considered as a shears with circular blades. The coefficient of pressure in punching, per any given area of section, will be exactly that for shearing the same area of section, without reference to the thickness of the material.

The measure of force, necessary to effect the various punchings easily gives the value of the resistance to shearing, in case of the ordinary metals. This resistance (per square meter) is determined to be, for

	Kil.
Lead	1,820,000
Block tin	2,090,000
Alloy of lead and tin	3,390,000
Zinc	9,000,000
Copper	18,930,000
Iron	37,570,000

It is difficult to give these figures in exact denominations of English measures and weights. A square meter is 1·196 square yards, nearly; and a kilogramme is, approximately, 2·205 lbs. avoirdupois.

THE GREAT UNION DEPOT ON FOURTH AVENUE, NEW YORK.

The contract for this enormous structure has been finally awarded to the Architectural Iron Works at the foot of Fourteenth street, New York. The depot is intended to accommodate the trains of the Harlem, Hudson River, and New York Central Railroads. For the latter a branch road will be built to connect with the Harlem, the trains being switched off in the neighborhood of Spuyten Duyvil. The car house will have accommodations for twelve single trains, while, if it be necessary, double or even treble that number can be accommodated.

Photographs of the plans and drawings were sent to Europe for bids, but it was found that American founderymen could more than compete with any bids received abroad.

The foundation of this immense structure, to be the largest of the kind on this continent, is well under way—in fact, nearly completed. The contract calls for the completion of the entire structure within eight months from its date. If not completed within the time specified, the contractor is to forfeit and have deducted from the contract price $500 a day for every day over; and if completed within the time specified, the contracter is to receive, in addition to the contract price, the sum of $300 for each day the work is so completed and accepted by the engineer.

The weight of iron to be used will be over 8,000,000 pounds. It will require 100,000 square feet of glass in the roof alone, and 90,000 square feet of galvanized corrugated iron to cover the roof. The roof over the car-house will extend over an area limited south and west by the office buildings, east by the Fourth avenue, and north by a line 30 feet 6 inches south of Forty-fifth street. The entire length of the roof will be 652 feet, and it will be 199 feet 2 inches in width between the walls, and supported by 32 arched trusses, placed 20 feet four inches apart. These great arches will be set upon the foundation, whose upper face is 2 feet below the surface of the ground, rising to an elevation of 94 feet from the springing line to the extrados of the arch.

The car-house is to be lighted through three skylights extending over the entire length of the roof—one on the center, double pitched, and two single ones on each side of the center. The rewill be seven courses of ventilators running the entire length of the roof, faced up with stationary sheet iron slats.

On the south end, the segmental portion of the arch above the brick wall will be faced with cast iron trimmings and plate glass.

The north end will be closed with a beautiful cast iron front highly ornamented. The east side, along the Fourth avenue, will be finished with cast iron pilasters acting as casings set in front of each truss. These pilasters are to have bases and caps, supporting a main cornice along the front, and crowned by a cast iron balustrade; a line of balconies will run along the west side and across the south end, connecting with the offices in the second story. The trusses are placed in heavy cast iron shoes, sixty-four in number. To permit free expansion and contraction of the trusses, without interference with the side walls crossed by them, there will be placed cast iron boxes or casings perforated by a series of cores, and fitted together by means of bars and angles in such a manner as to insulate entirely the mason work from the trusses.

The rafters will consist of five-inch deck beams secured to the top chord by double angle iron studs, 3½ by 3½ inches, and stiffened by diagonal braces of same size, riveted together and fastened on the chord by means of bent lap plates one half inch thich, and riveted to the former.

The doors and windows will have cast iron trimmings, all ornamented, the windows to be glazed with rough half inch glass. The whole of the north front will be of cast iron, the width to be 203 feet 10 inches, and raised 112 feet 6 inches in extreme hight. The windows and doors of the first story will have rolling shutters.

The ends of the structure will be occupied for offices on the first floor, while the ground floor will be set apart for ticket offices, passengers' rooms, baggage lockers, restaurants, newsstands, etc.

Pennsylvania iron, of the best welded quality, will be used for plates, flat or square bars. Round bars and rods for braces to be of Ulster iron: rivets and bolts, of charcoal iron. Sheet iron, best welded and refined Pennsylvania. Cast iron, mixed in the following proportions, viz.: American pig No. 1, and Scotch pig No. 1, 5 per cent of each for shoes, casings, lintels, box, angle, studs, and braces. American pig No. 1, 10 per cent, and Scotch pig No. 1, 15 per cent, for columns and pilasters. American pig, No. 1, 15 per cent, and Scotch pig No. 1, 20 per cent, for hanging cornices, friezes, and flat pannelings. American pig No. 1, 30 per cent, and Scotch pig No 1, 30 per cent, for small moldings and ornamented work. All rolled and welded iron to be subject to a strain of 30,000 pounds per sectional inch.

BILL TO AMEND THE PATENT LAWS NOW PENDING BEFORE CONGRESS.

We have now before us the completed bill pending before Congress to amend the patent laws, to which reference was made in No. 8 of the current volume. It amounts substantially to a codification of our entire present patent system, and we feel bound to confess, that in many respects the bill is a great improvement upon the old law, reflecting credit upon the Committee, of which Hon. T. A. Jenckes is chairman.

The bill came up for discussion in the House on the 15th inst., but went over under the rules, and before the discussion was concluded. The provisions of the bill embrace patents, designs, trade-marks, and copyrights, and are too voluminous to print in our columns.

We regret to notice, however, that the provisions relating to appeals from the Commissioner to the Supreme Court of the District, have been stricken out. We trust that the House will insist upon its restoration.

In explaining the various features of the bill, Mr. Jenckes says:

"In the law with regard to patents, which appears as chapter two of the bill, there are four principal propositions of amendment. One is the requirement of a fee to be paid at the expiration of seven years from the date of the patent, and another at the end of the twelfth year as a condition of keeping the patent alive. Such a provision is found in the patent laws of almost all other countries. The proposition had met the commendation of the Commissioner and of persons doing business at the Office. Its adoption will increase the revenues of the Office, and will weed out those worthless patents which are sometimes taken hold of by speculators near the expiration of their terms for the purpose of harassing the public with igenious reissues. One great annoyance and evil will be removed and positive good obtained in its place.

"Another source of difficulty, and which was becoming a great one, arose from the fact that there is a large number of what are called rejected applications in the Patent Office. During the past year there were over five thousand of final rejections, and the year before nearly as many, and since the constitution of the Office there are perhaps twenty thousand remaining in the Office; most of these rejections have been acquiesced in and the claims abandoned. But some of these have been rejected improperly, and contain descriptions of valuable inventions. In course of time it has been discovered in many cases the rejection was wrong and that the examiner had made a mistake, and the applicant has again made application for his patent, and pressed it, and it has sometimes been allowed and sometimes rejected. If allowed, he would go and try its validity in the courts. If refused, the further difficulty arose on the provision in the existing law for the revision of the decisions of the Commissioner.

"As the law now stands an appeal may be taken to one of the judges of the Supreme Court of the District of Columbia, or remedy be had in a suit in equity in that or any other circuit court. This led to a conflict in the jurisdiction exercised by the Commissioner and that exercised by a single judge in this District court, and exposed behind it a further and greater cause of difficulty. That is, the law as it now stands, contains no provision absolute in itself, clearly and distinctly defining what should constitute the abandonment of an invention to the public. We heard the solicitors at great length on the question, and the conclusion the committee arrived at is expressed in two short provisions of the proposed bill. The substance of them I will state. Each and every party whose application has been refused is allowed two years to renew that application before the Commissioner, but this provision is not allowed to revive any application for an invention which has been, as a matter of fact, abandoned to the public. In other words, it says a mere lapse of time in the prosecution of an application of a patent shall not be conclusive evidence of abandonment; that the right to a patent for a first and original invention is a vested right, and can only be lost by the inventor in not proceeding in accordance with the provisions of law, or in his forfeiting that right in accordance with those provisions; and to those in this condition, not cut off by any positive existing statute of limitation a new statute of limitation is proposed, defining the time within which such new application shall be made. Thus all the rights are preserved and the mode of prosecuting them is pointed out. The field of controversy concerning these old applications, whether abandoned or not, is fully and satisfactorily provided for."

"The Committee also propose to amend and enlarge the provisions as to relief between interference patents, and to provide relief in cases where a patent has been improperly obtained or improperly reissued, or where the validity of a patent is contested by persons using the things patented.

"There is now no means provided by which a person thus injured or threatened to be injured by a suit can turn around on his prosecutor and test his right to the patent. We propose to give that remedy, so that a single suit can determine the question and avoid the extended litigation and expense now attending controversies upon patents. Heretofore it has sometimes happened that persons have obtained reissues of old patents, and then gone around the country threatening suits against persons; sometimes commencing a suit in a court, and if not liking the temper of the judge, or from some untoward circumstance connected with the trial, abandoning it and commencing another somewhere else, with the hope of obtaining a decision in their favor. And when they have succeeded in obtaining a single decision they will go around again and levy a tax upon all who do not feel able to go to the expense of contesting the validity of the patent.

"That has been a great burden and a great wrong, which has many times been sought to be amended. But the difficulty has been to do it without injuriously affecting rights conferred and established. The committee propose to do it by recommending that where any party has been sued for the infringement of a patent, and he thinks the patent is invalid for any reason or should not be enforced against him for any cause, he may commence a suit against the owners of the patent who have sued him, in order to test the validity of that patent, and the final decision in that case shall be conclusive upon the right of all parties claiming the right to use the thing claimed to be patented.

"I know one case where after a defendant had succeeded in a suit upon a patent, the patentee turned around and brought upwards of a hundred suits all over the United States upon that very patent, subjecting each of the parties sued to as much expense as the one who had defeated him, in the hope of obtaining a reversal of the former decision. That is an evil to be prevented; and we think we have provided a remedy which will reach the case, so that the expense of one suit shall be all that is required to test the validity of any patent or the right of any party under it.

"The committee have recommended also certain provisions which are entirely new concerning trade-marks. These have not heretofore been the subject of any national law. It is a subject embraced within the common law jurisdiction of all the courts of the country, and also within the general equity jurisdiction of all the State courts. This bill does not propose to interfere at all with the local and State jurisdictions. A person, standing upon his common law rights, may still go into the State courts and defend a trade-mark, exactly as he may do now; but if he chooses to register his claim at the Patent Office, pay his fee, and take his certificate of registration, it will protect him throughout the United States, in the same way as a patent for a design or a copy-right is protected.

"Concerning trade-marks, we are at present in an anomalous condition, which perhaps is not understood by the House generally. By certain treaties or conventions with Belgium, France, and Russia, we have agreed to recognize the validity of the trade-marks of those countries upon their being registered in the Patent Office of the United States, and to give them the same effect throughout the United States that they have in the country where they originated; and trade-marks recognized by the law of this country have the same effect throughout those European countries as the trade-marks secured by the citizens or subjects of those countries.

"A *fac similie* of the trade-mark is to be sent to the Patent Office. The kind of business, as well as the kind of goods, to be protected, is to be described briefly and correctly. A fee of $25 is to be paid into the Treasury of the United States. A certificate of such registration, with a *fac simile* of what is filed in the office, is to be delivered, under the seal of the Patent Office, to the person causing such registration. It is to be in effect for thirty years from the date of registration, and if it be copied by a person not having a right to do it, or if it be copied by a person in such a manner that the imitation is calculated to deceive the public, then the party may have his remedy in any court of the United States for the injury done him."

ELECTRIC FORCES.

There is no fact connected with the electric agencies, by which distant communication is secured, more suggestive than the minuteness of the power by which it is sustained. To project a ball at a distant ship with certainty of aim, to blast the sunken rock that impedes navigation, to impel the giant ship that splits the storm with its defiant bow, forces are presented to the eye which bear some natural comparison with the work accomplished. But when a message has to be sent thousands of miles beneath the ever fretting sea, from one continent to another, force seems ignored. We look in vain for any machine hissing with a vigor such as the mind deems necessary to eject the electric current from America to Europe quick as the sunlight comes to the earth. There is even an absence of the usual forces for communication upon the land, where nitric and sulphuric acids, zinc and mercury, are busy in numerous cells brewing the electric fire. The power employed bears more truthful comparison with the action of the brain wherein human thought is evolved. The thought may be one which shall change the destinies of a nation; it may be the sweetest idyl that ever warbled from angelic lips; but both come from within the dome of a brow notable only for its repose.

The battery which operates the Atlantic cable is composed of five cells, although for some time it used only one. Each cell is composed of a glass tumbler, a small disk of sheet copper, and a similar one of zinc, a few pellets of sulphate of copper and moist sawdust filling the tumbler. This is all. It has no smell. A spoonful of water upon the sawdust now and then is all it needs for support. It seems insignificant and powerless, yet does its work efficiently and well. The French cable uses only seven such cells, although twice as long as the other.

We have before us, as we write, a battery which was used to transmit a message by the Atlantic cable—the minutest, we presume, ever employed. It has a fascination to us inexpressible. It is composed of a simple gun cap soldered to a piece of copper wire, and a narrow strip of zinc. These, with a drop of water from the ocean, were all the forces that were needed to send a message from continent to continent. Here is a sketch of its actual size:

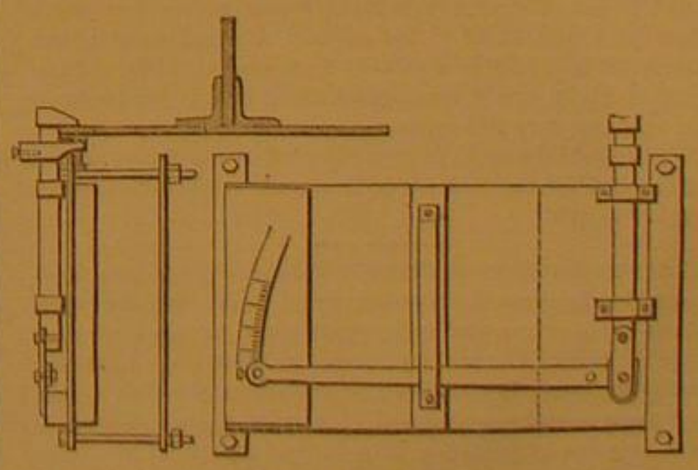


Had the ocean drop been a tear, it would have generated the same current which thus thrilled between two worlds and made them one. Were we disposed to moralize on the salt of this tiny battery and its mysterious agency, we might be excused did we regard it as typifying the power of sorrow which touches the universal heart and makes it throb. It is the alembic of the world's deepest and most omnipotent emotions, and yet may find its rise in the stopping of a single pulse, in the quenching of a single life.

This tiny battery has in it, indeed, a vast moral. We despise the lesser forces of our lives, and measure our influence by an unwise disparagement. From these, however, when true and pure, come the sunlight of the efflorescence of the earth. Let us hold our light high and honored, however small may be its flame. It may reach the radius of another light, and help the dawning of a brighter day—not to ourselves alone, but to thousands who never knew us. A single kind word has ere now planted a seed that has burst its blossoms upon the "infinite meadows of heaven."—*Journal of the Telegraph.*

INSTRUMENT FOR MEASURING THE DEFLECTION OF GIRDERS.

The accompanying engraving represents an instrument which has been used by the Western Railway Company, of France, in testing the bridges of the new Dieppe line *via* Pontoise and Gisors.



Wrought-iron bands together with bolts, serve to secure a plank, carrying the whole apparatus to a rigid structure independent of the girder. A clutch is then screwed on to the flange of the girder. A lever works on a pivot, and the shorter end—one tenth of the longer arm—is attached to a clutch bar. The other end carries a pencil which traces the deflection on a card. By means of the unequal division of the lever it is manifest that a small deflection will produce a comparatively large movement of the pencil. In point of fact, a deflection of 1-10,000th of a meter can be detected with this instrument.

BREAD POWDERS, EXTENSION.—The patent of Professor Horsford for pulverulent phosphoric acid, to be used in making bread, has been extended for seven years from April 22, 1870.

The Amended Patent Laws.

The bill to amend the patent laws, to which reference is made in another column, passed the House on the 21st inst As the seventieth section caused much comment in the House, on motion of Mr. Cleveland of New Jersey, it was stricken out. The section is as follows:

On all patents hereafter granted there shall be paid the following additional fees, namely: At or before the expiration of the term of seven years from the date of the patent the sum of $25, and at or before the expiration of the term of twelve years from the date of the patent the further sum of $50, and in default of the payment of either of the sums aforesaid, within the periods aforesaid, the said patent shall be forfeited, and the invention so patented become public property.

In the course of Mr. Cleveland's remarks, and as a reason for his moving to strike out the section, he said it was proposed by section seventy to increase the revenues of the department at the present rate of patent issues, after seven years, nearly $400,000, and after twelve years of more than $500,000 more, making, after twelve years, an increase in the revenue of more than $900,000 as a tax upon the inventors of the country because they are inventors.

Prevention of Boiler Incrustation.

A very simple mode of preventing boiler incrustation is in general use at the Darmstadt Gasworks. The engine has worked day and night since 1854 almost without interruption, and the formation of calcareous deposits has been entirely prevented by the use of crude pyroligneous acid, combined with tar; it is either introduced into the boiler or mixed with the feed water. Since this mixture has been in use they have never had a stoppage through incrustation, and have never had to use a hammer to remove scale. Each year, during the summer, when less gas is required, the boiler is opened, and perhaps a couple of handfuls of loose sediment taken from the bottom. The quantity employed is very small—just enough to redden litmus paper; consequently the iron is not attacked, as indeed is apparent from the fact that the boiler has been but twice under repair.

The Pneumatic Railway.

The use of the zircon or oxygen lights on the passenger car of the Broadway Pneumatic Underground Railway, in this city, has been discontinued, and common gas substituted. The gas is compressed in cylinders, and is made to pass through a soda-water bottle containing benzine; the brilliancy of the light is thus greatly improved owing to the carbon which the gas takes up in passing through the liquid.

The Pneumatic Railway continues to be an attraction. It is visited daily by large numbers of persons.

Editorial Summary.

A SPEAKING AUTOMATON.—A German genius has invented a speaking machine, which is now on exhibition in Leipsic, and is a masterpiece of inventive art. It is in imitation of all the parts of the human organs of speech, executed in india-rubber and wood. A keyboard played like that of a piano, puts the parts in motion, while by a pedal and bellows the required air is sent through the wind pipe. The keyboard has only fourteen keys, representing the sounds of a, o, u, i, e, j, r, w, f, s, b, g, d, sh; other sounds of the alphabet are produced by the same movement, and the admission of more or less air. The sounds of m and l are produced by closing the lips and pressing the tongue against the roof of the mouth, etc. The French nasal sounds are produced by a separate contrivance. The laughing, it is said, sounds truly diabolical, and the crowing of a rooster very comical.

PEARLS IN THE GULF OF CALIFORNIA.—The revenue returns for 1869 show that the catch of pearls and shell for the past year on the Gulf coast of the territory granted to the "Lower California Company" amounted to the large sum of $78,000. This, of course, is the valuation of the pearls given by the divers and speculators, and is consequently very much below the actual value of the catch. A pearl is sold frequently for $20, which, resold at Panama, at $200, brings $1,000 in Paris, and in many cases much greater profits have been made on very fine gems.

Not one-half the catch is ever reported to the Government, and the yield of the Gulf for 1869 may be safely estimated at $300,000 in gold.

ELECTRIC TELEGRAPH WITHOUT WIRES.—It has long been known that telegraphic messages could be transmitted without the use of wires, and many years since signals were sent across the Bristol Channel by the use of the water as the conducting medium; but in that case the water through which the signals passed was inclosed in a tube, so that it was, in truth, only the substitution of a wire of water, if the term can be used, for the metallic wire usually employed. Prof. Loomis now proposes to go further; he claims to have discovered a mode of transmitting messages by electrical air currents; and is seeking an opportunity for making experiments on the summit of Mont Blanc.

AN EXTENSIVE FOUNDERY.—An iron foundery has been recently erected by the Messrs. Howard at Bedford, England, of remarkable size. There are 35,000 square feet on the ground floor. There are four cupolas, or furnaces, capable of melting 300 tuns per week, and which are expected to be very shortly in full work. The internal and general arrangements were planned by Mr. James Howard, M.P., the erection being under the direction of Mr. Usher, architect, Bedford.

PROMISING experiments in coating iron with sulphur, as a protection from corrosion, have been recently instituted.

WEAR OF LOCOMOTIVE DRIVING WHEELS.—In reply to a recent correspondent's observations upon the greater wear of the tires on the front driving wheels of locomotives, two causes have been suggested by a number of correspondents. The first is, that these wheels carry greater weight, and the second that the cutting of the sand employed is greater upon them than on the others, as the sand is sprinkled directly before them. It is thought that these causes are ample to account for the fact observed.

Business and Personal.

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

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4·00 a year. Advertisements 15c. a line.

$3000 will buy a valuable improvement in manufacturing Pa Per Hangings. Address Lawrence Bellinger, Mohawk, Herkimer Co., N.Y.

Broughton's Lubricators and Oil Cups are the best. Manuf'd by H. Moore, 41 Center st. Beware of purchasing infringements on the above.

For Sale—3 patents on furniture, or on a lease in complete working order. G. Knell, 130 Market st., Philadelphia, Pa.

For Sale—Burton's patent sash and blind marker (by States, or otherwise), which will do the work of 5 men. Address G. W. Burton and Brother, Box 186, Bordentown, N. J.

Pictures for the Sitting Room—Prang's "Pompeii," "Sunset on the Coast," and "Launching the Life Boat." Sold in all Art Stores throughout the world.

$100 a day can be made by selling Lloyd's new dollar double maps of America and Europe. See advertisement on last page.

Inventors' experimental and Patent Office models, and light machinery, of the most intricate character, manufactured to order by Goodwin & Wood, 91 Liberty st., New York.

$300 will buy the entire Right of the best and cheapest Fruit Gatherer out. L. S. Fleckenstine, Safe Harbor, Lancaster Co., Pa.

45 Counties of West Pa. for sale, or on royalty, of Fleckenstine's Corrugated Gun Scrubber. Takes off grease, tar, etc. L. S. Fleckenstine, Safe Harbor, Lancaster Co., Pa.

Manufacturers of improved machinery for watch-case making please address J. C. Dueber, Cincinnati, Ohio.

Page's Pat't. Lacing, superior quality. Address J. Sweetman, Utica, N. Y.

Dickinson's Patent Shaped Carbon Points and adjustable holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24th, and Nov. 20, 1869. 61 Nassau st., New York.

Peck's patent drop press. Milo Peck & Co., New Haven, Ct.

Rivet machines wanted. John Cronin, 20 Burling Slip, N. Y.

Steel Makers' Materials—Wolfram ore, oxide manganese, Speigel iron, borax, titanium, chrome, lubricating black lead, for sale by L. & J. W. Feuchtwanger, 55 Cedar st., New York.

For the best Alarm Money Drawer, address Robbins, Frontz & Co., Hughesville, Pa. Agents wanted.

Machines for manufacturing Screw Bolts and Nuts of all kinds. Makers will please send price lists and other information to C. G. Berryman, Saint John, N. B.

An experienced mechanical and railway engineer wishes a position as Master of Machinery, or Manager. Address "Engineer," Station "G," Philadelphia, Pa., Postoffice.

Bartlett's Street Gas Lighter. Office, 569 Broadway, N. Y.

For description of the best lath and blind slat sawing machine in use, address W. B. Noyes, Gen'l Ag't, P. O. Box 538, Manchester, N. H.

Important advance on the draft and easement of carriage. See Jackson's Patent Oscillating Wagon, with tests of draft, models, etc., No. 149 High st., Newark, Essex Co., N.J. See Scientific American, Sept. 25, 1869.

Kidder's Pastilles.—A sure relief for Asthma. Price 40 cents by mail. Stowell & Co., Charlestown, Mass.

Needles for all sewing machines at Bartlett's, 569 Broadway, N Y.

Pat. paper for buildings, inside & out, C. J. Fay, Camden, N. J.

For Sale—An old established Malleable and Gray Iron Foundery, doing a large trade in hardware. Cause of selling, failure of health of the proprietor. Address "Malleable Iron," Newark, N. J.

Brick and Tile Drain Machine—First Premium in Ohio, Indiana, and Missouri; also Fair of American Institute, New York. Address Thos. L. Cornell, Derby, Conn.

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

For first-quality new 14, 17, and 20-in. screw lathes, milling machines, and one-spindle drills, at small advance from cost, apply to Geo. S. Lincoln & Co., Hartford, Conn.

Hackle, Gill Pins, etc., at Bartlett's, 569 Broadway, New York.

Portable Pumping or Hoisting Machinery to Hire for Coffer Dams, Wells, Sewers, etc. Wm. D. Andrews & Bro., 414 Water st., N. Y.

Keuffel & Esser, 71 Nassau st., N.Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves

For tinmans' tools, presses, etc., apply to Mays & Bliss, Brooklyn, N. Y

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

Two 60-Horse Locomotive Boilers, used 5 mos., $1,300 each. The machinery of two 500-tun iron propellers, in good order, for sale by Wm. D. Andrews & Bro., 414 Water st., New York.

To ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's manufacturing news of the United States. Terms $4·00 a year.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

Parties wanting Machinery built of any description, or inventions perfected, will do well to address J. Done, Jr., 61 and 63 Hamilton street, Newark, N. J.

Facts for the Ladies.

For ten years past we have been using, in our establishment, Wheeler & Wilson's Sewing Machines, and, also, sewing machines of other manufacturers; and, after so many years, we have arrived at the conclusion that Wheeler & Wilson's Sewing Machines are greatly superior to all others.

All the parts of their mechanism are so strong that the expense for repairs is merely a trifle. Besides, they can execute a larger variety of sewing than all other machines. The simplicity of their mechanism makes the repairs easy; they do not tire the operator, and make very little noise in running In a word, they cannot fail to be of great value to persons in want of sewing machines.

SISTER DOROTHEE,
Congregation of Notre Dame, Montreal.

Answers to Correspondents.

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

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

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

H. McG., of N. Y.—To find the horse power a belt of given width, moving at a given speed will transmit, divide the number of square inches of the belt in contact with the smaller pulley by two. Multiply the quotient thus found by the velocity of the belt per minute in feet, and divide the product by 36,000. The quotient will be the required horse power. To find the proper width of belt to transmit a given horse power, multiply 36,000 by the number of horse power, divide the product by the velocity of the belt per minute in feet; divide the quotient by the number of feet in length of contact of the belt with the smaller pulley, and divide this last quotient by 6. The result is the width of the belt in inches.

G. H., of N. Y.—The genuine Babbitt metal is composed of 4 parts copper, 12 parts best Banca tin, 8 parts metallic antimony, and 12 parts more tin to be added when the first-named ingredients are in a state of fusion. First melt the copper and add 5 lbs. of the tin. Then reduce the heat to a dull red; then add the rest of the first proportion of tin, and the other ingredients in the order and quantities mentioned, waiting for each to melt before adding another. Keep the surface of the metal covered with powdered charcoal to prevent oxidation.

J. N. C., of Ill.—A burning mirror of great power might be made of wood covered with burnished tin foil, but it would of course be liable to shrink, warp, etc., from the effect of weather. If the concavity be a portion of a sphere, not more than about eight degrees of arc should be used. The following rule would be accurate enough. Multiply the diameter of the mirror by 50, and take one sixth of the product for the radius of the concavity.

H. D., of Ohio.—The boiling point of water varies according to the hight above the sea level. Altitudes may be thus ascertained. A difference in hight of 543 feet makes a difference of one degree in the boiling point. The higher the elevation, the lower the temperature at which liquids boil, and *vice versa*.

V. C., of Wis.—The explosive used in the toy torpedoes is fulminate of mercury. A very small portion of this substance is twisted up in strong tissue paper with bits of sand, or broken glass. We consider them as dangerous playthings.

S. B. H., of R. I.—You will find full directions for finishing inlaid woodwork in Watson's "Manual of the Hand Lathe," published by Henry Carey Baird, 406 Walnut street, Philadelphia.

T. O. H., of Mo.—The presence of all the air that will remain in an annealing oven cannot affect the process of annealing. We don't believe in your vacuum theory.

T. E. H., of Mass.—You can use the ordinary lacquer, employed for protecting fine brass work, upon gilt. This will be better than soluble glass.

J. B., of ——.—Chloride of sodium is common salt. Your proposed application of it to scaling castings will not do.

Recent American and Foreign Patents.

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

FOLDING CHAIR.—George McAleer, Worcester, Mass.—This invention has for its object to improve the construction of folding chairs with flexible seats, so as to make them better adapted to support the back of the person sitting in them, than the folding chairs constructed in the ordinary manner.

REFRIGERATOR.—Anthony B. Sweetland, Fitchburg, Mass.—This invention relates to a new and useful improvement in refrigerators, for keeping food (or articles designed for food) at a low temperature, and consequently from decay.

COMBINATION BOOT JACK.—Samuel Kennedy, Rochester, Pa.—The object of this invention is to combine in a small space, a boot jack, blacking brush, and blacking box, so that the necessary apparatus for removing the boot from the foot, and blacking it, may be always together and more portable than they usually are.

LATHE SPINDLE.—James E. Boutelle, Fishersville, N. H.—This invention relates to a new and useful improvement in lathe spindles, for wood turning, whereby heating of the center is prevented, while it is made self-lubricating.

POWER LOOM FOR THE FABRICATION OF PLAIN VELVET STUFFS.—Pierre François Ramel and Jean Drogat, Lyons, France.—This invention relates to a new power loom for the fabrication of plain velvet stuffs, which is capable of weaving two pieces at the same time, and which is worked by hand or steam power, and able to weave every quality of velvet.

SAW MILL.—Charles Taylor, McKeesport, Pa.—This invention relates to improvements in circular saw mills, and consists in an improved arrangement of two carriages, one on each side of the saws, for operation by the same feed shaft, and the one on the side receiving the lumber being arranged for disconnecting with the driving shaft when not required for use.

STOVE.—J. L. Pfau, Jr., Quincy, Ill.—This invention relates to improvements in stoves and furnaces for burning coal, and more particularly cylindrical stoves, and consists in an air and gas mixing apparatus, arranged for resting on the top of the fire brick above the fire, and receiving the air through the side of the stove, heating it, and finally delivering it to the gas arising from the fire below, in a distributed way, calculated to facilitate the burning of the same and the smoke, more effectually than when the cold air is admitted directly to the gas, in the common arrangements.

HEAT RADIATOR.—Thomas Scantlin, Evansville, Ind.—This invention relates to a new heat radiator, which is constructed with the object of securing more extended radiating surfaces, and unobstructed draft. The invention consists chiefly in a novel arrangement of pipes and drum for obtaining the desired circulation of smoke, and also in a novel means for letting air into the stove.

THREAD GUIDE FOR BOBBIN WINDERS OF SEWING MACHINES.—Thomas Shanks, Baltimore, Md.—This invention has for its object to lay thread evenly on the bobbins of sewing machines when the same are removed from the shuttles for the purpose of being filled.

ANIMAL TRAP.—John O. Kopa and George W. Bauer, Washington, D. C.—This invention consists of four or more wooden or iron plates projecting from a common shaft hung in a box, each plate being provided with a bait-holder, so connected with a latch on the next plate in front that, when the animal stands on that one of the plates which is held by its latch in a horizontal position, and pulls at the bait suspended from the nearest vertical plate, such pulling loosens the latch of the horizontal plate and leaves it free to sink beneath the animal's weight, and precipitate the latter into the box, which operation also resets the trap and closes the orifice by which the animal entered.

HAY AND COTTON PRESS.—B. R. Brown and James Toone, Jr., Jackson, Tenn.—This invention consists of a device for holding the platen of a cotton or hay press down to its work when operating upon the loose material.

ROAD SCRAPER.—James C. Evans, Delaware, Ohio.—This invention relates to divers improvements in revolving or self-dumping scrapers, all tending to increase the efficiency of the machine.

CORN PLANTER.—James M. Kiracofe, Mount Solon, Va.—This invention has for its object to furnish an improved corn planter, which shall be so constructed and arranged as to drop the corn accurately and regularly, and cover it, and drop the fertilizer at the same time with the corn.

HANDLE SEAT FOR PLOWS.—Edward Wiard, Louisville, Ky.—This invention has for its object to furnish an improved seat for securing the handle to the mold board of plows, which shall be so constructed as to hold the handle firmly and securely.

COMBINED RULE AND CALCULATOR.—Nels Ockerlund, New York city.—This invention has for its object to furnish a simple and convenient instrument, which, while serving all the purposes of an ordinary rule, may be used for measuring angles, adding, subtracting, finding the fourth term of a proportion, etc., etc.; while, at the same time, being compact and easily manipulated.

STUMP-SAWING MACHINE.—A. and H. Goodman, Williamsburgh, Mo.—This invention relates to improvements in machines for sawing stumps close to the ground, and consists in the application of a vibrating sawing frame upon a frame hinged to the side of a truck frame, and provided with small rollers for rolling together with the truck towards the stump, as motion is imparted to the saw frame by connecting rods working from a line shaft on the truck, and operated by a horse-power apparatus also mounted on the truck, to be worked by a sweep attached to the driving wheel on the top of the truck, and arranged to work over the saw frame and stump, or in case of sawing high stumps or trees, the drive wheel may be provided with short levers and handed around. The said power is also provided with a set of feeding gears for working the driving wheels of the truck, and arranged for being geared or ungeared with the power as required.

COOKING UTENSIL.—J. A. Morrison, Brady's Bend, Pa.—The object of this invention is to furnish cheap, ready, and convenient means for toasting bread, broiling or frying meat, or warming vegetables, and it consists in combining with a metallic frame or stand two curved reflectors, one above other, with their convex sides near and facing each other, and with a toasting or broiling grate between them, supported by the frame, the concave side of the upper reflector being uppermost and forming a pan for frying.

MEASURING BOARDS.—I. J. W. Adams, Salisbury, Md.—This invention relates to a new and useful improvement in the mode of measuring boards and planks, and is especially adapted to measuring flooring as it is delivered from the planing machine, whereby accuracy of measurement is secured and time saved.

LOOMS FOR FANCY WEAVING.—Albert R. Field, Centra Falls, R. I.—This invention relates to new and important improvements in looms for weaving fancy goods, and it consists mainly in the mechanism for raising and lowering the harness of the loom, but embraces in combination with such mechanism other and improved mechanical appliances for producing the necessary motions for properly operating the harness, changing their positions, and thereby changing the figure or face of the goods woven.

PUMP SPOUT.—J. H. Gleim, Tipton, Mo.—The object of this invention is to provide convenient means for returning water to a well or cistern as it is pumped up, and in so doing the inventor has three objects in view: first to *save water*, which in some sections of the country at certain seasons of the year is a matter of great importance; secondly to obtain *cool water*, after thus pumping and returning the water, without waste; and thirdly, pumping and returning the water for the purpose of agitating and thereby aerating the water in the well.

EXPANSION JOINT FOR PIPES.—J. E. Jones, Tidioute, Pa.—The object of this invention is to produce a suitable joint for connecting the ends of pipes, the said joint allowing free expansion and contraction of the pipes, during the changes of temperature.

HOSE COUPLING.—Charles Powell, Birmingham, England.—This invention relates to improvements in coupling joints for hose or other pipe, and consists in providing longitudinal brackets or projections, on the end of one section with notches fronting the center, and a rotating collar on the other section behind the flange, with spiral flanges for wedging in the said notches, when the joints are placed together and the said collar is turned on its section, clamping the flange between it and the flange or end of the other section firmly together. The flange of the section on which the collar turns has radial notches engaging the projections of the other section to prevent it from being turned with the revolving wedging collar, by the frictional contact. The revolving wedging collar may have lugs for the attachment of a spanner for turning it, or a lever may be permanently attached to it.

GUN WIPER.—Herman Greve, Sparta, Wis.—This invention relates to a new gun wiper for small arms, and consists in an expanding and contracting cylindrical piece of vulcanized india-rubber, or other suitable substance, made hollow for the most part of its length, having a screw plug arranged in the hollow and permanently connected at the bottom, and provided with spiral grooves on the exterior, which is dropped into the barrel, and expanded by a rod with a tubular end, having screw threads fitted for the screw plug, and screwed down therein to expand the wiper against the wall of the barrel, and to turn it to scrape the foul matter adhering to the inner wall of the barrel into the groves of the wiper so that it may be drawn out when the wiper is withdrawn.

GATE.—S. Henry, Chenoa, Ill.—This invention relates to improvements in gates for fences, and consists in a combination with gates composed of longitudinal bars pivoted to the posts and to the vertical end bars, so that a slight downward movement of the end vertical bars next the posts and attached to the horizontal bars near the pivots and the posts, will open the gates by swinging them upon the said pivots of hinged platforms on each side of the gate connected at their ends with these vertical bars, so that the weight of the person or animal advancing will open the gate.

DOVETAILING MACHINE.—James R. Van Epps, Albany, N. Y.—This invention relates to new and useful improvements in machines for cutting dovetails for putting together boxes, drawers, flasks for founderies, and for all similar work.

WINDOW-BLIND HINGES.—A. C. Cornell, St. Louis, Mo.—This invention relates to improvements in hinges, to be used for opening, closing, and locking the blinds by turning a shaft projecting through the window frame to the interior of the building.

DRILL.—Alexander Thompson, Burlington, Vt.—This invention has for its object to so improve the device for holding rotary drills that the feed of the drill can be varied at will, and that, also, the drill and holder may be used in narrow places, where they otherwise could not be inserted.

SHIFTING RAIL FOR CARRIAGE SEATS.—Caspar Disser, West Union, O.—This invention relates to a new device for securing the rail to a carriage or buggy seat, and for facilitating the removal of the same; and it consists in the application of swiveled fastening buttons and hook-shaped back fastenings, by which the rail is securely locked, and which facilitates the ready removal of the same

BELT REPLACER.—William C. Bridges, Michigan City, Ind.—This invention relates to a new apparatus for adjusting belts on their pulleys, facilitating their removal from and application to, such pulleys, and it consists in the application of a curved semi-annular belt-receiver to a suspended lever, in such manner as to conveniently receive the belt from the pulley and reapply it to the same.

EGG-PACKING CASE.—George Ruston, Freeport, Ill.—This invention relates to improvements in egg-packing cases, and consists in providing small cells within a box by means of narrow strips of strong paper extending across the box one way, and perforated at suitable distances for the reception of short tenoned pieces, dividing the spaces between the long strips, into compartments, one for each egg

CARTRIDGE CASES.—O. Schevenell, Marion, Ala.—This invention relates to a new and useful improvement in cartridges for shot guns, more especially, but which may be used in rifles and guns of larger caliber, and it consists in making the cartridge case of staves of wood, or other suitable material, with common gun wads at the ends of the staves the whole being cemented or stuck together so that the shot will be retained therein and kept in place, while the case, or joints of the case will be broken in ramming down the cartridge.

BARK MILL.—J. G. Curtis, Emporium, Pa.—This invention relates to improvements in bark mills, and consists in an arrangement with a pair of metal cylinders, with notched teeth formed on them, in circular rows, with plain grooves between them, one having coarse and the other finer teeth, and the one with the coarser teeth being arranged in a suitable case above the other, of strong iron plates, with projections corresponding to the grooves in the rollers, and notches corresponding to the teeth, fitted in the sides of the case, for adjustment, to or from the rollers, and for action in connection with the toothed rollers for grinding the bark fed into the case at the top, to be first acted on by the coarse or breaking roller, in connection with which, at the point of receiving the bark, there is a strong iron block, permanently attached to the case, and having projections and grooves acting in conjunction with the roller, for breaking the bark into coarse pieces before passing to the lower breaking plates.

Official List of Patents.

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Patent Solicitors. No. 37 *Park Row, New York*

101,967.—APPARATUS FOR MEASURING BOARDS.—I. J. W. Adams, Salisbury, Md.

101,968.—SPIDER FURNACE FOR BURNING BAGASSE.—John Amick, Assumption parish, La.

101,969.—MANUFACTURE OF STEEL FROM CAST OR PIG IRON.—H. M. Baker, Washington, D. C.

101,970.—ROOFING MATERIAL.—M. G. Balfour (assignor to himself and B. Boorman), Mauston, Wis.

101,971.—HAY DERRICK.—Alden Barnes, Bloomington, Ill.

101,972.—VENTILATOR.—Orlando Barr, Beloit, Wis.

101,973.—STEAM GENERATOR.—J. F. Belleville, Paris, France. Patented in England, June 15, 1866.

101,974.—WATER-PROOF COMPOUND FOR BOOTS AND SHOES.—M. H Boettiger, Sacramento City, Cal.

101,975.—LATHE SPINDLE.—James E. Boutelle, Fishersville, N. H.

101,976.—CULTIVATOR.—Jacob Bower, Dayton, Ohio.

101,977.—STOP-COCK FOR STEAM AND LIQUIDS.—Joseph Breeden, Birmingham, England. Patented in England, Dec. 21, 1868.

101,978.—BELT REPLACER.—William C. Bridges, Michigan City, Ind.

101,979.—CLOTH-MEASURING APPARATUS.—T. M. Brintnall, Medina, Ohio.

101,980.—SHIFTING RAIL FOR BUGGIES.—Ira Bronson, Lockport, N. Y.

101,981.—TURNING CHISEL.—R. P. Buttles and Salmon Sweet, Mansfield, Pa.

101,982.—SAWSET.—E. Y. Clark, New York city.

101,983.—SHUTTER WORKER.—A. C. Cornell, St. Louis, Mo. Antedated April 14, 1870.

101,984.—BARK MILL.—J. G. Curtis, Emporium, Pa.

101,985.—CAMERA STAND.—William W. Dames, San Jose, Cal.

101,986.—SHIFTING RAIL FOR CARRIAGE SEATS.—Caspar Disser, West Union, Ohio. Antedated April 4, 1870.

101,987.—SLATE WASHER.—Samuel G. Dugdale, Richmond, Ind.

101,988.—HEMMER FOR SEWING MACHINES.—John V. D. Eldredge, Detroit, Mich.

101,989.—LOOM.—A. R. Field, Central Falls, R. I.

101,990.—WHEAT DRILL.—John F. Fisher, Greencastle, Pa. assignor to himself and Daniel Breed, Washington, D. C. Antedated April 7, 1870.

101,991.—AXLE FOR WHEAT DRILLS.—John F. Fisher, Greencastle, Pa., assignor to himself and Daniel Breed, Washington, D. C. Antedated April 7, 1870.

101,992.—BOILER FEEDER.—Lucus Foote, Fairfield, Ohio.

101,993.—VELOCIPEDE. — Frederick J. Forsyth, Bay City, Mich.

101,994.—MANUFACTURE OF ELASTIC ROLLS.—J. B. Forsyth, Boston, Mass.

101,995.—PUMP SPOUT.—J. H. Gleim, Tipton, Mo.

101,996.—TURBINE WATER WHEEL.—D. W. Glendinning, Detroit, Mich.

101,997.—GUN WIPER.—Herman Greve, Sparta, Wis.

101,998.—FARM GATE. — Michael Gunshenan, New York city.

101,999.—CLOTHES DRYER.—Joseph C. Haines, West Philadelphia, Pa.

102,000.—SINGLETREE.—Andrew J. Hanna, New Garden township, Pa.

102,001.—SHEET-METAL BENDING MACHINE.—C. C. Hare, Kansas City, Mo. Antedated April 8, 1870.

102,002.—SINK AND WASHSTAND.—Christer L. Hedell, Galesburg, Ill.

102,003.—GATE.—Samuel Henry, Chenoa, Ill.

102,004.—CORN PLANTER.—Christopher Hippensteel, Lee's Cross Roads, Pa.

102,005.—STEAM CONDENSER. — John Houpt, Springtown, Pa.

102,006.—BOLT CUTTER.—H. L. Howard, Mendon, Mich.

102,007.—WHIP. — Liverus Hull, Charlestown, assignor to American Whip Co., Westfield, Mass.

102,008.—WAGON TIRE TIGHTENER.—A. B. Hurd, Watkins, N. Y.

102,009.—WAGON BRAKE.—Reuben Hurd, Morrison, Ill.

102,010.—EXPANSION JOINT FOR PIPES.—J. Evans Jones, Tidioute, Pa.

102,011.—DOVETAILING MACHINE.—Dedrick Jordan, Charlestown, Mass., and Joseph Dill, Grand Rapids, Mich.

102,012.—CLOSET AND BED.—Wm. Keily, Bath, Me.

102,013.—PRINTERS' FURNITURE.—A. N. Kellogg and J. J Schock, Chicago, Ill.

102,014.—BOOTJACK AND BRUSH.—Samuel Kennedy, Rochester, Pa.

102,015.—SWEEP HORSE-POWER.—Richard J. M. King, Ypsilanti, Mich.

102,016.—BELL.—Joseph Kintz (assignor to himself and P. Clark), West Meriden, Conn.

102,017.—CORN PLANTER.—James M. Kiracofe, Mount Solon Va.

102,018.—APPARATUS FOR REMOVING OILS, GREASE, GUMS, AND THE LIKE, FROM COTTON AND WOOLEN WASTE, AND RECOVERING THE SAME.—J. W. Krebps, Chicago, Ill.

103,019.—DENTAL APPARATUS FOR CASTING PLATES FOR ARTIFICIAL TEETH.—J. A. Loomis, Carthage, Ill., and C. F. Moll, San Francisco, Cal.

102,020.—SMOKE STACK.—Hector Mackinnon, Cleveland, Ohio

102,021.—CHERRY STONER.—Jonah Merchant, Farmington Ill.

102,022.—FOLDING CHAIR. — George McAleer, Worcester Mass.

102,023.—COMBINED HAY RACK AND WAGON BOX.—F. G. McClellan, Attica, Ohio.

102,024.—FRUIT JAR.—Robert McCully, Philadelphia, Pa Antedated April 2, 1870.

102,025.—AXLES AND THEIR BOXING.—Rob Roy McGregor Covington, Tenn.

102,026.—BOLT CUTTER.—Wm. Mendham, Philadelphia, Pa. Antedated April 4, 1870.

102,027.—SHEET-METAL GROOVING MACHINE.—D. H. Metcalf and Daniel squier, Battle Creek, assignors to themselves and Martin Metcalf, Grand Rapids, Mich.

102,028.—AGRICULTURAL STEAMER.—Henry W. Millar, Utica N. Y.

102,029.—DOOR SPRING.—Abel Mishler, New York city.

102,030.—METHOD OF TREATING TRACING PAPER.—Julius Moog, Karlsruhe, Germany, assignor to Emil Heusner, Newark, N. J.

102,031.—COOKING UTENSIL.—J. A. Morrison (assignor to himself and A. J. Elliott), Brady's Bend, Pa.

102,032.—WINDMILL.—W. D. Nichols, Chicago, Ill.

102,033.—APPARATUS FOR REDISTILLING AND RECTIFYING SPIRITS.—Alonzo Noteman, Toledo, Ohio.

102,034.—RULE AND CALCULATOR.—Nels Ockerlund, New York city.

102,035.—ALARM AND OTHER BELL.—Thomas Pemberton and Geo. A. Pemberton, Birmingham, Eng. Patented in England, May 4, 1868.

102,036.—ATTACHMENT FOR HEATING STOVES.—J. L. Pfau, Jr., Quincy, Ill.

102,037.—STEAM TRAP.—L. H. Plum, Cincinnati, Ohio.

102,038.—HOSE COUPLING.—Charles Powell, Birmingham, England.

102,039.—LOOM.—Pierre F. Ramel and Jean Drogat, Lyons, France.

102,040.—HARNESS BUCKLE.—George Reyer, Indianapolis, Ind.

101,041.—COOLING ALE AND BEER.—Michael Reynolds, New York city. Antedated April 7, 1870.

102,042.—CHIMNEY.—Francis Richardson, Hebron, Ill.

102,043.—RAILWAY RAIL SPLICE.—George P. Rose, Elmira, N. Y.

102,044.—STOVEPIPE THIMBLE.—P. H. Rose and M. B. Hudson, Canandaigua, N. Y.

102,045.—CULTIVATOR.—H. S. Ross, Millville, Ohio.

102,046.—WASHING MACHINE AND BOILER.—John Russell and T. T. McGrath, Fentonville, Mich.

102,047.—EGG PACKING.—George Ruston, Freeport, Ill.

102,048.—SHOEMAKERS' EDGE PLANE.—J. H. Sanford (assignor to Chandler Sprague), North Bridgewater, Mass.

102,049.—DREDGING APPARATUS.—C. A. Scanlan, Charleston, S. C.

102,050.—FUNNEL CAN FILLER.—Thos. Scantlin, Evansville, Ind.

102,051.—CARTRIDGE CASE. — Oswald Schevenell, Marion, Ala.

102,052.—HORSE-COLLAR CAP. — John Sellors, Bellevue, Mich.

102,053.—HEATING DRUM.—Charles W. Servoss, Chicago, Ill.

102,054.—EYELETTING MACHINE.—Elijah Shaw, Milwaukee, Wis.

101,055.—BUTTER WORKER.—W. S. Shoemaker, Towsonton, Md., and E. H. Shoemaker, Columbus, Ohio.

101,056.—WATER WHEEL REGULATOR.—J. P. Sibley and A. Walsh, Bennington, Vt.

102,057.—ROTARY PUMP. — Anthony Sluthour, Cleveland, Ohio.

102,058.—WRENCH.—O. J. Smith, Wauwatosa, Wis.

102,059.—CLOTHES DRYER.—Lewis A. Stave, Oconomowoc, Wis.

102,060.—TURBINE WATER WHEEL.—Gilbert Stover, Crystal, Mich.

102,061.—ROOFING COMPOUND.—Wm. M. Stuart, St. Clair, Mich., assignor to himself, A. O. Whitcomb, W. S. Holmes, and R. H. Holmes.

102,062.—BLOWER.—Benjamin F. Sturtevant, West Roxbury, Mass.

102,063.—FAN BLOWER.—Benj. F. Sturtevant, West Roxbury, Mass.

102,064.—REFRIGERATOR.—A. B. Sweetland (assignor to himself and James Daley), Fitchburg, Mass.

102,065.—SAW MILL.—Charles Taylor, McKeesport, Pa.

102,066.—DRILL.—Alexander Thompson, Burlington, Vt.

102,067.—DETACHING HOOK.—J. W. Tuttle and Julius Peterson, Rochester, N. Y.

102,068.—MACHINE FOR MAKING WROUGHT-IRON CHAIRS FOR RAILROADS.—Wm. Van Anden, Poughkeepsie, N. Y.

102,069.—DOVETAILING MACHINE.—J. R. Van Epps, Albany N. Y.

102,070.—MACHINE FOR MOLDING GLASS BUTTONS.—Charles Vigneron, Providence, R. I.

102,071.—HANDLE SEAT FOR PLOWS.—Edward Wiard, Louisville, Ky., assignor to B. F. Avery.

102,072.—LOCOMOTIVE AND CAR BRAKE.—J. C. Wilson, Winneconne, Wis.

102,073.—FEEDING APPARATUS FOR NAIL MACHINE.—U. S Wolff, Burrel township, Pa.

102,074.—BELT TIGHTENER.—Alvin N. Woodard, Fenton, Mich.

102,075.—TOOL HANDLE.—Edwin L. Abercrombie, Florence Mass.

102,076.—BUCKLE.—J. J. Adair (assignor to W. J. Huey), Portland, Ind.

102,077.—ELECTROTYPING. — Joseph A. Adams, Brooklyn, N. Y.

102,078.—PROCESS FOR FACING VALVE AND VALVE SEAT FOR STEAM ENGINES.—Q. S. Backus, Winchendon, Mass.

102,079.—WHEEL GEAR FOR CARRIAGES.—Albert Baxter, Howard, N. Y.

102,080.—STOVE FOR RAILROAD CARS.—G. Beeman, Ironton, Ohio.

102,081.—GRAIN DRILL TEETH.—Lyman Bickford, Macedon N. Y.

102,082.—HEMMER FOR SEWING MACHINE.—A. W. Boomer and J. P. Haskins, Poultney, Vt.

102,083.—WASHING MACHINE.—Samuel Brackett, Wenona Mich.

102,084.—CHURN DASHER.—Isaac Brewbaker, Fincastle, Va. assignor to W. A. McCue.

102,085.—GLOBE VALVE.—Isaac W. Brown, Jefferson City Mo.

102,086.—HOT AIR FURNACE.—Lorenzo W. Brown, Cleveland Ohio.

102,087.—BOX HOOK.—Charles Bruso, Worcester, Mass.

102,088.—CAPSTAN.—E. Buel, Silver Creek, N. Y.

102,089.—SPRING BED BOTTOM.—J. N. Bull, Springfield, Mass Antedated March 31, 1870.

102,090.—ADJUSTABLE HOLLOW DRILL.—C. E. Butler, Hudson, N. Y.

102,091.—HEAD-BLOCK OF SAW MILL.—J. A. Clark, Leavenworth Ind

102,092.—COMBINED MANURE FORK AND SCRAPER.—J. W. Clarke, Kingston, Wis.
102,093.—EXTRACT FOR THE CURE OF CANCER AND OTHER DISEASES.—P. A. Cobb, Lynchburg, Va.
102,094.—PATTERN CHAIN FOR LOOM.—H. D. Davis, North Andover, Mass.
102,095.—HORSESHOE BLANK.—John Day, Buffalo, N. Y.
102,096.—OPERATING FAN TREMOLOS.—J. H. Dow (assignor to himself and Darius Wilcox), Birmingham, Conn.
102,097.—CONCRETE PAVEMENT.—N. H. Downs, Birmingham, Conn.
102,098.—FRENCH BEDSTEAD.—R. C. Du Bois, Washington, D. C.
102,099.—THILL COUPLING.—George W. Dubuisson, Norwich, Conn.
102,100.—HAME ATTACHMENT.—Charles H. Easte, South Boston, Mass.
102,101.—LAWN MOWER.—Norman Eaton, Woburn, Mass.
102,102.—ROAD SCRAPER.—James C. Evans, Delaware, Ohio.
102,103.—LUNCH VALISE.—Sigmund Feust, New York city.
102,104.—ELASTIC ROLL.—Jas. B. Forsyth and John J. Haley, Boston, Mass.
102,105.—COMBINATION TOOL.—Calvin A. Foster, Fitchburg, Mass.
102,106.—SCISSORS SHARPENER.—Calvin A. Foster, Fitchburg, Mass.
102,107.—WHEEL FOR LOCOMOTIVE LAND CONVEYANCE, AND COAL-HOISTING APPARATUS.—James S. French, Alexandria, Va.
102,108.—SHUTTER FASTENER.—Frederick W. Frost, Somerville, Mass.
102,109.—METALLIC CARTRIDGE.—Adonis N. C. Gavard, Paris, France.
102,110.—WIRE COVERING MACHINE.—Ambrose Giraudat, New York city.
102,111.—SCREW PROPULSION FOR TUG BOATS.—Edward D. Gird, Syracuse, N. Y.
102,112.—SAWING MACHINE.—Allen Goodman and Hardin Goodman, Williamsburg, Mo.
102,113.—FLY NET FOR HORSES.—John Graham, New York city.
102,114.—STOVE PIPE SHELF, HEATER, AND DAMPER.—Edward Hall, Beloit, Wis., and F. D. Searl, Rockton, Ill.
102,115.—BRICK MACHINE.—George W. Harlan, Cincinnati, Ohio.
102,116.—NON-CONDUCTING COVERING FOR STEAM BOILERS.—Washington Harris and Wm. Howell, Philadelphia, Pa.
102,117.—PIE STAMPER AND CUTTER.—Allen Hawkes (assignor for one half to O. E. Bigelow), Providence, R. I.
102,118.—MINERAL PAINT.—Edward B. Heckel, Vincent, Pa.
102,119.—STOVE PIPE DRUM.—Jacob Heger, Jefferson, Wis.
102,120.—FAUCET.—Joseph Heine and John Vonficht, Toledo, Ohio.
102,121.—HORSESHOE.—John Henderson, Albion, N. Y.
102,122.—MECHANISM FOR MAKING WIRE HEDDLES.—E. T. Hertle and Richard Thompson, New York city.
102,123.—COVER FOR TABLES, FLOORS, ETC.—August Herzog, New York city.
102,124.—SIRUP PITCHER.—John H. Hobbs, Wheeling, West Va.
102,125.—HINGE FOR SHUTTERS.—Johann Hof and Philipp Brennels, Baltimore, Md.
102,126.—HYDRANT.—James P. Hyde, New York city.
102,127.—AXLE BOX FOR CARRIAGES.—David Jewett, Lynn, Mass.
102,128.—EARTH CLOSET.—George Baker Jewett, Salem, Mass.
102,129.—STOPPER FOR JARS AND BOTTLES.—H. W. Ketcham, New York city.
102,130.—MACHINE FOR ROLLING CONICAL AND OTHER TUBES.—Charles Kewin, San Francisco, Cal.
102,131.—HARVESTER.—William A. Kirby, Auburn, N. Y.
102,132.—KNOB FOR SAFE DOORS.—Joseph G. Kittredge, San Francisco, Cal.
102,133.—ANIMAL TRAP.—John O. Kopas and Geo. W. Bauer, Washington, D. C.
102,134.—ANIMAL TRAP.—John O. Kopas, Washington, D. C., assignor for one half his right, to S. I. Wailes, Salisbury, Md.
102,135.—TREATING PARAFFINE AND OBTAINING IT IN CRYSTALS.—Frederick Lambe, London, England. Antedated Dec. 4, 1868.
102,136.—ROTARY PUMP.—Erwin Lavens and James C. Lamb, Middletown, Conn.
102,137.—PISTON ROD PACKING.—Harvey T. Lee, Marysville, Cal.
102,138.—HAME FOR HARNESS.—Josiah Letchworth, Buffalo, N. Y.
102,139.—COFFEE URN.—Eugene Martin, Waterbury, assignor to himself and Blaise Soules, Bridgeport, Conn.
102,140.—ROTARY PUMP.—Henry W. Mather, New York city.
102,141.—BRICK KILN.—William T. Mathews, Negaunee, Mich.
102,142.—SELF-WINDING AND BALANCING CURTAIN FIXTURES.—F. C. D. McKay, Elmira, N. Y.
102,143.—STOVE GRATE.—Henry Miner (assignor for one half his right, to Louis Harter), Green Island, N. Y.
102,144.—PAVING BRICK.—David Moffatt and John Thomson, Philadelphia, Pa.
102,145.—PICKER CHECK FOR LOOM.—William Montgomery. Northampton, Mass.
102,146.—MANUFACTURE OF STEEL.—Charles Motier Nes, York, Pa.
102,147.—SAFETY VALVE.—H. J. Paine (assignor to himself and Joseph Kelly), Providence, R. I.
102,148.—TREATING TIN SCRAP TO OBTAIN USEFUL PRODUCTS.—D. D. Parmelee, New York city, assignor to W. K. Marvin.
102,149.—CAR COUPLING.—William B. Parsons, Short Tract, N. Y.
102,150.—DOUBLE SHOVEL PLOW.—George Perry, Granville, Ill.
102,151.—JOINT FOR PITMAN HEADS, SICKLES OF HARVESTERS, ETC.—Iva Poffenberger, Champaign county, Ohio.
102,152.—HULLING MACHINE.—William Porter, Brooklyn, N. Y.
102,153.—PAPER FILE.—John P. Quarles, Richmond, Va.
102,154.—SCREEN ATTACHMENT FOR WINDOWS.—Geo. Reed, W. C. Hosgland, and J. J. Newson, Brooklyn, Cal.
102,155.—MACHINE FOR UNITING BOOT AND SHOE SOLES TO THE UPPERS.—T. K. Reed, East Bridgewater, assignor, by mesne assignment, to Gordon McKay, trustee of the McKay Sewing Machine Association, Boston, Mass.
102,156.—APPARATUS FOR PITCHING BEER AND OTHER BARRELS.—Hermann Reutti and Philipp Winkelhaus, Hamilton, Ohio.
102,157.—INKING APPARATUS FOR COLOR PRINTING.—Israel L. G. Rice, Cambridge, Mass.
102,158.—APPARATUS FOR REEFING SAILS.—N. W. Rich, Swampscott, Mass.
102,159.—MACHINE FOR TRIMMING THE HEELS OF BOOTS AND SHOES.—E. P. Richardson, Lawrence, assignor to himself and F. W. Carruth, Boston, Mass. Antedated April 9, 1870.
102,160.—MACHINE FOR JOINING THE CLEANING TEETH OF CROSSCUT SAWS.—John R. Robson, Ovid, Mich.
102,161.—COMPOUND TO BE USED IN TREATING RHEUMATISM AND OTHER DISEASES.—John B. Rodgers, St. Louis, Mo. Antedated April 12, 1870.
102,162.—PLOW.—Samuel D. Sayre, Rockford, Ill.
102,163.—LAMP.—Bennett B. Schneider, New York city.
102,164.—BOBBIN-WINDER FOR SEWING MACHINES.—Thos. Shanks, Baltimore, Md.
102,165.—WATCHMAN'S TIME CHECK.—David Shive, Philadelphia, Pa.
102,166.—CLEANING WOOL AND HAIR.—Chas. F. A. Simonin, Philadelphia, Pa., and Edward W. Coffin, Glendale, N. J.
102,167.—DEVICE FOR HANGING PICTURES, ETC.—Corelli W. Simpson, Bangor, Me.
102,168.—LAMP.—Francis Vanvost Sleeth, Keokuk, Iowa.
102,169.—VAPOR BURNER.—Chas. E. Smith and H. J. Rice, Columbus, Ohio.
102,170.—SEWING MACHINE.—Geo. A. Smith and Edward L. Miller, Philadelphia, Pa.
102,171.—CHURN POWER.—Ruth N. Smith, New York city.
102,172.—HORSE HAY RAKE.—Solomon P. Smith, Waterford, N. Y.
102,173.—HAY TEDDER.—Walter Smith, Weston, Mass.
102,174.—GOVERNOR VALVE.—William Smith, Philadelphia, Pa.
102,175.—APPARATUS FOR COOLING GRAIN.—S. A. Stebbins, Toledo, Ohio.
102,176.—SELF-ACTING EQUALIZING VALVE.—J. J. Steiger, Peoria, Ill.
102,177.—AMALGAMATOR.—Charles C. Stevenson, Gold Hill, Nevada.
102,178.—FOLDING CHAIR.—Alexander W. Stewart, Boston, Mass.
102,179.—FOLDING CHAIR.—Alexander W. Stewart, Boston, Mass.
102,180.—FODLING CHAIR.—Alexander W. Stewart, Boston, Mass.
102,181.—METAL-CAPPED CORK.—Edwin Street, East Haven, Conn.
102,182.—SPRING BED BOTTOM.—Richard Tattershall, Beloit, Wis.
102,183.—TYPE DISTRIBUTING MACHINE.—D. B. Thompson, Brooklyn, N. Y.
102,184.—MACHINE FOR GRINDING AND POLISHING MARBLES.—J. H. Volk, Chicago, Ill.
102,185.—CARPET FASTENER.—R. W. Walker, Washington, D. C.
102,186.—STILL FOR PETROLEUM.—John Warren, Flushing, N. Y.
102,187.—STOP VALVE FOR PETROLEUM PACKAGES.—Albin Warth, Stapleton, N. Y.
102,188.—TAP FOR LIQUID PACKAGES.—Albin Warth, New York city.
102,189.—COPY BOOK.—John D. Williams, New York city.
102,190.—BUTTON FASTENING.—Morris Wise, New York city.
102,191.—SHUTTER WORKER.—Hermann Wolff, Milwaukee, Wis.
102,192.—SHUTTER WORKER.—Herman Wolff, Milwaukee, Wis.
102,193.—ARTIFICIAL TEETH.—John H. Wood, Lebanon, Ohio.
102,194.—MEDICINE FOR COUGHS AND COLDS.—Allen Young, Pittsborough, N. C.
102,195.—MACHINE FOR FORMING AND CUTTING EYELETS AND FOR THE PREPARATION OF STOCK FOR THE SAME.—S. W. Young (assignor to himself, Russell A. Dennison, and Elisha Dyer), Providence, R. I.
102,196.—ADVERTISING DESK.—H. W. Crotzer, Philadelphia, Pa.
102,197.—DOOR SPRING.—A. T. Ballantine (assignor to himself, W. W. Kingsland, N. R. Bates, and L. D. Phelps), Titusville, Pa.
102,198.—BRONZING AND GILDING.—J. L. Duffee, Washington, D. C.
102,199.—PUMP.—B. F. Gustin, Middletown, Ind.

REISSUES.

3,921.—TREATING ORGANIC MATERIALS WITH AIR.—Rudolph D'Heureuse, New York city.—Patent No. 93, 182, dated August 3, 1869.
3,922.—HOISTING MACHINE.—Wm. Miller, Cincinnati, Ohio.—Patent No. 48,579, dated July 4, 1865; reissue 2,066, dated September 5, 1865.
3,923.—GRAIN SEPARATOR.—G. B. Turner, Cuyahoga Falls, Ohio, assignee of G. B. Turner and James A. Vaughn.—Patent No. 1,013, dated April 9, 1861.
3,924.—GAS GENERATOR.—Benjamin Best, Dayton, Ohio, assignee of Patrick Kelly.—Patent No. 92, 317, dated July 6, 1869.
3,925.—MILL.—J. B. Brown, Peekskill, N. Y., assignee of C. B. Hutchinson.—Patent No. 29,490, dated August 7, 1860.
3,926.—MILL.—J. B. Brown, Peekskill, N. Y., assignee of C. B. Hutchinson.—Patent No. 29,490, dated August 7, 1860.
3,727.—HAND STAMP.—B. B. Hill, Chicopee, Mass.—Patent No. 59,295, dated November 6, 1866; reissue 2,836, dated January 14, 1868; reissue 3,261, dated January 12, 1869.
3,928.—OILER FOR LOOSE PULLEYS.—C. A. King and D. B. Wesson, Springfield, Mass., assignees of C. A. King.—Patent No. 95,912, dated October 19, 1869.
3,929.—BAKER'S OVEN.—M. A. E. McKenzie, Brooklyn, N. Y., assignee to Duncan McKenzie.—Patent No. 28,139, dated May 1, 1860.
3,930.—ROLLER FOR CLOTHES WRINGER.—Woonsocket Rubber Company, Woonsocket, R. I., assignees of J. F. Holt.—Patent No. 49,030, dated July 25, 1865.
3,931.—MACHINE FOR SAWING MARBLE.—P. J. Torney, for himself, and Charles W. Hayden, and J. L. Kidwell, assignees of P. J. Torney, Washington, D. C.—Patent No. 84,518, dated December 1, 1868.

DESIGNS.

3,973.—MASONIC CHART.—James Ames, Indianapolis, Ind.
3,974.—BUGGY BODY.—William M. Armstrong, Middletown, Ohio.
3,975.—WATCH CHAIN.—Montraville Buffum, Leominster, Mass.
3,976.—CARPET PATTERN.—R. R. Campbell (assignor to Lowell Manufacturing Company), Lowell, Mass.
3,977 to 3,983.—CARPET PATTERN.—E. J. Ney, Dracut, assignor to Lowell Manufacturing Company, Lowell, Mass. Seven patents.
3,984.—TRADE MARK.—D. A. Page, Dover, N. H.
3,985.—HANDLE FOR SPOONS, FORKS, LADLES, ETC.—J. R. Wendt, New York city.

EXTENSIONS.

MACHINE FOR SOWING FERTILIZERS.—W. S. Bartle, Newark, N. Y.—Letters patent No. 14,708, dated April 22, 1856; reissue 558, dated May 18, 1858.

PULVERULENT ACID FOR USE IN THE PREPARATION OF SODA POWDERS, FARINACEOUS FOOD, AND OTHER PURPOSES.—E. N. Horsford, Cambridge, Mass.—Letters Patent No. 14,722, dated April 22, 1856; reissue 2,597, dated May 7, 1867; reissue 2,979, dated June 9, 1868.

DISCLAIMERS.

HORSE HAY RAKE.—Mary G. Pratt of Marple township, Pa., administratrix of Randall Pratt, deceased.—Letters patent No. 40,067, dated January 8, 1856; reissue 1,593, dated February 28, 1865.—Filed Jan. 7, 1870.

COMPOSITION FOR INKING ROLLERS, PADS, ETC.—Lewis Francis and C. H. Loutrel, New York city, assignees of Lewis Francis and F. W. Letmate.—Letters patent No. 43,192, dated June 21, 1864; reissue 2,805, dated November 25, 1867.—Filed March 28, 1870.

NEW BOOKS AND PUBLICATIONS.

ELECTRO-METALLURGY PRATICALLY TREATED. By Alexander Watt, F.R.S.A., Lecturer on Electro-Metallurgy, etc., formerly one of the Editors of "The Chemist." New Edition. Strahan & Co., Publishers, 56 Ludgate Hill, London.

MODERN WORKSHOP PRACTICE. As Applied to Marine, Land, and Locomotive Engines, Floating Docks, Dredging Machinery, Bridges, Shipbuilding, Cranes, etc., etc. By John G. Winton, Engineer. Strahan & Co., Publishers, 56 Ludgate Hill, London.

The above valuable works, noticed in No. 17, can be had on application to Messrs. Virtue & Yorston, No. 12 Dey street, this city.

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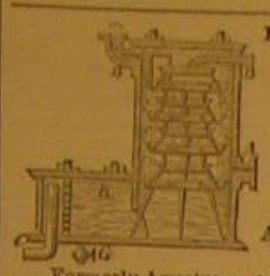


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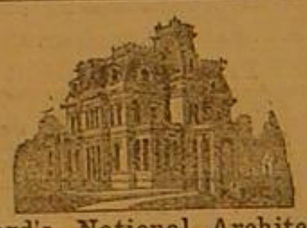
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