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SIR JOHN HERSCHEL.

The recent death of Sir John Herschel renders the portrait of that eminent scientist, which we herewith publish, appropriate and acceptable. Such a life as his is necessarily full of interest to all intelligent persons. It is, however, impossible for us to give space for anything more than a mere sketch of the career of this famous astronomer, compiled from various sources. A writer in *Nature* has thus gracefully described his birth and early life:

"John Frederick William Herschel was born at Slough, in the early part of 1792, being the only son of that great philosophical astronomer, of whom it were difficult to decide, and one cares not to inquire, whether the father was or was not more illustrious than the son. Thus the boy was nurtured within sight of that remarkable telescope, wonderful indeed for the day of its construction, which, though in reality among the least of Sir William's achievements, has probably contributed the most to render the name of Herschel famous among men. His education was conducted chiefly at home, or, at all events, under home influences, and mainly in the society of persons considerably advanced in years; and it is probably to this circumstance that we may attribute much of that singularly retiring, though kindly and affectionate disposition, for which he was so greatly esteemed by all who had the privilege of his acquaintance.

"In 1809, he was removed to St. John's College, Cambridge, where there are still retained, among a few of its oldest members, some curious traditions of his scrupulous attention to the duties of his position. Certain specified selections from the "Principia" of Newton formed, of course, a portion of the curriculum of study. In that day they came to the student in the form of manuscripts, translated and somewhat modified from the Latin text; John Herschel, however, conceived it his duty to read the entire work, just as Newton had left it. We mention this circumstance solely because it furnishes us with an early indication of that staple quality of mind without which no true greatness is ever attained, namely, thoroughness of work. It is not surprising that such a man carried off the highest honors in the University examination, and that, in 1813, he graduated as Senior Wrangler of the year; the first among a little phalanx of eminent men, than whom the University of Cambridge has seen nothing superior, and not much that is comparable, since.

"It was shortly after his degree that we find the elder Herschel, in one of his latest communications to the Royal Society, referring with evident satisfaction to the fact that he had a son who was now capable of taking an important part in those astronomical, or rather, as they may more properly be called, those cosmical researches which had formed the successful pursuit and the delight of his own life; and before his death he had the pleasure—we might not improperly call it the reward—of seeing his son, in the year 1820, become one of the honorary secretaries of the newly formed Astronomical Society.

"For fifty years and more, the young Herschel continued to be one of its most constant and loyal supporters, employ-



THE LATE SIR JOHN HERSCHEL.

ing some of the last conscious moments of his life in compiling for its service a complete list, or, if we may be allowed the expression, a complete natural history of double stars, commencing with his father's first discoveries, and terminating only with his own decease."

Another writer says: "The real work of Herschel's life began when, in conjunction with Mr. South, afterwards Sir James South, he deliberately set to work to map out the whole of the known stars. Double stars, nebulæ, and finally the stars of the Southern hemisphere, were alike catalogued and placed by him.

"These enormous labors carry us down to the year 1838, when Sir John, who had been knighted by William IV., and who was made a baronet at the coronation of the present Queen, returned from the Cape of Good Hope, where he had resided four years at his own expense, for the purpose of completing his catalogue. Every honor that a scientific man can desire fell to his lot He had awarded to him the Astronomical Society's gold medal; Oxford made him a D. C. L.; he was a Fellow of the Royal Society, and of all kinds of British and foreign societies and academies; and, had he chosen to accept the office, he might, no doubt, have been President of the Royal Society.

"He still continued his work, but henceforward it was of a more varied character. His mind had imbibed from his father a metaphysical turn, and he had, earlier in life, published his 'Preliminary Discourse on the Study of Natural Science,' a work which contributed more than anything else to the popular recognition of his acquirements. Like many others, he translated Homer, and in the *Cornhill* he published a poetical version of a part of Dante's 'Inferno.'

"His other works were numerous, but of late years his principal contributions to literature were either articles in the quarterlies, or papers in *Good Words*, intended to explain in popular language, such subjects as volcanoes, comets, the sun, light, and the outlines of mathematical problems of astronomy.

"Few philosophers of an age which has produced a Faraday and a Brewster have attained distinction equal to that of Sir John Herschel. His mathematical acquirements and his discoveries in astronomy, in optics, in chemistry, and in photography, were all of a very high order, and, being aided by an admirable style, secured for him the widest reputation among men of science, both in England and abroad.

"Sir John Herschel married, in 1829, Margaret Brodie, daughter of the Rev. Dr. Alexander Stewart, by whom he had a family of nine daughters and three sons. He is succeeded in the title by his son, Mr. William J. Herschel, of the Bengal Civil Service."

A writer in *Appletons' Journal* thus speaks of the celebrated Herschel family. "The little that is known of Sir John's ancestors is honorable. Abraham, Isaac, and Jacob, as the representatives of three generations were called, were sound Protestants, in days and in places where Protestantism was a reproach. Abraham Herschel, the great-great-grandfather of John, was expelled from Mahren, his place of residence, on account of his Protestantism. Isaac, his son, was a farmer near Leipsic. Jacob, son of Isaac, declined agricultural pursuits, and gave expression to the family aptitude for music by making it his profession, by bringing up five sons to the same calling, and by developing musical ability in all his ten children. Among the five was the astronomer, Frederick William, who was born at Hanover in 1738, and came to England at one-and-twenty, a professional musician, but caring even more for something else than music—for metaphysics. To the end of his life, when he was known all over the world for his astronomical discoveries, his chief delight was in metaphysical study and argumentation. Perhaps we may ascribe to this taste, prevailing in the little household at Slough, the tendency of his scientific son to diverge into metaphysical criticism whenever his theme, or any interruption of it, in the course of composition, afforded occasion."

"Sir John grew up among four elderly persons, three of whom at least were devoted to the same pursuits. His father was fifty-two at the time of his birth. His mother was a widow when Sir W. Herschel married her. As the marriage was a remarkably happy one, we may assume that the lady sympathized in her husband's pursuits, or at least honored them. The other two were Miss Caroline Herschel, celebrated as the discoverer of five comets, and a brother, who gave assistance in the observatory. How soon the child became aware of how the nights were passed by these students, we have never heard. Perhaps he was unaware that, while he was sleeping the night away, his father and aunt were awake to the utmost stretch of their faculties, he at the telescope, communicating with her by a set of mute signals; and she in another room, noting his observations, and making calculations for him by lamp light, nothing moving but the pendulum and her pen, and nothing heard but the clock and an occasional movement of the ponderous machine.

"But the house was kept quiet by day, for the watchers to sleep; and this must have been impressive to the child, and so must the visits of awe-struck strangers. Few were admitted, it is said; and none were allowed to use the great telescope; but here and there one was favored with an admission to the observatory, to be shown the method of commanding the field of search, or to be permitted (as one has recorded) to read small print at midnight "by the light from the small star in the foot of the goat." It is not surprising that John should have evidenced his love of natural philosophy before he left Eton.

His lifelong and very conspicuous veneration for his father points to a happy childhood and youth under his eye. Comfort abounded at home, as far as money could procure it. The astronomer had four hundred pounds a year from the king; his lady had a considerable jointure; and the sale of his improved specula afforded a considerable income. It was from a thoroughly happy home that the boy went to Eton, and afterward to Cambridge."

INSTRUMENT FOR PARTING LADIES' HAIR.

Joseph L. Meek, of New York city, has been turning his attention to the growing wants of ladies in dressing their hair. He has provided an instrument, by the use of which, it is claimed, ladies may be able to part their hair with that geometrical accuracy so much desired. As will be seen it consists of a yoke, which, placed over the crown of the head,



holds a slotted guide, by means of which the comb is, in making the part, forced to follow the medial line between the ears of the fair, whose ears are supposed to be in an exact horizontal line when their heads are level.

Hydraulic Mining.

A correspondent of the *Evening Post*, writing from California, says that the ancient river bed from which so much gold has been taken in this State is in many places covered with earth to the depth of two or three hundred feet. Once, perhaps, they say here, it ran in a valley, but now a huge hill covers it. To dig down to it and mine it out by ordinary processes would be too expensive; therefore hydraulic mining has been invented. Water brought from a hundred or one hundred and fifty miles away and from a considerable hight, is led from the reservoirs through eight, ten or twelve inch iron pipes, and, through what a New York fireman would call a nozzle five or six inches in diameter, is thus forced against the side of a hill one or two or three hundred feet high. The stream when it leaves the pipe, has such force that it would cut a man in two if it should hit him. Two or three and sometimes even six such streams play against the bottom or a hill, and earth and stones, often of great size, are washed away, until at last a great slice of the hill itself gives way and tumbles down. At Smartsville, Timbuctoo and Rose's Bar, I suppose they wash away into the sluices half a dozen acres a day, from fifty to two hundred feet deep; and in the muddy torrent which rushes down with railroad speed through the channels prepared for it, you may see large rocks helplessly rolling along.

Not all the earth contains gold. Often there is a superincumbent layer of fifty or more feet which is worthless, before they reach the immense gravel deposit which marks the course of the ancient river; and from this gravel, water worn and showing all the marks of having formed once the bed of a rushing torrent, the gold is taken. Under great pressure this gravel—which contains, you must understand, rocks of large size, and it is not gravel in one sense of the word, at all—has been cemented together, so that even the powerful streams of water directed against it make but a feeble impression; and to hasten and cheapen the operation, a blast of from 2,500 to 3,000 kegs of powder is inserted in a hill side, and exploded, in such a way as to shatter and loosen a vast bulk of earth and stones, whereupon the water is brought into play against it.

You know already that the gold is saved in long sluice boxes, through which the earth and water are run, and in the bottom of which it is caught by quicksilver; and so far the whole operation is simple and cheap. But in order to run off this enormous mass of earth and gravel a rapid fall must be got, into some deep valley or river; and to get this has been the most costly and tedious part of a hydraulic mining enterprise. At Smartsville, for instance, the bed which contains the gold lies above the present Yuba river, but a considerable hill, perhaps two hundred and fifty feet high, lies between the two, and through this hill each company must drive a tunnel before it can get an outfall for its washings. One such tunnel, driven for the most part through solid and and very hard rock, has just been completed. It cost $250,000 and two years labor, and was over three thousand feet long; and until it was completed not a cent's worth of gold could be taken out of the claim.

CANDLES WITH PERPENDICULAR AIR PASSAGES.—Our English cotemporaries report the introduction, by a well known firm, of a candle with holes, close and parallel to the wick, throughout the length of the candle. The idea of the makers is, that air will be supplied, by these passages, to aid combustion; but how the air through the holes can do more than the air immediately surrounding the flame, we are unable to perceive. A tubular wick, to supply air to the interior of the flame, might increase the combustion, but the perforated candle seems only suitable for an advertising trick.

Sea-Bathing.

There are circumstances necessarily connected with a visit to the sea-side, which greatly tend to increase its beneficial effects. In almost all instances the used up man of business or of pleasure, the man suffering from general debility, occasioned by his mental or physical powers having been overtaxed, or from continued residence in close, unhealthy towns, and persons suffering from general languor and lassitude, or undergoing difficult and tedious convalescence from the effects of severe illness or accident, are benefited. To these people it is not the sea air alone, nor yet change of air; but it is change of scene and habit, with freedom from the anxieties and cares of study or business, the giddy rounds of pleasure, the monotony of every day life, or of the sick room and convalescent chamber, which produce such extraordinary beneficial effects—a seemingly perfect renovation of wasted energies and renewal of the powers of life—effects not to be obtained by means of any purely medical treatment.

With bathing in the open sea, there is to be considered, first, the shock experienced on entering water at its natural temperature, when shivering, convulsive respiration and oppression of the chest are always experienced, although but for a moment, and pass away on immersion and free action in the water; secondly, the stimulating effects of the saline substances; thirdly, the mechanical action and pressure of the large moving mass of water and the motion of the waves acting as douches, which, combined, are not in all cases well borne by delicate persons and children. The direct effect of cold bathing is sedative and benumbing, and causing the blood to recede from the surface of the body into the grand arterial trunks, congesting the brain and internal organs, depressing the vital powers, and as it were bringing on death. It is this direct effect we have to guard against, and this we can only do by encouraging sufficient and healthy reaction, indicated by the genial glow, feeling of general vigor, and increased appearance of blood to the surface of the body, sometimes wearing the aspect of a healthy skin, but at others exhibited by small red patches like measles, diffused redness as in scarlatina or spots like flea bites. It is, therefore, how to avoid the direct evil effect, and how to encourage sufficient and healthy reaction, that we have to consider.

First, the duration of a cold bath should not be too prolonged, and it is to be laid down as an unexceptional rule, that a certain degree of vigor and power of reaction are essential in all by whom cold sea bathing is to be attempted. Thus it is not advisable that old people, the weak and delicate, including children, or such as are disposed to internal congestion or hemorrhage, should take a cold sea bath. General lassitude, with tendency to sleep, headache, or toothache, sensitiveness of the breast, increase of appetite, and constipation, are frequent results of a cold bath at the commencement of a course of sea bathing.

For bathing, therefore, in the open sea, it is desirable to prepare the delicate and unaccustomed by giving them a few preliminary tepid baths, which produce a gently stimulating action on the skin, acting at the same time as a sedative to the nervous system; and by gradually lowering the temperature of these baths, the patient becomes strengthened to undergo the shock of a cold bath without risk, the severity of which very rapidly becomes diminished by the force of habit in bathing. The latter part of the month of July, is the most suitable time to commence a course of cold sea-bathing, the delicate or invalided having been previously inured by tepid baths.

In the morning, before ten o'clock, the temperature of the sea is at its lowest, and it is, therefore, at this time unsuited to the uninured and delicate, while it is most bracing and invigorating to the strong, and to such as can aid reaction of the circulation by the exercise of swimming. The sea reaches its maximum temperature at twelve o'clock, and continues the same until five; it is, therefore, during this time the delicate should bathe, the earlier the better, but in this, of course, persons must be guided by the tide.

Beet Root Sugar.

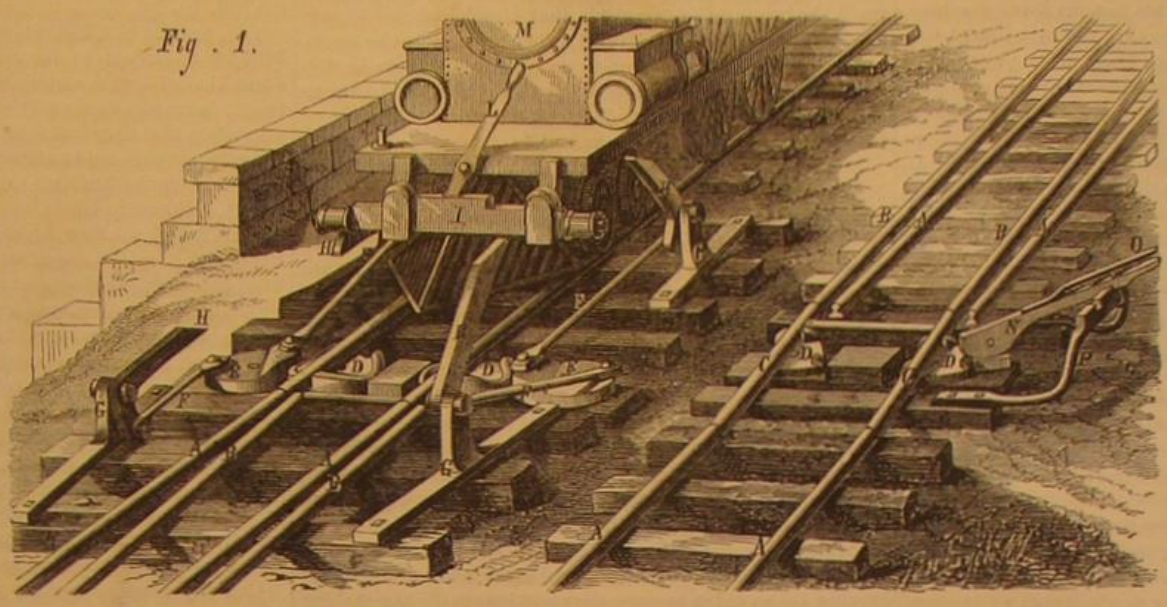
The London *Grocer* gives the following statistics:—The number of manufactories at present engaged in the manufacture of this article is on the increase in Central Europe. It appears that there are no less than 1663, which are divided as follows: "Great Britain and Italy have each 1 manufactory; Sweden, 4; and Holland, 20. Next comes Belgium, with 135; then Austria, with 228—136 of which are in Bohemia, and 26 in Hungary; and Germany, with 310. Prussia possesses 230 of this number, the greater portion of which—namely, 143—are in the province of Saxony. The South German States have fewer in proportion, Wurtemberg having 6, Bavaria 5, and Baden only 1, which is, however, perhaps the largest in Germany or elsewhere, consuming annually a million cwt. of beet root. Russia and France have about an equal number of these manufactories—namely, 481 and 483. The most of the sugar in France is made in the Department du Nord, which has 167 manufactories, or more than a third of the whole. At present, this article is not produced in any of the following European countries: Spain, Portugal, Denmark, Greece, Turkey, or Roumania. In America, it is still in the very first stages of development. It was unsuccessfully attempted for several years in the State of Illinois, but a manufactory has lately been set going in the State of Wisconsin.

THE fastest railroad train in the world, probably, is said to be a new express on the Exeter and Great Western Railways, from Plymouth to London, the journey of one hundred and ninety-four miles being arranged to occupy four hours and a quarter.

Improved Switch for Railroads.

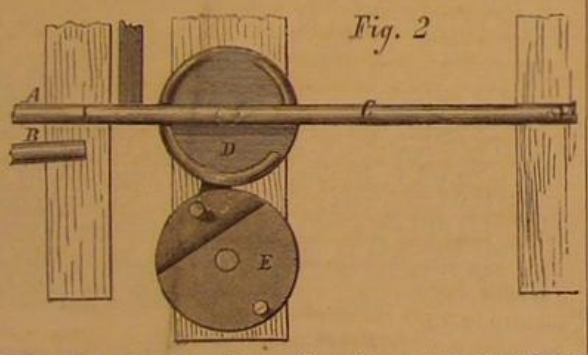
The object of the steam switch is to use the locomotive as a general switchman on railroads. The hand and steam switch are both constructed and operated on the same plan of turntables. The turntables, D, are vibrating tables placed under the rails of the switching track, so as to move them either way as far as required, and limit their motion. There may be one or several of them used under each switching rail; and their centers of vibration on the crossties, on each side of the track, are on a common line between a right and left switch. Where only one turntable is used under each switching rail, it is placed where the rails in a right and left switch intersect, which is about one third of the length of the track from the switching end. Across the face of each turntable, there is a A-shaped recess for the rail to rest in and for limiting its motion. The narrow part of this recess is to be just wide enough to receive and hold the rail and allow its vibration, while the wider part is to be wide enough for a full left and right hand switch. The wider part of the recess must be governed by the movement of the track where it is placed, and the narrow part, by the width of the rails used. The turntables are made full, both on the upper and under sides, near their centers, so as to offer the least possible friction to their full vibration. They may be secured by bolts directly to the crossties or to small bedplates attached to them, and in such a way as to prevent the access of water, and thus prevent their freezing fast in winter. An arm from each turntable, on each side of the switching track, projects outside of it so as to gear it to the disk, E, either horizontally or vertically, by teeth in both, or otherwise. If vertically, an additional post is required in the rear of each disk. Their centers and attachment to the crossties are the same as those of the turntables, and just outside of them, as both are secured to the same crosstie. The recesses across the faces of the turntables may be continuous and permanent, or adjustable, or confined to their circumference. The shoulders of these recesses between the rails must be low enough not to interfere with the flanges of the car wheels, while outside of the rails they may be nearly as high as the rails themselves. The wide or narrow ends of these recesses may be toward the switching end of the track, if preferred.

Fig. 1.



STRAIT'S TURN-TABLE AND HAND AND STEAM SWITCH FOR RAILROADS.

Fig. 2



By hinging or otherwise attaching a lever, N, to either arm of the two turntables, so that its outward end will rise and fall a few inches, so as to fasten in a guard, P, just outside of the track, with two lever recesses on its top, one for a right and the other for a left hand switch, it can be used as a hand lock switch. The spring, O, attached to the top of the hand lever, is to hold the lever securely in its place. The turntables, D, may be of any size and shape, to vibrate the best, and between the rails may be either connected or disconnected.

The disks, E, are two tables of the same size as or a little larger than the turntables, secured on the same crossties by bolts through their centers, just outside of them, and so geared either horizontally or vertically, that both will have a similar vibration. At opposite points on their circumferences, the four connecting rods, F, are movably secured at one end, to give them their reciprocating motion. The four stationary posts, G, are placed just outside of the track and in its line either way, far enough from the switching track, either up or down it, to allow it to be fully switched before the foremost wheels in a train can mount it. The other ends of the four connecting rods, F, connect and fasten to the short arms of the vibrating levers, H, and alternately elevate and depress them on each side, as the shifting bar, I, is set.

When the operating roller on the shifting bar, I, in front of the foremost pair of wheels in a train, acts on the vibrating levers, K, on one side of the track, it depresses the levers to a horizontal line, and switches the track to that side, while the levers, H, on the opposite side, are correspondingly elevated. Both levers on the same side have a similar motion by the pressure of the operating roller on either. The lever on either side, when operated on by the corresponding roller on the shifting bar, I, communicate their motion to the rods, F, the rods to the disks, E, the disks to the turntables, D, and the turntables to the switching track, C. M represents a locomotive, truck, tender, or car, and L the lever, for shifting the roller bar, so as to act on either side, as may be required. By means of cords and pulleys the shifting bar, I, and its rollers are placed under the control of the engineer or an assistant, to regulate the switching of the track.

The recesses on the faces of the turntables to receive and hold the rails and regulate their motion, can be made by the insertion of four short bolts, at the proper points near their circumferences, so that their heads will be just above the rail flanges. The more these recesses are lengthened in the line of the track the more their vibration can be decreased; the lower the stationary posts may be made, the less may be the elevation of the vibrating levers.

The connecting rods, F, all have a pulling motion when acted on by the operating rollers; and the depression or elevation of one vibrating lever on one side of the track, insures the same motion to the others. These rods, by means of swivels or brackets, can be tightened or lowered so as to equalize their strains and motions. In switching forward, the operating rollers have to be attached in advance of the foremost pair of wheels in a train; and in front of the hindmost pair, in switching backwards or backing down.

There is generally a space of about thirty inches outside of the track on both sides, and between the bottoms of the cars and the crossties. The stationary posts and vibrating levers are located and operated in this space, but sufficiently outside not to be in the way of the tracks. The vibrating levers are intended to operate in a space of from twenty to twenty-four inches in hight, and the angle of the vibrating levers is about 110°, to equalize their motion on each side of their centers.

By this arrangement trains may pass and repass freely either way, either on the side or main track, A. Each of the four stationary posts and vibrating levers stands as a sentinel to shift the track as may be required. The turntables and disks may be from ten to sixteen inches in diameter; the posts, from ten to twelve inches high, and the vibrating levers, from thirty to fifty inches long. The posts may be set as far up and down the adjoining track, both ways, as may be necessary to insure a full switch before the foremost or hindmost pair of wheels mount the switching track. The rollers may be made of rubber, wood, iron, or a coil of steel springs. The vibrating levers may be made of cast or wrought iron, and if made of wrought iron may be tipped with spring steel, where a high speed is required. The operating rollers, instead of being attached to a common bar, I, may be separately attached, adjusted and operated.

As the motion of either of the levers, H, correspondingly changes the positions of all of the others, it makes no difference how they are left, or what are their positions when tampered with; for the rollers on either side, when they pass, bring all on one side, to a common level, and elevate those on the other side correspondingly. Each lever can be used also to switch the track by hand, when necessary.

Patented, May 9, 1871, to H. Strait, whom address, for further information, 66 Pearl street, Cincinnati, Ohio.

Convex and Concave Mirrors.

The manufacture of concave and convex mirrors has always been a work of great difficulty and expense; and it seems strange that hitherto the slight flexibility which all glass possesses, has never been taken advantage of for the purpose. Recently the task has been achieved by taking a disk of plate glass, nearly 40 inches in diameter (and of this size, glass three sixteenths of an inch thick is easily flexible), and cementing it into a cast iron dish, turned perfectly true all over its inside. The air chamber under the glass is exhausted through a tube passing through the dish, and so little vacuum pressure is required that, by inhausting the air with the mouth, the atmospheric pressure on the glass will give it a concavity of nearly three quarters of an inch in the center. This is, we believe, a greater deflection than is ever required for reflecting telescopes. By blowing in the chamber, the glass is, with similar ease, forced outwards.

This extremely simple and ingenious invention has been produced by Mr. Nasmyth, of Manchester, England. It seems that there can be no difficulty in fixing a ring of iron round the glass to secure its retaining the concave or convex form, and if so, some of our ingenious mechanics will soon be able to produce lenses of perfect and immaculate translucency of any required diameter. The lens made of glass surfaces, with a filling of bisulphide of carbon, has already been used in the spectroscope, and has so proved itself valuable for instruments requiring the most delicate transparency; and if, by Mr. Nasmyth's invention, we can build up lenses of any size, the revelations of the hitherto constructed telescopes will soon be thrown into the shade by the researches of instruments of unprecedented power.

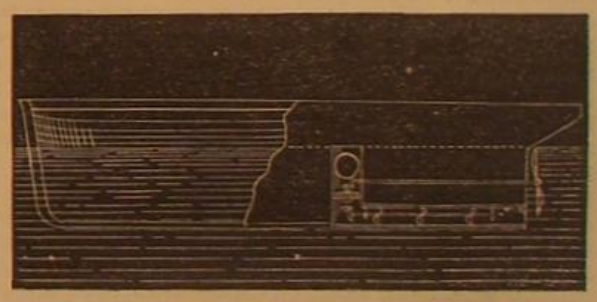
A SELF-MOVING SHIP.

One of our correspondents at Nashua, N. H., sends us the subjoined diagram of the mechanism of a new self-moving vessel, now building on the stocks at that place, and which is to be launched and tried on the 4th of July next.

It appears that much interest is felt at Nashua concerning the success of this novel ship, and public opinion is divided as to its merits. If it succeeds it will be the first self-moving vessel ever floated, Nashua will at once become renowned, orders for similar ships will come in from all parts of the world, and the coffers of the Nashuan shipbuilders will overflow with riches.

It is a little singular that two great enterprises, both of analagous character, both expected to culminate on the same glorious day, should, without any collusion, have been projected by two different individuals, both men of genius, in different parts of the country. There is Mr. Paine, in Newark, N.J., who expects to get an almost illimitable amount of power from the natural forces generated in a quart cup of acid and zinc; and here is Mr. Hamilton, in Nashua, N. H., who expects to accomplish the same thing by simple cold water. Truly, if these experiments should succeed, the 4th of July, 1871, will be a memorable day in the annals of science.

But all expectations based upon their success will result in disappointment. In the case of Mr. Hamilton's vessel, the water will rise within the wheel cistern to the level of the exterior water, and there remain. No current will flow through his flume; his wheel and screws will stand idle, and his ship will float powerless on the wave. Himself and worthy coadjutors will then be able to comprehend those simple but immutable laws of hydraulics which block their way, but with which at present they are evidently unacquainted.



The Nashua *Telegraph* thus describes the new vessel and its machinery:

"For some days public curiosity has been excited by the sudden appearance of a miniature shipyard on an open lot just north of the South Common. Within ten days the hull of a small ship has gradually assumed shape under the saw and hammer of two industrious workmen, who ply their tools with an earnestness that admits neither of flagging nor any interruption. At present the thing looks much like the skeleton of a fossil megatherium. The extreme length is thirty-two feet, beam six feet, and the depth of hold eight feet. The propeling power is to be a turbine wheel, set at the bottom of a flume rising five feet from the ship's bottom. The water enters the flume from the ship's sides just below the water line. This opening is provided with a valve to prevent the water from returning when the ship lurches in a rough sea.

"How is the water to leave the ship? asks every one. From the bottom of the flume, near the turbine wheel, a tunnel eighteen inches in diameter extends along the ship's bottom to the extreme stern. The tunnel is to be so constructed as to constitute a vacuum, and is to be supplied with a set of revolving fans to accelerate the egress of the water, and with valves to prevent the inflowing of the water from the stern. The water in the flume will have a head of five feet, furnishing a power of nine-horse. Now the inventor, who is one of the workmen, expects to secure one hundred revolutions of the screw before the outer valve in the tunnel is reached by the out-flowing current of water, or a rate of speed equal to five miles an hour. A moving vessel always makes a trough in the sea at the stern, and the faster the vessel moves the greater the trough. This trough will lessen, to a considerable extent, the pressure on the outer tunnel valve, and the remaining force necessary to overcome the pressure, open the valve, and release the water, is expected to be created by the movement of the vessel itself. The principle is that which will empty the bowl of a common clay pipe drawn rapidly through water. Once in motion, the ship is expected to attain a rate of speed only equalled by the power of the turbine.

"Of course a patent has been applied for. The inventor is James A. Hamilton, a Maine man, who has followed the sea for twenty or more years, seven of which were passed in the service of his country. With him are associated Isaac C. Richardson and John M. Buckley, of this city. They are very confident of success, and claim that their confidence is based on the success of an experiment with a small model on the Harbor Pond. The vessel will be ready for its machinery about the first of July. It will be launched in the Nashua, and the trial trip may come off about the 4th of July.

"Our mechanics are divided on the question of the success of the experiment. Some shake their heads very wisely, and say it is too big a thing to be a success. They evidently think that the experimenters will meet with a defeat as disastrous as Darius Green experienced with his famous flying machine. Others believe with the proprietors that the experiment will succeed, in which case the carrying trade of the world will be revolutionized, the use of steam knocked into a continental hat, and the cost of a trip to Europe reduced to the capacity of any man's pocket. The cost of the experiment will be about $2,000, which the men engaged in it can ill afford to lose, and we sincerely wish they may not lose it. The trial-trip will be an interesting event, the date of which cannot yet be fixed, but which will be duly announced through the *Daily Telegraph*."

Correspondence.

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

Mental Emaciation.

MESSRS. EDITORS:—May I be permitted to make some remarks upon an article in a recent issue of your journal, and bearing the above caption?

Is it true that "the best and strongest minds are tugging at the mysteries of nature, and expending their energies in physical researches?" This assertion I connect with the following: "Ask nine out of any ten, selected at random, what is their religious belief, and you will find that they accept a creed they cannot comprehend or explain." This is given as an instance of mental weakness. I ask, is this true? Are there not grave errors deducible from the position you assume, notwithstanding the portion of truth underlying it? Does a man prove his mental strength by "tugging at the mysteries of nature" so that he may "explain and comprehend his religious belief?" Allow me respectfully to say, no; and therefore to ask whether in your article you have not confused mental corpulence with mental strength? I think it can be shown that a man who tugs at the mysteries of nature and expends his energies in physical research, becomes a storer up of facts; a gatherer of knowledge; an accumulator of absolute truths. He fills out his intellectual being, and so becomes what we justly call a learned man; such as are Tyndall, Darwin, Huxley, and others. This gives him intellectual corpulence (justly distinguished by you from intellectual emaciation); what we may term mental enlargement, but not necessarily mental strength. He is learned but not consequently wise. A man who weighs 220 pounds is not necessarily stronger than one only 140 pounds, that is, in absolute power. He will be comparatively stronger, but not relatively. In fact, the taking on flesh, in all ordinery cases, renders one unwieldy and incapable of muscular effort. It is similar in mental condition. The profoundest attainments in scientific research do not, as a necessary consequence, render their possession strong, mentally; neither is the possession of the profoundest learning a guarantee of intellectual power.

This is the true distinction between the learned and the wise man. Learning, or the accumulation of material, is mental enlargement, that is, corpulence. Wisdom, as the development of self-acting vigor and power, is mental grasp, that is, strength. The wise man does not cultivate his intellectual being by merely taking in and comparing and storing up absolute facts; but by dynamic efforts of reason, thought, and philosophic deduction, he develops that strength of mind, enabling him to grasp those greater questions to which facts are mere stepping stones. Nature and the empirical school of knowledge come in as mere tools in his hand to enable the exercise of pure reason, intellectual thought, and the dealing with questions of moral and spiritual existence, which can no more be evolved from physical knowledge than can the wondrous deeds of the athlete be found in a Lambert. But, even if this were not so, and mental corpulence were really mental strength, and if, to tug at the mysteries of nature and find out and accumulate knowledge, really made a man stronger; is it true that to do this with the object of reaching an unattainable end, is its proof? Let us see. There are many persons who are tugging at the mysteries of nature, to discover the secret of perpetual motion. Is this a proof of their strength of mind? Ceaselessly do they study and toil to wring out of nature what they are convinced can be found in it. You say, and I say, it is folly; and how relentlessly have you striven to ridicule this folly! And yet, I ask, is the man who tugs at the mysteries of nature to explain his religious belief, one whit wiser than they? Do you conceive that Darwin, Huxley, and this class of naturalists generally, manifest any greater strength of mind in tugging at the mysteries of nature, to find out the hidden source of life, or demonstrate a material God? Here the old saw comes in—"The young folks think the old folks fools, but the old folks know the young folks to be fools." The perpetual motionist thinks you and I are fools, to doubt that he can discover his quest, even as the materialist thinks that the Christian philosopher is a fool to question his pursuit; but you and I know that the perpetual motionist is a fool to tug at the mysteries of nature in order to find out what is impossible, even as the Christian philosopher knows that the scientist is a fool, who is toiling, by the accumulation of knowledge, to discover the unknowable. Nothing less than this, in true philosophy, is the endeavor to "explain and comprehend a religious belief." Mental weakness alone prevents its evidence.

This is the preposterous position assumed, by many learned men of the day. Swelling in their mental corpulence, replete with the accumulation of all scientific knowledge, they venture to attack subjects which require for their treatment illimitable mental strength. They bid us accept their dicta upon topics with which their very acquirements disqualify them to cope. They tug at the mysteries of nature as the Rosicrucians toiled after the philosopher's stone, hoping to reach the origin of life, or attain that Utopian absurdity, expressed by you in a later issue, "When men strive to know, not in the sense of the passive acceptance of creeds or formulas, thought out by others, but each thought out by themselves, then will poverty, drunkenness, crime, and most of the diseases of the human race end."

Do you wonder that to a Christian philosopher such aim in knowledge stands, an unutterable folly, and that he, recognizing in man a fallen and sinful nature, shall say to him what you would to the perpetual motionist: "Do away with gravity and its laws, and you can obtain your quest; until then your toil is weakness, not strength." So he will say, "do away with a sinful nature and moral weakness, until then your toil is folly." R. W.

New Haven, Conn.

A Barometer Without Mercury.

MESSRS. EDITORS:—In 1856 or 7, I described in the SCIENTIFIC AMERICAN a "Cheap Barometer," which does not differ very essentially from that invented by Professor Heller, and described in your issue of June 10th. It consisted of an air tight tin can, suspended or fastened to the shorter end of a long and light balance beam, the longer end of the beam serving for an index to show the variations in the atmosphere by moving over a graduated arc. A correspondent pronounced it a hygrometer. According to him, the movement of the index was caused by the deposition of moisture upon the tin can. He was certainly wrong, for the index did not move, with the variations of the weather, in the right direction to satisfy his theory. But his criticism suggested an idea. I then constructed another barometer, consisting of two oyster cans fastened to the ends of a balance beam, of equal arms, one of the cans being made air tight, the other left open, the latter one having been thoroughly washed to remove all remains of salt. The pivots are points of needles resting upon bits of glass. The whole is inclosed in a tight wooden box, to preserve it from currents of air, with the exception of the index which is outside of the box, and moves over a graduated arc of 6 inches radius. The open can serves no other purpose than to balance the tight one, and to furnish an equal and compensating surface for the deposition of moisture, dust, etc.

The nice adjustment of the center of gravity of the beam, to make the instrument effective to indicate small changes in the density of the atmosphere, creates the liability of one or other of the cans kicking the beam when great changes take place. To remedy this a small weight is attached to the index or pointer, which may be slipped one way or the other as the case may require.

My barometer shows the two daily variations very perceptibly, the index moving nearly ½ of an inch. I have not studied its movements much in connection with the weather, nor compared them with those of the mercurial barometer. It is little other than a plaything, as I suppose most fluid barometers to be in the hands of the unscientific.

J. H. PARSONS.

Doctoring Iron—The Bendell Process.

MESSRS. EDITORS.—We noticed with pleasure your article in the SCIENTIFIC AMERICAN, June 10, 1871, on "Doctoring Iron."

We agree with you in regard to failures accompanying previous experiments, and the fact that it is difficult to define the line where iron ends and steel begins.

The primary cause of failures is easily accounted for; the parties who have thus operated have invariably used a combination or compound of the elements.

We are not at liberty at the present time to fully explain our process, and throw it broadcast to the world; but we will do so in a short time, when we expect to meet with counter opinions and prejudices. Allow us to say this much to you in confidence, that we use not elements, but one of the primary principals which are the component parts of iron ore, which has an affinity for all the elements, and especially so for the superfluous gases that unite with iron, namely, phosphorus, sulphur, and silicon, thus discarding all compounds or mixtures of chemicals or metals. We take either red short or cold short iron alone, and produce a neutral iron, that is pronounced by all the iron merchants and best judges of iron in this vicinity (whose names we are at liberty to use), superior to any refined iron in the market, and some say, equal to Peru, Norway, or Sweden iron; it is unsurpassed by none for density, tenacity and ductility.

We send you samples per express that are rolled from the puddled billet, and made from No. 2 Hudson pig iron. Also, a sample of a railroad bar, the flange and standard being made from iron puddled in the ordinary way, the cap (composed of two 3 inch and two 4 inch puddled bars) by our process, made in the same furnace, worked by the same men, from the same pig iron as is used at the Lodi Rolling Mills, Syracuse, N. Y. BENDELL, THOMPSON & CO.

Syracuse, N. Y.

Steam on the Erie Canal.

MESSRS. EDITORS:—I applaud, with all my heart, the commendable interest you take, as journalists, in the all absorbing question of the hour, to wit: canal navigation by steam.

Permit me to suggest that the first thing to be done is to let a test be made, and that too at the very earliest practicable moment, of such inventions as have been made, to ascertain whether the bill, generously and wisely passed by the Legislature, with all of its severe exactions and restrictions, can or cannot be complied with. The suggestion of throwing away another year to wait for another Legislature to make amendments to it, plainly suggests that somebody, unable to face the stern requisitions of the present bill, wants the great canal's interests to languish another year, merely to enable him to slip in on some slipshod device shut out by the present bill.

The present bill, I grant you, is severe in its terms, but $100,000 ought not to be given away by the State on any other kind of terms, especially when there are from ten to twelve inventors now ready to enter the contest, firm in the conviction that they can take the prize.

Again: permit me to attract special attention to the fact that only one half of this prize is to be given upon the first report. The second half is not to be awarded until November, 1873, and not then unless the Commissioners find that the device to which the first prize has been awarded has been generally adopted, and promises to prove practical and profitable. This fact, you must perceive, renders the time which intervenes between the first award and the first of November, 1873, of incalculable value to the successful contestant. The sooner the contest comes off, and the sooner the first award is made, the longer must be the period that will intervene between the first trial and November 1st, 1873; and, of course, the greater will be the opportunity and facilities, afforded to the invention successful on the first trial, to take the last half of the premium, to work out the redemption of our sinking canal fortunes, and to convert the Erie canal into a source of revenue to the State.

Can any solid reason be given why this commission has not been organized, and a day fixed to put the inventions already made through a thorough test? If they do not intend to act, why do they not resign, and let his Excellency, Governor Hoffman, appoint others who will act? ERIE.

Kalsomining.

MESSRS. EDITORS:—Seeing an article in your paper of June 3, on kalsomining, I thought I would contradict some of the errors therein, in order to prevent some inexperienced reader from being deceived by it.

First, the article says, take nine ounces of glue to six pounds Paris white. This, in my experience, and I have had considerable, is not enough. One pound of good glue to ten pounds Paris white are the usual quantities. But a man must be guided by the condition of the ceiling; the quantities I have stated are for a ceiling clean and in good condition. If ceilings have some old stuff on them, they may sometimes be prepared by giving them a light coat, provided the old coat has glue enough to hold it from rubbing off. But this way can never be depended on to make smooth work.

Now, in regard to brushes, it is simply impossible for a person to make good work with the ordinary lime brush; you might just as well use a rag and expect to turn out a good job. Your directions as to thinning with warm water I think a grave mistake; house painters always endeavor to get it chilled before using. It works much easier, and makes a smoother finish.

In conclusion, I would like to ask some of your many readers if there is anything that they can recommend as a substitute for glue? Something that will not sour so quickly when mixed up, and as cheap as glue, is wanted.

Brooklyn, N. Y. W. J. DAVIS.

[It will be seen that Mr. Davis' formula varies from ours about six tenths of one per cent. The use of cold water to thin a mixture of which the stiffening is glue will not be approved by many practitioners.—EDS.

Tanning Leather.

MESSRS. EDITORS:—The increasing demand for leather is developing new processes for its production. The following is proposed as one among the experimental methods for attaining practical results:

Prepare a solution of animal and vegetable fibrin, gelatin, and analogous protein compounds which can be precipitated by chemical affinity on canvas and other fabrics of cotton, woolen, linen, silk, and other fibrous substances. Take the fabric thus prepared through a regular tanning process, rendering the precipitate insoluble in water, and capable of resisting absorption. The process promises, in the hands of a chemist, important results. FREDERICKSBURG.

Fredericksburg, Va.

Another Barometer Without Mercury.

MESSRS. EDITORS:—I notice in your issue of June 10, a description of a barometer without mercury. Several years ago, I constructed one upon the same principle, as follows: I made a light box of a capacity of about 50 inches. This I fastened to the end of an index about 28 inches in length. About 4 inches from the box I put through a pivot with knife edges, and balanced the index with a leaden weight, which was adjustable sidewise, and up and down, so that I could change the center of gravity at will till I had got the extremes of variation about equal from a horizontal, and the whole distance through which the index moved to correspond with the length of the arc. The index and box were varnished to keep them from being affected by moisture. The rest of the instrument was simply a piece of board with a standard on one end to support the index, and an arc of 40

inches on the other end. I have had the center of gravity adjusted so near the pivot that the index would vary more than the 40 inches in the extremes of weather, and it was no uncommon thing for it to vary several inches in a day. Such a machine needs to be boxed up, or kept where there is no air in motion, or the index will be constantly on the move.

Buchanan, Mich. W. G. B.

A Petrified Bird's Nest and Eggs.--Fossil Trees in California.

MESSRS. EDITORS:—In the SCIENTIFIC AMERICAN of April 24th, I read an account of fossil trees in one of the lower counties of California. That is not the only place where they have been found. In the mining districts of Chalk Bluff and You Bet, Nevada county, Cal., they have been found in great numbers and quite large, though not so large as those described. They were found imbedded in the gravel which overlies the slate, at a depth of from fifty to one hundred feet, and in some places still greater. In fact, when I was engaged in mining in those districts, there had been no bed rock found in many places, and the depth of gravel was consequently unknown. These fossil trees were exhumed in washing away the gravel banks by what is known as the hydraulic mode of gold mining, much practiced at that time in California. The trunks and some of the largest branches (as for instance, where a tree would form a fork) were generally entire, but the roots and smaller branches were all gone, showing that they had been roughly handled by the water, and proving the pre-existence of strong currents at some remote period of time. These remains were mostly silicified, though I have found specimens that were not. I once found the remains of what had probably been a spruce tree, near the edge of one of these ancient channels, the bark of which was in a good state of preservation, though strongly impregnated with sulphur. I burned some of this bark, after drying it, on a blacksmith's forge by way of experiment. I succeeded in obtaining heat enough from it to bring steel to the proper temperature for working and tempering, but the sulphur fumes were anything but agreeable. These ancient relics of the forests of other ages seemed to comprise both the hard and soft woods, and in some instances the natural appearance of the wood was remarkably preserved. I have seen specimens of tar pine, exhumed at Chalk Bluff, that lohked as if they might be easily ignited by holding them in a flame. I once found, fifty feet below the surface of the ground, and six feet from the bed rock, a piece of wood (apparently some kind of cedar) about five feet long by seven inches wide, worn quite thin, and sound enough to preserve its elasticity in a great measure. This specimen was found at Red Dog, near Chalk Bluff, in the claim of Mallory & Co. The most remarkable petrifaction I ever saw was found in the mining ground of Messrs. Nichols and Ennis, in the You Bet mining district. It consisted of a bird's nest and eggs thoroughly silicified, the eggs retaining their natural size and shape. The nest was somewhat flattened, and what had evidently been the straws and twigs of which it had in former times been composed were like threads of glass. Some of the eggs were broken before the nest was discovered; the shells seemed thickened but very little, if any. What had apparently been the inside of the egg was now like a little dab of glass. This nest was taken from the fork of a large fossil tree, where it had been for ages undisturbed in its cosy rest-resting place, until wood, nest and eggs had passed away, and their place and form been assumed by the silex of which the fossil was composed. GOLD MINER.

Cheap Rice Huller.

MESSRS. EDITORS:—In the SCIENTIFIC AMERICAN of May 20, I noticed a call for a cheap rice huller. From my experience with rice, I believe two iron rollers twelve to eighteen inches, more or less, in length, by three inches diameter, slightly inclined, and so arranged as to quite touch, parallel, revolving towards each other, will accomplish the objects of hulling and polishing, and at the same time come under the head of cheap rice mill. E. G. H.

Fulton, Texas.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections in the month of May, 1871:

During the month, there were 576 visits of inspection made, and 1,101 boilers examined—905 externally and 328 internally, while there were 115 tested by hydraulic pressure. The number of defects discovered were 490, of which 49 were regarded as specially dangerous. These defects were, in detail, as follows:

Furnaces out of shape, 30; fractures, 17—7 dangerous; burned plates, 30—5 dangerous; blistered plates, 56—10 dangerous; cases of sediment and deposit, 52—4 dangerous; cases of scale, 68; cases of external corrosion, 30—6 dangerous; cases of internal corrosion, 18—2 dangerous; cases of internal grooving, 2; water gages out of order, 29; blow-out apparatus out of order, 2; safety valves out of order, 12; pressure gages out of order, 79—3 dangerous; deficiency of water, 9—4 dangerous; broken braces and stays, 8—1 dangerous; boilers condemned, 2.

The defects which are brought to light by careful inspection during the month, are often numerous, and but for their timely detection, serious disaster might occur. Our object in reporting them is, that as far as practicable, their re-occurrence may be obviated by calling attention to them. These defects, when taken singly, may seem very slight and hardly worth noticing; but when one familiar with this work has seen the subtle and insidious work of the enemy gradually but surely progressing, it is time to cry out in warning against it. A little corrosion may seem a slight thing; but when it is known that, if unchecked, it will sooner or later put the boiler in a very dangerous condition, and jeopardize the lives of all those who work in its immediate vicinity, it is time to call the attention of steam users to the fact, that the best boilers are liable not only to this, but to any one of the defects enumerated above, and to show the importance of securing, at least once a year, a careful examination of every part of the boiler and all its attachments. We have in our possession a piece of iron taken from a plate of a boiler which, from external corrosion, was reduced to one eighth inch in thickness; and the day before our inspector discovered it, 80 lbs. pressure was used on the boiler. There are, no doubt, scores of boilers in a similar condition in every large city and manufacturing town, which condition will never be known until they are thoroughly examined internally and externally, or until, under combined defects and weaknesses, unable longer to resist the power within, they yield, scattering death and destruction in all directions.

Boilers at High Levels.

In the course of the account, says *Engineering*, of the recent meeting of the South Wales Institute of Engineers, appears a report of a somewhat curious discussion. Some little time ago Mr. T. Dyne Steel designed and sent out some boilers and engines for use at the silver mines of Cerro de Pasco, Peru, these boilers being set to work at such an elevation above sea level that the atmospheric pressure is equal to but about nine pounds per square inch above a vacuum. As both the engines and boilers included many very ingenious and interesting constructive details, Mr. Steel very properly read a paper on them before the South Wales Institute of Engineers, and it is to the discussion on this paper that we have alluded. It appears that the workmen in charge of the engines, fearing that the reduced atmospheric pressure would exercise some mysterious influence on the boilers, worked the latter at a pressure of but thirty pounds, instead of fifty pounds or sixty pounds per square inch, as intended, and the consequence was an extravagant expenditure of fuel. Mr. Steel, hearing of this, very properly sent out orders for the boilers to be worked at the pressure originally intended, and has since received information of a most satisfactory reduction in the consumption of fuel. Had the matter ended here we should have had nothing to say about it; but when the facts above stated were laid before the South Wales Institute by Mr. Steel, we find to our astonishment that several members rose and supported the idea that the reduction in the atmospheric pressure would actually increase the strain on the boilers! It never appears to have occurred to these gentlemen, or, indeed, to any one who spoke in the discussion, that the load on a safety valve merely represents the difference of pressure within and without the boiler, and that the difference due to this load will of course remain the same, whatever the absolute external pressure may be. In other words, if a safety valve be loaded to fifty pounds per square inch, the maximum strain which can be imposed upon the boiler (supposing the valve to act properly) will be that due to an excess of internal over external pressure of fifty pounds per square inch, and this will be the case whether the boiler is worked in a vacuum or in a chamber containing air compressed to a dozen or more atmospheres. As with the safety valves so with the pressure gages, these gages merely indicating the difference of pressure within and without the boiler. It is certainly most singular that such a simple matter as this could possibly be misunderstood, and that a discussion upon it should have taken place before an engineering institution without the facts being set forth in their true light.

What is Life?

I have thus far contrasted inert matter with organized beings possessing life. That the term life indicates a very special property there can be no doubt, but as yet an impenetrable veil seems to shroud its ultimate processes. I believe, however, that the veil is at the far end of the labyrinth in which we are now wandering, and that patient observation and guarded generalization may yet enable us greatly to narrow the limits of the unknown—to approach some steps nearer to the veil. I must premise that, as I am now looking at the subject from a purely physiological point of view, I regard life simply as a condition capable of producing certain perceptible phenomena, and can take no cognizance whatever of that mysterious union between spirit and matter which is broken in passing through "the valley of the shadow of death." Material processes and material changes only are subject to the material instruments of biological research. These inner mysteries are now and must probably ever remain, in our present condition of existence, beyond the veil.

It becomes daily more manifest, with the advance of knowledge, that the action of known physical laws—such as chemical affinity and capillarity as manifested by porous media and by colloids—is most intimately interwoven with all organic processes, and it is as yet impossible to say how far life may influence, in the sense of modifying or directing, the action of these laws. Life has been called the vital force, and it has been suggested that it may be found to belong to the same category as the convertible forces heat and light. Life seems, however, to be more a property of matter in a certain state of combination than a force. It does no work in the ordinary sense. If a man lift a weight a couple of feet off the ground, many of the so-called vital actions are called into play, but yet every part of the work done can be accounted for by the action of the ordinary physical forces. The act of the will, in legal phrase the "mere motion," which induced the lifting of the weight, can be referred, we can scarcely doubt, to the mechanical action of some part of a large and complicated apparatus, the cerebral hemispheres, and was accompanied by a waste of their substance.

The telegraphic communication' to the muscles involved, which harmonized their several acts and signalled the contraction of their fibers, was conveyed through a cord whose molecules were set in vibration by a force very probably convertible with the physical forces, generated by chemical change and the waste of tissue; and in the muscle, the organ by which the weight was actually raised, an amount of waste took place—that is to say, an amount of carbon was combined with oxygen precisely equivalent theoretically to the quantity of coal which must have been burned in a perfectly constructed engine to do the same work.

Chemical forces act in living beings under very special circumstances. For a series of years a mass of substances is held undergoing constant change and throughout in the most unstable state of chemical combination. The instant the condition of life is removed, decomposition commences, and the complex constituents of the body are resolved into more simple and stable combinations. But yet it may be fairly questioned whether the chemical relations of the component elements of an organized body are in any way directly affected or controlled by life. It has become quite conceivable, especially through the researches of the late Master of the Mint, that a constant adjustment and re-adjustment of membranous and colloid diaphragms in the presence of powerful catalytic agents may possibly explain the maintenance of almost any chemical conditions, however complicated.

The one function of living beings whose explanation it seems at present impossible to imagine except by regarding it as the manifestation of a special property, is what has been called the "molding of specific form;" the building up of a heterogeneous and complicated organism, which shall repeat, not rigidly but with a certain degree of flexibility, the characters which have been transmitted to it through a germ from a parent, every molecule of every part having thus a direct relation in form, in position, and in composition, to every other molecule of the body. At present, regarding it from a purely material point of view, we are scarcely justified in regarding life as more than that condition of an organized being in which the products of chemical and physical changes taking place within it are stamped with a specific organic form.—*Prof. Wyville Thompson.*

The Sub-Atlantic Telegraph.

For several months past the entire foreign telegraphic business has been dependent upon the single French Cable; both of the other cables, belonging to the Atlantic company, have ceased to operate. Owing to the stormy weather and the pressure of ice off the coast of Newfoundland, it has been impossible to fish up the damaged cables. Recently, however, the cable company's steamer *Scanderia*, which was sent out from England expressly for the work, has recovered both of the damaged cables, taken up sixty-eight miles thereof, all in good order, and replaced ninety-five miles of new cable of heavier and stronger character. The cables thus repaired are now in working order. On July 1st the rates for messages will be $1 for each word.

Raising the Bodies of Drowned Persons.

In the case of a recent accidental drowning, in the Hackensack river, N. J., several persons made attempts to recover the body, but without success. A French Canadian, named Buschè, then undertook the job, and is reported to have proceeded after the following scientific manner. Having supplied himself with some glass gallon jars and a quantity of unslacked lime, he went in a boat to the place where the man was seen to go down. One of the jars was filled half full of lime, then filled up with water and tightly corked. It was then dropped into the water, and soon after exploded at the bottom of the river with a loud report. After the third trial, each time in a different place, the body arose to the surface and was secured.

IT appears from the report for 1870 of the Postmaster-General of Hong Kong, China, that the average time made by the American steamers from that place to San Francisco, by way of Japan, was 34 days. The average of the British steamers to England, by way of the Suez Canal, was 61 days. If we add 6½ days from San Francisco to New York by rail, and 12 days from New York to Liverpool by steamer, we have 52½ days as the time in which England can be reached from China by way of the United States, against 61 days by the Oriental route—a difference of 8½ days in favor of the former. Eventually, with quicker trips by rail and steamer, which can readily be made, the time over the American route can be made shorter still by from three to four days.

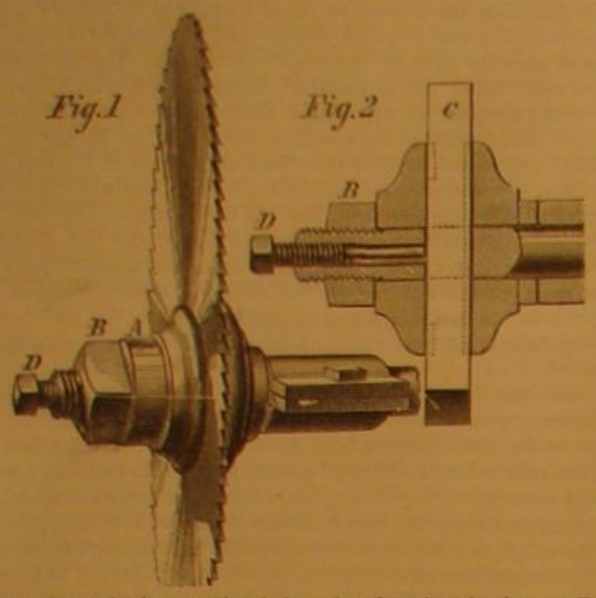
HOW TO BRIGHTEN STRAW MATTING AND OILCLOTH.—Tell your readers, writes Mrs. G. E., that if they wish their straw matting to keep new looking and bright, they must wash it twice during the summer with salt and water, say about a pint of salt, dissolved in half a pailful of warm, soft water, drying the matting quickly with a soft cloth. The salt, she says, will prevent it from turning yellow. Far away, and from quite an opposite quarter, we hear another friendly voice, begging us to say to our readers that after oilcloth is scrubbed and dried, it should be rubbed all over with a cloth dipped in milk. "You've no idea," says our friend, "how brightly the colors come out. Husband says it's the albumen in the milk, but I think it's the very thin film of grease deposited. Meantime, our oilcloth shines the whole year through."

RAND'S IMPROVED SAW ARBOR.

Our engraving illustrates an improvement in saw arbors, whereby they may be made not only to carry saws, but also a great variety of tongueing and grooving tools.

Fig. 1 shows the arbor with a saw mounted upon it. The neck of the arbor is made as shown, considerably longer than is necessary to receive the saw and loose collar, and upon this extra length of neck, is fitted a loose sleeve, A, filling the space between the nut, B, and the loose collar, and so clamping the saw firmly.

Fig. 2 shows the method of holding grooving tools, etc. To effect this a radial mortise is cut through the neck of the arbor, and the tool, C, being inserted, is held by the set screw,



D. Then the loose collar, being placed against it, the nut, B, is firmly turned down, clamping the tool securely.

This is a very simple modification of the arbor, and one which seems practicable and useful. Quite a variety of work could be done by an arrangement of this kind.

The invention was patented through the Scientific American Patent Agency, May 23, 1871, by Jacob Rand, 862 Fourth street, South Boston, Mass., whom address for further particulars.

IMPROVEMENT IN RIVETING TOOLS.

This is an invention which possesses decided originality, and the principle of which is undoubtedly sound, being analogous to the "spinning" of metals on lathes, and shaping them by friction upon their surfaces. Two equal sized contiguous rollers are hung upon the same pin, and applied against the ends of the pins or bolts under a twofold rotation so as thereby to head the pins or bolts in the desired manner. The contiguous faces of the rollers are notched to give room for the escape of particles that may be rubbed off the pins or bolts.

This invention introduces an entirely new system of riveting by friction, transversely under longitudinal pressure, instead of the ordinary hammering process, which uses force only longitudinally, and racks machinery and buildings, without being continuous in operation. By rotating the tool under lengthwise pressure the action is continuous, and therefore, it is claimed, quicker than hammering, besides being more gentle and less injurious to the machinery. It is further claimed that the fibers of the pin or bolt to be headed will be gradually bent over, and cannot be fractured, as is frequently done by hammering. The rivet produced will consequently be of superior quality to those heretofore made. The machine for riveting the pivots of hinges consists of two of the tools above described, held in line, and a pair of jaws between them, for holding the hinge. The latter is dropped between the jaws and secured, and then the tools are at once applied to both ends of the pivot, rotated till the head is completed, and finally withdrawn. The riveting process can thus, it is asserted, be carried on with great rapidity, exactness, and neatness. Benjamin F. Cobb, of West Troy, N. Y., is the inventor of this novel tool.

ODIORNE'S IMPROVEMENT IN SEALS FOR HYDRAULIC MAINS OF GAS WORKS.

In the ordinary gas works the gas, in passing from the retorts to the hydraulic main, is intercepted by the hydraulic seal, and has to be forced through by accumulated and otherwise unnecessary pressure in the retort. Mr. Alfred Odiorne, of Springfield, Ill., has invented a new seal, the object of which is to prevent the gas from flowing back to and out of the retorts while the same are opened for drawing and charging. The new seal is therefore only necessary during this brief time, while, by the process in common use, its use is continual. It has always been a desideratum to limit this obstruction to the flow of the gas to the short time needed for drawing and charging; but no contrivance to accomplish this has yet come into use, although much ingenuity has been expended in attempts to that end. This movable seal is intended to produce this desired result.

It consists of a box for each bench placed in the hydraulic main, with a compartment for each dip pipe. When the box rests on the bottom of the main, the top of the box is one inch below the ends of the dip pipes, and when filled with water or the products of condensation it will, consequently, not obstruct the gas, but let it flow freely from the retorts into the main. When the box is raised up, the ends of the dip pipes are immersed, and a seal is thus made, preventing the flow of the gas back to the retorts.

The box is suspended and raised or lowered by means of rods, which pass through the top of the main, and are connected with a weighted lever above it. The holes through which the rods pass are larger than the rods, allowing them to rise and fall with ease, and are sealed from leakage by annular sealing cups. The cups are screwed or otherwise secured to the main, and are of sufficient depth to resist the outward pressure from the main, and are filled or partly filled with water, glycerin, or any other suitable liquid.

To the long and weighted arm of the lever is attached a small chain by which the stoker can easily raise and lower the box.

By this improvement, it is claimed, the back pressure on the retorts is lessened from two to four inches, as the case may be, or about one half of the ordinary pressure, while, in a great measure, the collection of carbon in the retorts will be prevented, as well as the clogging in the stand pipes and leakage, while the yield of gas is increased, labor and fuel saved, and wear and tear lessened. It also obviates the necessity of keeping any liquid in the hydraulic main, giving increased main capacity.

IMPROVED SELF-MEASURING FAUCET.

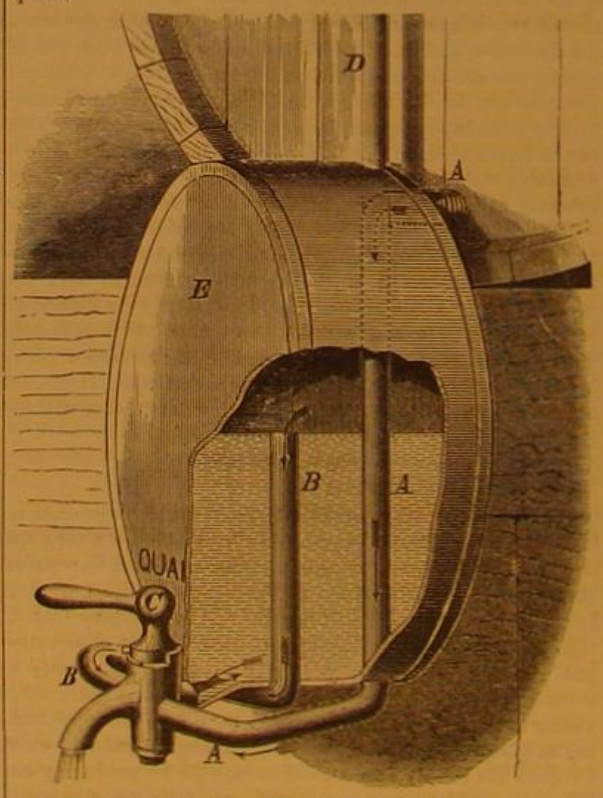
Many attempts have been made to introduce the general use of measuring faucets. These instruments have, however, so often lacked the essential elements of simplicity, cheapness, and durability, that few have achieved even partial success.

The one illustrated herewith is certainly very cheap, all the parts being made of plate tin or other suitable thin sheet metal, except the faucet proper, which is of brass, or composition, exceeding in weight and the cost of construction very little that of ordinary brass faucets, of the same capacity.

The working of this device is claimed to be in all respects satisfactory and will be easily understood by reference to the engraving, in connection with the following description.

A is a hollow screw tap and pipe by which communication is established between the interior of the barrel and the faucet proper, C, and through the latter to the interior of the tin plate chamber, E, when the handle of the faucet plug is turned to the right position, beyond which it is prevented from turning by a stop.

From the chamber, E, rises a vent pipe of very small bore, which is inclosed in a protecting pipe, D. It is obvious that when the plug is turned to the right position, the fluid will run out of the barrel through the tap and pipe, A, enter the chamber, E, and filling it, expel the air contained in it through the vent pipe. When thus filled the chamber holds one quart.



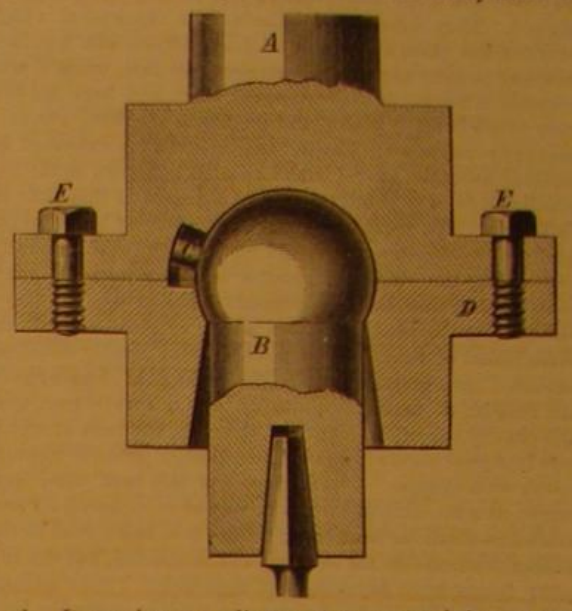
The plug of the faucet is of the kind known as "three-way," its ports being so formed that when the handle is turned to the extreme right, the flow will be from the barrel into the chamber. When turned to the middle position, as shown in the engraving, the flow from the barrel will be stopped, and the fluid in the chamber, E, will flow through the pipe, B, the top of which is so adjusted as to deliver only one half of the contents of the chamber, one pint. When the handle is turned against a stop at the extreme left, the flow passes directly back through the faucet, C, and discharges the entire contents of the chamber, E, the faucet being so placed as to draw off from the lowest point of the chamber. The handle being then turned back to its original position the chamber again fills, and so on, pints or quarts being drawn as desired. This can be done as well in the dark as the light, and hence danger from fire, in bringing lights near casks containing inflammable oils, is avoided. The liquid is drawn directly into the vessel destined to receive it, without the intervention of portable measures, and the uncleanly dripping attending their use. The instrument is well adapted to measuring all fluids; and to the retail trade in coal oils, or for any other fluid which is uncleanly to handle, or likely to be ignited by the approach of an artificial light, it is especially adapted.

The instrument may be made to measure and discharge any two given quantities, but as most burning fluids are retailed in quarts and pints, the instrument will probably meet the most general favor when constructed as described, since any quantity above its capacity can be measured by repeating the measuring and discharging.

Patented through the Scientific American Patent Agency, March 28, 1871, by Dr. William M. Wright, of Chambersburg, Pa., assignor to Phœbus and Wright, whom address for territorial rights or for further information, Fortress Monroe, Va.

PHILIPPI'S IMPROVED DRILL CHUCK.

The annexed engraving illustrates an improved drill chuck, which will be found a great convenience in many kinds of



work. It requires no adjustment to center, being so constructed that the point of the drill may be placed upon the point desired to be drilled, where it will remain.

A, in the engraving, is the mandrel shaft, with a globular cavity to receive the drill chuck, B. This chuck is not rigidly confined like ordinary drill chucks, but is allowed to move in any direction, so that the point of the drill will find its center and run true. D is a flange plate or cap, by means of which the chuck is secured to the end of the mandrel, being held by screws, E. The portion of the flange which surrounds the socket portion of the chuck is made flaring to give the chuck play. C is a pin or lug, on one side of the ball, which is placed in a recess formed in the mandrel and cap, by which the chuck is made to revolve with the mandrel.

Patent recently allowed through the Scientific American Patent Agency, to P. Philippi, Beardstown, Ill., whom address for rights or further information.

Shad and Ferry Boats.

After the establishment of the railroad ferry at Havre de Grace, Md., some thirty years ago, the number of shad, which had been very plentiful in the Susquehanna river, began to diminish, and it was believed that the splashing of the boat had the effect of driving the fish back into the bay to seek other and quieter spawning grounds. About four years ago, a bridge was built and the boat withdrawn, and from that time the number of shad coming in has steadily increased. This year, the yield at Columbia alone has been as high as 3,000 to 4,000 in twenty-four consecutive hours.

[We find the above item in one of our exchanges. We doubt its correctness. The Havre de Grace ferry boats used to run across the river, on an average, about once an hour. The presence of steamboats in other rivers does not, we believe, affect the shad. On the Hudson river, at New York, scores of ferry boats, and steamers of all sizes, are plying night and d y. The shad have diminished, but the fishermen attribute the lack to the setting of gill nets, not to steamboats.—ED.

Cheap Concrete Flooring.

Among the many modes of using gas tar in making asphalted pavements and flooring with which our correspondents have lately favored us, the following is a good and practicable one: Mix three bushels of coal ashes from a blacksmith's shop with two bushels of gas lime, and then add sufficient gas tar to make a stiff mortar. If the ammoniacal liquor has been separated from the tar, its place must be supplied by adding water till the tar is thin enough for use. For stables and cattle sheds, the mortar can be laid down with a spade, and fine sharp sand or gravel sifted over it; then roll well, and you will have a good concrete floor. It will take a few days to get thoroughly hard, even in dry weather; but it will be a good piece of work, if carefully done. Autumn is the best time for laying this kind of pavement.

Competition among the Perpetual Motion Seekers.

Mr. E. Connellan, of Water Street, New York city, writes us that he will furnish at three days' notice, a perpetual motion or gravitating machine, upon a guarantee that he shall receive a certain sum of money to be named by him to the individual who jumps at the chance. We regret that the announcement of Mr. Connellan's invention has been anticipated by James A. Hamilton, of Maine, a description of whose machine appears in another column. However, he may console himself by reflecting that Mr. Hamilton has also been anticipated by Mr. Paine, of Newark, who, producing 67,000,000 foot pounds by the consumption of three grains of zinc, is likely to beat all other perpetual motion men out of the field.

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JOSEPH HENRY AND THE ELECTRIC TELEGRAPH.

It is not often that the discoverer of great scientific truths obtains in his lifetime the full measure of credit that properly belongs to him; and the reason for this injustice is to be found in the abstruse and unintelligible nature of the researches which early explorers have to make, often carrying them beyond the reach of the popular mind; but the practical man who applies the discoveries, and "out of the nettle danger plucks the flower safety," generally runs away with all the honor, and, surrounded by a halo of glory, amid the roar of cannon and the applause of the multitude, is pronounced to be the real benefactor of his race. The present moment is perhaps an opportune one for us to consider the claims of a man still living to a large share in whatever of value and honor there may be attached to the invention of the magnetic telegraph.

If the telegraph were an estate, subject to partition by order of the Court, the number of heirs whose claims would have to be considered would be found to be very great.

The Court would have to go back to the ancient Greeks, who, 600 years before the Christian era, discovered the peculiar property of amber, *elektron*, from which the whole science of electricity derives its name. Then the claims of the heirs of Gilbert, who in 1600, in England, added a long list of electrical bodies to those previously known, and was one of the greatest philosophers of his own or of any age, would have to receive due attention. And thus by degrees we should pass by Franklin, Galvani, Volta, Davy, Oersted, Seebeck, Ampère, Arago, Ohm, Schweiggers, Sturgeon, Wheatstone, Gauss, Weber, Steinheil, Faraday, Daniell, Grove, Jacobi, Nobili, Page, and a good many others, whose claims in a court of justice would have to receive due consideration, and finally we should reach the names of the truly illustrious Americans, Professor Joseph Henry and Professor Samuel F. B. Morse.

We do not propose to trace the history of the telegraph down through all the ages indicated in the imperfect list given above. The story has been repeatedly told, sometimes in a popular way, sometimes in scientific language, and each author has contrived to add something new to the general stock of our knowledge of the subject. In this embarrassment of riches it is not surprising that the popular mind should be a little confused, and that a multitude can always be found to shout for every new pretender, "the king is dead; long live the king!" The whole history of the telegraph could only be written by a scientific man of unusual acquirements. It would involve immense research, profound knowledge of physics, and rare linguistic attainments; and, after the work was done, none but scientific men could understand or appreciate it. A popular story is quite another affair, and narrations of this character are as abundant as the number of advocates who for money, from friendship, or from enthusiasm, have been found to present the claims of their favorites to the consideration of the public. We shall not attempt to write a scientific or a popular history, but confine ourselves to a statement of what Professor Henry has done, without intending to detract from the praise due to anybody else. We feel that justice has never been rendered to Professor Henry, and it is time that the great omission should be supplied. The first essential fact which rendered the electromagnetic telegraph possible was discovered by Oersted, in the winter of 1819-20. Then followed the important contributions of Arago and Ampère in 1820. In 1825 Sturgeon first produced what is properly known as the electromagnet, in the form of a horse-shoe, but the power of this magnet was very slight in consequence of the manner in which he wound the wires, and its chief value was in suggesting a new path for future research.

The next improvement was made by Professor Henry, and this consisted in insulating the conducting wire itself, instead of the rod to be magnetized, and covering the whole surface of the iron with a series of coils in close contact. Henry's magnet was described in Silliman's *Journal* in 1831; and, in 1832, a mechanical arrangement was put up in the Albany Academy for making signals and sounding a bell through a wire more than a mile in length. Previous to Professor Henry's investigations, the means of developing magnetism in soft iron were imperfectly understood, and no electromagnet, applicable to the telegraph, was known. The particular form of battery adapted to project the current through a long conductor was first pointed out by Henry, and he was the first to magnetize a piece of iron at a distance and to call attention to the fact of the applicability of the experiment to the telegraph. The principles developed by him were applied to render the various machines invented by Gauss, Weber, Steinheil, Wheatstone, and Morse effective at a distance. The galvanometer now employed for transmitting messages by the Atlantic Cable, is about as close an imitation of the apparatus devised by Henry for ringing a bell, in the Albany Academy in 1832, as the different circumstances of the cases require. And the electromagnet, now used for the telegraph all over the world, is the one invented and described by Henry in 1831. Whether the instrument used be a semaphore, that is, carrying evanescent signals, or a telegraph making a permanent record, the engine for driving the works by aid of the battery is the electromagnet invented by Professor Henry.

The magnet is the power behind the throne; it drives the electric clock and the magneto-electric machine; it frightens away burglars, gives the alarm of fire, warns of danger, explodes the mine, transmits signals, sends messages by the needle, and makes permanent record by the telegraph.

The philosopher who discovered the scientific principles upon which the electromagnet is founded, and who invented the form of apparatus best adapted to demonstrate these principles, must be regarded by the whole world as having made the chief contribution towards the application of electromagnetism to the various wants of man. This philosopher was Joseph Henry, and to him was accorded the homage of the whole scientific world for his magnificent researches.

While we very properly render great credit to the inventors of the various forms of apparatus now commonly called telegraphs, let us not forget the man who disclosed to us the power with which to drive not only this but every other magneto-electric machine. All honor to the great American philosopher, Joseph Henry!

EXTRACTING GOLD FROM WASHINGS AND POOR ORES.

Our Australian advices of the latest date report the discovery of an agent for extracting the ultimate residue of gold from ores and water, after the ordinary means of search and smelting have done their best. The new process is so important to the miner, and so simple in preparation and application that we look eagerly for the result of a trial of it in some of the rich gold fields with which our country abounds. The matter is deserving serious consideration, the more so that we recently read a statement from California that in the earlier years of gold mining in that State, not less than fifty per cent of the gold was left unresolved in the refuse earth.

The new process is one of amalgamation, and consists in treating the ore or refuse with a new compound, which has been patented in Australia by two gentlemen from Ballarat, and is called by them saccharate of mercury. This preparation consists of mercury triturated with sugar, until an impalpable powder is formed, and the metal cannot be discerned in it except by using a powerful magnifying glass. The powder is dry, and is to be mixed with the so-called exhausted earth, the water, or the washings of the quartz-crushing machines. Our informants tell us that it will attract and attach to itself all the gold disseminated in the earth or held in suspension in the liquid. The usual system of amalgamation can be carried on simultaneously with the use of the new preparation as an accelerator. The ease with which the saccharate can be prepared, and its comparative cheapness render it unnecessary for us to say more under this head, and we proceed to give the results of a few experiments with it in Australia.

The inventors tested, on Sept. 13, 1870, 6 pounds of tailings which contained gold equal to 25 ounces 16 pennyweights, and on October 10, of the same year, 6 pounds of tailings yielded gold at the rate of 9 ounces 4 pennyweights, to the tun. One pound of gem sand, from New South Wales, contained gold equivalent to 49 ounces 15 pennyweights to the tun; and the banks, for which the test was made, have certified to the accuracy of the figures. A sample of pannings showed a proportion of 515 ounces 14 pennyweights to the tun; but we think the large figure shows that the case was an exceptional one.

A valuable part of the new discoveries is the production of a rotatory machine, to be used for new ores wherein the gold exists in the proportion of at least one ounce to the tun. Half a pound of the saccharate, costing fifty cents, is sufficient for the treatment of a tun of ore. The Melbourne *Leader* rightly says that, if these experiences be indications of the average conditions of ores and washings when thrown aside after treatment by ordinary methods, gold mining is about "to commence a second infancy."

Our miners in the West will, no doubt, soon give their experiences with saccharate of mercury, and a new impulse to a most important industry will be the result.

EFFECT OF CORPORATION EMPLOYMENT ON WORKMEN.

In passing various points in our city where gangs of workmen are employed upon public works, and witnessing the indolent, timeserving manner in which their labor is performed, we have been led to consider the effect of this kind of employment upon the workmen themselves. There is no doubt that its influence is hurtful to the moral character of the men, and that as "a little leaven leaveneth the whole lump," the demoralizing effect extends more or less through the entire class of those who get their living by the labor of their hands.

In the first place these city employés are obliged to serve a set of political masters, who, so long as the men vote right (that is, in support of the party in power), will not scrutinize too closely the quality or quantity of their work. The men, knowing this, not only slight their work, but "soldier" as much as possible. The proportion of citizens in any community whose standard of honesty is high enough to impel them faithfully to labor the entire time they are paid for, without watching, is not large. Time is so indefinite a thing to the majority of mankind, that its waste has always been a source of regret to thinking minds. Many a man who would shrink from purloining a dollar, will yet rob his employer of hours of service, and take his weekly wages without a qualm of conscience.

We believe that a total change, wherever practicable, from the system of employment by the day, week, month, or year, to that of payment for the amount of work accomplished, commonly called "piecework," would result in a marked elevation in the moral tone of the community at large; and that while those who labor would ultimately earn more than they do at present, employers could in many cases conduct their business with greater profit.

We have in mind an instance in which a business was changed from a barely living concern into a money-making enterprise by the adoption of this system under a carefully considered scale of prices; and though the workmen at first loudly protested against the change, and were with difficulty prevailed upon to accept it, they have earned so much more by piecework than they did previously, that none of them would now return from choice to the old system.

There is another effect produced by this system of "piecework" worthy of notice. There is less of the feeling of abjectness on the part of the employed. They are not so strictly confined to hours, in coming to and going from work. If a man chances, from unavoidable circumstances, to be a trifle late in the morning, he, if disposed, may apply himself more vigorously, or stay a little later at night and recover the loss. If he does not feel well, he can favor himself a little without fear that the "boss" will be at his heels with a reprimand. He feels more manly and independent, and holds his head higher.

In city employment we find the extreme reverse of all this. The men, feeling themselves the slaves of a political ring, avail themselves of every opportunity to rob the taxpayers of service. They get into a morally unhealthy state—so much so that they will not tolerate among them a man who tries to do a fair day's work. There have been instances of men being assailed by vituperative language, for honest service, and even of personal assault upon such as felt impelled to disregard warnings of this kind.

The only remedy for this state of things we can at present suggest, is the performance of all city work by contract, so far as is practicable. This in connection with the principle of paying men by the contractor according to the amount of work accomplished whenever it is possible to do so, would in a great measure put an end to timeserving, and at once elevate the character of the employés.

LIGHTNING RODS.

The hypothesis that the phenomena of electricity depend upon the existence of positive and negative imponderable fluids has served a purpose in speaking and writing upon the subject. In the absence of positive knowledge, it is perhaps as well to speak of this mysterious force as a fluid, and as such we shall deal with it in the present article. In this view, a conducting rod may be compared to a viaduct over or through which the current passes. Whether *over* or *through* has been a question upon which theorists have widely differed, and the question is of no practical importance whatever as bearing upon the construction of lightning rods. The law that the resistances of conductors vary as the areas of their cross sections is, however, well established, and it follows that the capacities of rods to harmlessly conduct away lightning discharges are—if made of the same materials—as their cross sections. The shape of a rod, if of uniform size throughout its length, does not affect its conducting power.

The question as to how large the rods ought to be, and at what distance apart they ought to be placed, involves a definite knowledge of the maximum amount of electricity that is ever discharged to or from the earth at any one point, an amount obviously indeterminate. To guide us, therefore, upon this point, we have only the results of accumulated experience. This has shown that comparative safety can be secured by rods one inch in diameter, having a metallic connection with the moist earth equal in area to that of the surface protected, and that rods having the above dimensions and the above metallic connections with the earth, may be relied upon to shield, from disruptive discharges, circular areas of roof having radii equal to twice the hight the conductors are elevated above the structures to which they are attached.

It must also be borne in mind that the metal work upon the surfaces of buildings should be connected with the principal conductor, by rods of ample size, and further, that the

power of any conductor is only the power of its smallest part. Perfect safety demands that the capacity should be maintained at its maximum throughout the system.

Leaving to individual judgment the best method of fulfilling these conditions, we may say that they are seldom complied with, and that they are found lacking in every instance where damage is occasioned by the lightning stroke. Such a system as we have described entails so much expense, that remote though possible contingencies are accepted rather than to incur the outlay. If connection of a rod with the earth be broken it is useless, and in many cases is indirectly a source of danger.

Rods do not attract lightning from the clouds; they only dispose of it when it comes within the sphere of their influence.

MASSACHUSETTS SHOEMAKERS ON THE TAXES.

A protest has been issued, signed by a large number of the leading shoe manufacturers of Massachusetts, including Lynn, Boston, Haverhill, Marblehead, Worcester, and Beverley, against the tariff and other taxes upon leather and shoe findings.

The protestants state that of late years there has been an increase of twenty-five per cent in the productive power of a given amount of capital and labor, due to the good effects of improved machinery and processes; but this gain is completely nullified by the taxes, so that they are unable to furnish boots and shoes any cheaper than formerly.

They further allege that, while the revenue, received by the government from all the taxes on leather and products used in their business, amounts to only three millions five hundred thousand dollars, the actual tax imposed upon the manufacturers of boots and shoes is eighteen millions of dollars per annum.

"The legislation of our own country has driven our products from the markets of Canada, Mexico, the West Indies, and South America, which we had enjoyed for more than a century. It has transferred the manufacture of our products to a great degree to Canada, where it enjoys greater advantages, and is subject to fewer impediments, in the prosecution of business. Thus, our country has, to this extent, lost the benefits of this industry, and given her wealth to others, though a system of tariff taxation, professedly framed to foster and encourage American industry, but which expels it from America and increases the wealth of other nations.

"In addition to the direct influences of the tariff upon our production, the system of protective duties indirectly imposes grievous burdens upon it by increasing the cost of our buildings, engines, machinery, tools, and supplies, as well as railroad transportation. It raises the prices of house rent, fuel, food, clothing, and all supplies, so as to render extravagant wages a necessity to our workmen. This apparent increase of wages, however, yields no substantial benefit to our workmen, because it is all consumed in the enhanced cost of living.

"We believe that an entire removal of all protective duties would greatly advance our industry, as we should then have the markets of the world in which to sell our products, thus largely increasing the labor employed and the profits of manufacturing. We, moreover, believe that the enhanced wealth and comfort of our own people, consequent upon a change of system, would be evidenced in an increased consumption of our goods. A reduction in the duties levied upon the articles used in our manufacturing, is demanded by the interests of all capitalists and laborers engaged in the boot and shoe industry.

It is but just and reasonable that the views of representative men in the business should be carefully considered by the next Congress, and proper relief granted. In the value of its product, and the number of hands employed, the boot and shoe interest is larger than any other single industry in the country.

COLOSSAL BRONZE BUST OF WASHINGTON IRVING.

It will be gratifying to many of our readers to know that a bust is to be erected to the memory of the great author, in Prospect Park, Brooklyn, and still more, to learn that the work has all been done in this country. Heretofore, nearly all the bronze work erected in the United States has been done in Germany or France. The founderies which we have established within the past few years, render it no longer necessary for our sculptors to send their works abroad; we have skilled artisans equal to any in the world in nearly every department of mechanics.

This colossal bust of Irving was modeled by the well known sculptor, J. Wilson Mac Donald, 161 Fifth Avenue. It is the head and shoulders only, and is many times larger than life. The pedestal, which is of granite, and the head render the whole work fourteen feet high. It is pronounced by the friends and relatives of the great story writer to be an admirable likeness. The bust was cast at the foundry of Maurice J. Power, in East 25th street, in this city, and reflects great credit upon his establishment. The metal is very rich, and the finish quite artistic.

The work is to be unveiled in Prospect Park, the day we go to press, June 24th, with appropriate ceremonies. Henry Ward Beecher is to deliver the oration, and the sculptor is to unveil the bust.

The bronze is erected at the expense of Hon. Demas Barnes, one of Brooklyn's most prominent citizens.

THE writer of the "Card," signed "Fides," in another column, page 14, is known to us to be a responsible person, and the gentleman for whom the situation is wanted has been long and favorably known at this office.

SCIENTIFIC INTELLIGENCE.

WATERPROOF GLUE.

Ordinary glue can be rendered insoluble in water by adding to the water, with which it is mixed when required for use, a small quantity of bichromate of potash, and exposing the articles to which it is applied to the light. Chromic acid has the property of rendering glue and gelatin insoluble, and, as the operation of heating the glue pot is usually conducted in the light, no special exposure of the articles to which it is attached need be made. It is probable that paper could be rendered impervious to water by pasting the sheets with this prepared glue. The bichromate is said to render rubber particularly hard and unattackable by hot water. The chromated gelatin ought also to be tried on parchment paper, wood, leather, and cloth fabrics. The proportion of bichromate to be taken must be ascertained by experiment; for most purposes one fiftieth of the amount of glue employed will be found to suffice—that is, one pound of dry bichromate of potash to fifty pounds of dry glue.

Many applications of waterproof glue will readily suggest themselves to our readers. The Albert photographic process is founded upon this property of gelatin, and billiard balls, buttons, and ornaments are now largely made of the chromated glue.

HOP REFUSE FOR PAPER.

A large paper manufacturer near Marseilles, France, has sent agents to the various hop merchants of the Continent to purchase the waste of hop vines for the purpose of mixing it with other stock as a substitute for wood and straw. The fiber is said to be strong, and well adapted for paper. The process by which the raw material is worked up is kept as a trade secret, but it cannot materially vary from the treatment to which wood and straw are now subjected. As hop raising has now become an important branch of agriculture in Northern New York and Canada, it would be well to take note of the French example and save the refuse for the paper manufacturer. Paper can only be made from waste with profit, and such material as wood, straw, seaweed, grass, cornstalks, hop vines, and the like, naturally fall into the the same mill with the rags so long used for this purpose. Cheap paper is associated with cheap books, and the latter with higher civilization and intelligence; therefore we hail with pleasure the introduction of any new material for its manufacture.

[Special Correspondence of the Scientific American.]

THE KELLY PATENT EXTENSION CASE.---ADDRESS OF HON. S. S. FISHER.---COMPETITIVE EXAMINATIONS.---FEMALE APPLICANTS FOR CLERKSHIPS IN THE PATENT OFFICE.

Washington, D. C., June 20, 1871.

The application of William Kelly for an extension of his patent for an "Improvement in the Manufacture of Iron," the same expiring by limitation on the 23d inst., has excited great interest, from the magnitude of the manufacturing establishments in which the process is used, and the capital represented by the parties applying for and those opposing the extension.

The case was argued before Commissioner Leggett on the 15th instant, Mr. George Harding appearing for applicant, and Mr, Franklin E. Felton for the opposition. Among the sixty-four remonstrants are the names of the most prominent financial and business men of the country—*e.g.*, J. E. Thompson, President of the Pennsylvania Railroad, Jay Gould, President of the Erie Railroad, Thomas A. Scott, President of the Union Pacific Railroad, H. J. Lombaert, President of the American Steamship Company, John W. Brooks, President of the Burlington and Missouri River Railroad, Nathaniel Thayer, of Boston, Jay Cooke, Samuel Sloan, James F. Joy, President of the Michigan Central Railroad, and Samuel M. Felton, President of the Pennsylvania Steel Co. On the same day with the hearing, the Commissioner decided in favor of the extension, the Examiner, Professor B. S. Hedrick, having also reported favorably.

Mr. Kelly's invention consists in "decarbonizing molten crude cast iron by running it into a vessel separate from that in which it is melted, and blowing through it blasts of air so as to burn out the excess of carbon." For the benefit of some of your readers, it may be well to state in a general way, without entering on more scientific and accurate details, that cast iron is the first product of smelting the ore, and that this contains about four per cent of carbon; by reducing this proportion of carbon to 1 or 1·5 per cent the product is steel; and by still further reduction, so as approximately to to remove all the carbon, we have pure or malleable iron. Steel may therefore be made by either eliminating the carbon from crude iron, or by adding carbon to malleable or bar iron, and both modes involve some form of chemical action. Among the different processes for reducing the amount of carbon is the so-called pneumatic, which, in a broad sense, is simply injecting, into and through the body of the molten iron, currents of air, the oxygen of which unites with the carbon and escapes. To whose inventive mind this valuable thought first occurred it is not easy to decide, and it was probably original with more than one individual. In Europe, Mr. Henry Bessemer, of England, appears to have been the first who successfully applied the pneumatic process, and his original patent was issued, both in England and this country, in 1856. The claim reads as follows: "The conversion of molten crude iron, or of remelted pig or finery iron, into steel or into malleable iron, without the use of fuel for reheating or continuing to heat the crude molten metal—such conversion being effected by forcing into and among the particles of a mass of molten iron, currents of air or gaseous matter, containing or capable of evolving sufficient oxygen to keep up the combustion of the carbon till the conversion is accomplished."

Mr. Kelly's invention was considered by the Patent Office as similar to Bessemer's, and when his application was filed, in Nov., 1856, the parties were put in interference, Mr. Bessemer having just received his patent. The latter did not appear as contestant, and the interference was decided for Kelly. In 1854, Mr. Christian Shank filed an application for an air blast process, and in 1856 received a patent here; and in England, in 1855, Mr. Martien was granted a patent for a similar improvement in the manufacture, but it is evident from its action that the Office did not consider any of these as equivalents of Kelly's invention. And here it should be stated that Kelly in his patent disclaimed a broad application for blowing air into molten iron, but claimed only his method of doing it.

The opposition, however, contended that the above patent to Shank and also the patent to Martien fully covered Kelly's original claim, and that it should not have been allowed. The other grounds taken by those opposing the extension were that Kelly had not used due diligence in introducing his invention into general use; that the prolonged existence of the patent would be prejudicial to the public interests by reason of the onerous burdens imposed thereby on American manufacturers, and that the invention was practically useless and a failure. In proof of the last named argument, witnesses were brought forward to show that Kelly's process required the supplementary use of Robert Mushet's patent, which consists in introducing into the molten iron, at the proper moment, a triple compound of iron, manganese, and carbon. It was also argued that the British iron masters, being relieved from royalties by the expiration of the Bessemer and Mushet patents, would secure a monopoly of the American market.

Mr. Bessemer's and Mr. Shank's patent expired last year, and their applications for extension were refused, so that the Bessemer process of manufacture in this country is now covered only by the extended patent of Kelly. Five Bessemer steel works are at present in operation in this country, viz., at Troy, Harrisburgh, Johnstown, Penn., Cleveland, and Detroit, and a sixth is erecting at Chicago.

Mr. Bessemer is one of the financially successful inventors. Since the original patent of 1856, others have been granted him, and he is said to live in luxurious and princely style.

The Bessemer works in this country are all in the hands, directly or indirectly, of a company styled "The Trustees of the Pneumatic or Bessemer Process of making Iron and Steel," these parties having purchased the numerous patents of Bessemer, Mushet, and Kelly, and "consolidated their several interests for the purpose of avoiding all conflict of claims thereunder." These trustees are John F. Winslow, John A. Griswold, of Troy, N. Y., and Daniel J. Morrell, of Johnstown, Pa.

The late Commissioner of Patents, Hon. S. S. Fisher, has recently delivered an address in Cincinnati, before the Young Men's Christian Association, on his experiences as a bureau officer. It is an interesting and amusing "tale out of school," and gives one an agreeable peep behind the curtain, with a moral or two of practical moment to the country. Mr. Fisher gives a sorry picture of the working of the American mode of appointment and promotion in the civil service, and of the trials to which the heads of departments and bureaux are subjected. He strongly favors a system of competitive examinations, and a long tenure of office, and refers with satisfaction to the working of the plan which he himself adopted when Commissioner. Ample authority for the introduction of thorough pass and competitive examination was found in an Act of Congress, passed in 1853, and Mr. Cox, the Secretary of the Interior, was in favor of a reform. In referring to the retirement of Mr. Cox from the Secretaryship, Mr. Fisher says that it was unquestionably "due to the determined resistance of certain men to this work of reform."

Most of the present corps of Assistant Examiners passed one of the competitive examinations, and Mr. Fisher gives it as his opinion "that so intelligent and efficient a body of men has never before been seen in the Patent Office;" and that if a similar system were introduced into the other Departments, and rigidly adhered to, the number of employés might be reduced one third. The inaugurations of the examinations, when applied to those already holding places, caused a great flutter and commotion, and several resigned rather than face the ordeal. One man, to heap coals of fire on the Commissioner's head, accompanied his resignation with the present of a small Bible, enclosing in it, on a slip of paper, the "Beatitudes" in Latin.

The number of female applicants for clerkships, even in the Patent Office, where only about sixty-five are employed, is greatly in excess of the males. As employées he highly recommends them. "Some of the lady clerks," he says, "had no equals among the gentlemen, and they and many of the men should have changed salaries."

Mr. Fisher's opinions on the subject of test examinations are worthy of all consideration, but it must be allowed that everything depends on the character of these examinations. To merely sift out the fools and ignoramuses by a few schoolboy questions, is a simple and eminently desirable operation; but to test the fitness of an applicant for a responsible position is quite another transaction, and the crucible is not so easily manufactured. Knowledge is needed of his character, and ability as displayed in positions already held, and other witnesses than himself must be consulted. Qualities and habits of mind and life need to be considered as of more value than scholastic attainments; but how is an examination of a few hours, as ordinarily conducted, to secure answers to such inquiries? For example, in applying a test for fitness to hold

the position of Examiner in the Patent Office, how useless must it be, unless it includes some mode of measuring the judgment and perceptive faculties of the applicant, as well as other qualities too subtle and fundamental to be weighed in the scales of a school text book! The Patent Office itself can furnish examples of abundant scientific and literary acquirement, and brilliant examination record, combined with a chronic and incurable inability to act sensibly and wisely as examiners.

NARROW GAGES FOR RAILWAYS.

There are two classes of considerations which form the basis of opinion with reference to narrow gages for railways. The first includes commercial, the second, engineering, data relating to railways of this character already built and in operation.

Commercially considered, that kind of railway is the best which pays the best dividends. Those railways pay, or, in the hands of honest directors, will pay, the best dividends, in which the first cost, and the annual expenses of running and repairing, are least in proportion to the carrying done upon them. Narrowing the gages of many roads, built, building, and projected, would not reduce their carrying capacity below what they may reasonably expect their traffic to ultimately become, while it would reduce, more or less, the first cost of everything used, and lessen current expenses. This has been amply proved by experiment. There are, however, some roads that are now running nearly up to their capacity. Such roads cannot economically narrow their gages. Commercially, then, these roads are favorably regarded as affording a solution of how cheap yet sufficiently efficient railways may be built and operated with profit to their owners.

In an engineering point of view, all necessary to consider is—can these roads be practically and economically constructed and operated? Experience has answered "yes" in a most emphatic manner to this inquiry. It is therefore evident that the day of narrow gages has dawned.

The experiments with narrow gages have been principally confined to various parts of Europe and to India. Quite a number have been operated with a saving in first cost of thirty per cent, and a saving in running expenses of twenty-five per cent over that of the ordinary wide gage roads doing the same business.

One of the principal savings is in reduction of the wide disproportion of paying to non-paying weight existing on wide gage roads, estimated by Mr. Fairlie as being only one to seven in freight trains, and one to twenty-one in passenger trains running on wide gage roads.

The celebrated Festiniog railway, with two feet gage, carries three times as much in proportion to the weight of its cars as the best wide gages.

The public has the right to say something on this matter. The reduction of gages on passenger roads would greatly reduce the comfort of railway travel in its modern perfection. A violent protest against such reduction, on roads depending in great measure on passenger traffic, might be expected, while in parts of the country where cheap railways or none must be put up with, narrow gages would be hailed as affording facilities for travel and freight traffic, of which they would be long deprived if they had to wait till four and one half feet gages would pay.

REMARKABLE FLOOD.—Papers from the Cape of Good Hope give accounts of a remarkable and sudden flood which has occurred at Victoria West. It is supposed to have been caused by the bursting of a water spout. In the space of two hours thirty houses were washed away and one hundred lives lost. The flood seems to have commenced at the farm of a Mr. Hugo, some distance from the town. His house, homestead, and stock were all swept away, his wife and all his children but one infant (which he managed to save by swimming with it in his arms), were drowned. He describes the scene as appalling beyond measure. First he and his wife heard a sound "like iron falling from the sky;" they looked out, and saw a huge black mass of cloud sweeping along the earth toward them; they caught up the children and rushed from the house, but it was too late, and everything was swept away in the torrent, save Hugo and his infant; even their escape was little short of miraculous.

COAL ON THE ISTHMUS OF PANAMA.—An unexpected and most important discovery of coal beds on the Isthmus of Panama, made three or four years ago, has recently been brought practically to public attention by a trial of the coal at Aspinwall. The result leaves no doubt whatever that the mineral is of excellent quality, superior to the Cumberland coal, and quite equal to the best Newcastle.

The coal beds lie on the River Indio, about thirty-five miles from Aspinwall.

AMERICAN POMOLOGICAL SOCIETY.—The thirteenth session of this institution will be held at Richmond, Va., on September 6, 7, and 8, of this year. It will be in conjunction with the exhibition of the Virginia Pomological and Horticultural Society. A long list of premiums, for the best fruits and wines of different classes is announced.

LAST OF THE NOVELTY IRON WORKS.—These once large and prosperous works are about to be closed out at receiver's sale. In their prosperous days they accumulated a great deal of first class expensive machinery. That which has not been previously sold will be offered at auction on the 6th July. See advertisement for particulars.

ALL the members of the royal family of Prussia are required to learn some trade; the present Emperor of Germany whose printing, and, it is said, spent three years at the case.

NEW BOOKS AND PUBLICATIONS.

AMERICAN CYCLOPÆDIA AND REGISTER OF IMPORTANT EVENTS FOR 1870. Embracing Political, Civil, Military, and Social Affairs; Public Documents; Biography, Statistics, Commerce, Finance, Literature, Science, Agriculture, and Mechanical Industry. Vol. X. New York: D. Appleton & Co., 549 and 551 Broadway. 1871.

This work is too well known to the reading public to require any remarks as to its general scope and character. The present volume does not give evidence of very wise discrimination in the selection of matter. At least, on such topics as we are in the habit of discussing, and with which we are most familiar, we find some very important things not referred to; while minor matters are afforded space. For instance, we find nothing regarding the Suez Canal, the Mont Cenis tunnel, the bridge at St. Louis, the operations at Hell Gate, the Hoosac tunnel, etc., while several comparatively unimportant engineering works are mentioned at greater or less length. In looking at other departments, we have some basis for a similar criticism. A work of this kind ought to be edited with ability and care, and while we do not wish to depreciate the value of this volume, we certainly think it might have been improved. The article on the Franco-Prussian war is a comprehensive and well condensed account of that remarkable conflict. The article, "Chemistry," is also a well edited one. The same may be said of "Astronomical Progress."

THE EYE IN HEALTH AND DISEASE: Being a series of short articles on the Anatomy and Physiology of the Human Eye, and its Surgical and Medical Treatment. By B. Joy Jeffries, Lecturer on Optical Phenomena and the Eye, at Harvard University. Boston: Alexander Moore, Lee & Shepard. New York: Lee, Shepard & Dillingham.

There is, perhaps, no organ in the human body more systematically and ignorantly abused than the eye. The book herewith announced aims to correct this abuse by the dissemination of reliable information relative to its physiology and functions. While written in so popular a style that the unprofessional may read it understandingly, it will be found a book capable of adorning a professional library. Our readers will be able to judge of its merits from some extracts we shall make from it, and also from extracts we have already published from the *Atlantic Monthly*.

LOCOMOTIVE ENGINEERING AND THE MECHANISM OF RAILWAYS. A Treatise on the Principles and Construction of the Locomotive Engine, Railway Carriages, and Railway Plant. With Examples selected from the International Exhibition of 1862. Illustrated with sixty large Engravings and numerous Woodcuts. By Zerah Colburn, Esq., Civil Engineer. Parts 18, 19, and 20. New York: John Wiley & Son, 15 Astor place.

These numbers complete this magnificent work, which, as a whole, is superior to anything before published upon the subject of locomotive engineering. The work has been so frequently noticed in our columns that we need not again enumerate its merits. It is a work that ought to find a place in the library of every engineer.

TROW'S NEW YORK CITY DIRECTORY. Compiled by H. Wilson. For the Year ending May 1, 1872. New York: John F. Trow, Publisher, 52 Greene street.

This standard annual appears this year in new type, and adds to its other merits, a new colored map of the city, including the whole island, marking all the changes in street openings and in the two water fronts. It is a very large volume, and has evidently been prepared with the greatest care. It contains 200,953 names, and the labor required to canvass the names and residences of so large a number, and arrange them alphabetically, is a task that is not easily appreciated by the inexperienced.

SIGN WRITING AND GLASS EMBOSSING. A Complete Practical Illustrated Manual of the Art. By James Callingham. To which are added numerous Alphabets. Philadelphia: Henry Carey Baird, 406 Walnut street. Price, $1·50, by mail, free of postage.

Like all the works published by Mr. Baird, this is an eminently practical one, giving the plainest instructions and directions in regard to the art which forms the subject of the treatise. Judging from the sad want of anything like artistic design in the average sign writing we daily meet with, the work should find a large demand in this country.

TRANS-MISSOURI STOCK RAISING; the Pasture Lands of North America, Winter Grazing, etc. By Dr. H. Latham, late Surgeon N. P. R.R. Omaha, Neb., *Daily Herald* Steam Printing House.

This is a pamphlet, describing the vast region lying between the Arkansas on the south, British Possessions on the north, the one hundredth meridian on the east, and the summit of the Rocky Mountains on the west, where cattle and sheep graze out the entire year, without other food or shelter than is naturally afforded.

AMERICAN NEWSPAPER DIRECTORY. Containing Accurate Lists of all the Newspapers and Periodicals Published in the United States and Territories, and in the Dominion of Canada and British Colonies of North America. Together with a Description of the Towns and Cities in which they are Published. New York: Geo. P. Rowell & Co., Publishers and Newspaper Advertising Agents, 41 Park Row.

Those who have much advertising to do will find this book a valuable and reliable guide.

THE PARENT'S GUIDE; or Human Development, through Inherited Tendencies. By Mrs. Hester Pendleton. Second Edition. Revised and Enlarged. New York: S. R. Wells, Publisher, 389 Broadway.

This book is written with a good motive, and will do good. It tells many plain truths. Doubtless it contains some errors that the physiologist would point out, but the chief purpose of the book will not be defeated by them.

TILL THE DOCTOR COMES AND HOW TO HELP HIM. By Geo. H. Hope, M.D. From the Fifth London Edition. By a New York Physician. A Complete Manual of Directions in Cases of Accidents, indispensable to every Household. New York: G. P. Putnam & Sons.

A very readable, as well as useful, little book, one that will keep people from useless tinkering, and guide them correctly, till medical aid can be called.

THOUGHTS FOR THE YOUNG MEN, AND THE YOUNG WOMEN OF AMERICA; or, a few Practical Words of Advice to those Born in Poverty and destined to be Reared in Orphanage. By L. U. Reavis, St. Louis, Mo. New York: S. R. Wells, 389 Broadway.

A good timely, thoughtful, and morally healthy book. Any young man or woman will be the better for reading it.

HISTORY OF SPRINGFIELD, ILL. Its Attractions as a Home and Advantages for Business, Manufacturing, etc. Published under the auspices of the Springfield Board of Trade. By J. C. Power, Springfield, Ill. State Journal Print.

The facts this report contains, shows the home of the late President Lincoln to be the center of large manufacturing establishments, which probably accounts for our large subscription list from that place.

ECLECTIC MAGAZINE. W. H. Bidwell, Editor, Proprietor, and Publisher, 108 Fulton street, New York.

The July number is at hand. It is unlike any of the other monthlies published in this country. Its contents are made up mostly of selections from other home and foreign periodicals, thus forming a cyclopædia of varied literature of the best kind.

ATLANTIC MONTHLY. James R. Osgood & Co., Publishers, Boston, Mass.

The July number is just out, and its list of contents is varied, and indicative of its sustaining its past popularity.

AMERICAN EDUCATIONAL MONTHLY. J. W. Schermerhorn & Co., Publishers, 14 Bond street, New York.

A magazine of popular instruction and literature; a magazine of special interest to teachers. $2·00 per annum.

VENTILATION OF THE CAPITOL.

Hon. T. A. Jenckes will please accept our thanks for a copy of the Report of the Joint Select Committee on the above subject.

WE are in receipt of the Second Annual Report of the Bureau of Statistics of Labor of Massachusetts; embracing the account of its operations and inquiries from March 1, 1870, to March 1, 1871. Boston: Wright & Potter, State Printers. It is an important and valuable document.

No. 5 of the *Workshop*, published by E. Steiger, 22 and 24 Frankfort street New York, is one of the best of this excellent repertory of design we have seen. Besides the usual collection of rich designs, it contains an excellent article, "Heliography as a branch of Art Industry," which alone is worth the price of the number.

Queries.

[*We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.*]

1.—CRUDE TARTAR.—Having some crude tartar, I would like to know the best way to clarify it.—McA.

2.—BALLOON VARNISH.—What is the best varnish for a silk balloon? How obtained or prepared and applied?—H. W.

3.—STENCILLING.—I want a solution, say of rubber, for instance, that can be stencilled on hard metal and will not rub off easily, but will present a hard surface when dry, and dry quickly, yet can be got off easily, say by soaking in water or an alkali for a short time. I suppose it will have to be rather thick and not *runny*, for stencilling.—P. H.

4.—BOILER PIT.—I have a boiler pit, six feet deep, sides and bottom of which are brick, laid in cement. In rainy season it lets in water badly. Can I plaster or paint it with anything to make it water proof, and thus save the labor of pumping?—E. H. H.

5.—CONE PULLEYS.—I want a rule for constructing cone pulleys, so that one length of belt will fit each pair on the cones.—H. G. L. & A. W.

6.—PLEASURE BOAT.—I want a rule for shaping or drafting a pattern for the knees of a small pleasure boat.—C. D. M.

7.—BEVEL GEARING.—What is the best mode to gear and ungear a bevel pinion on top of a shaft turning a horizontal drum shaft, and having a drum below the pinion, the driven shaft being perpendicular? I wish to alternate and run first one and then the other. Can it be done without stopping the shaft? and how?—W. McW.

8.—CHESTNUT AND HEMLOCK TIMBER.—In this village, on a contract for chestnut scantling of good quality, for stringers or bed timbers for sidewalks, at double the price of sound hemlock, the trustees accepted and used worm-eaten timber, which has given dissatisfaction and rise to the question of the comparative durability of such timber with young, thrifty timber or with sound hemlock. It is obvious that a correct solution to the question is of much importance to multitudes who have occasion to use timber for posts, stakes, stringers, ties, etc. Will those in possession of facts obtained from observation or practical and experimental tests, please answer?—A. H.

9.—COPYING INK.—How can copying ink be made which will leave a copy of writing on copying paper, without dampening the paper, the use of press, or blurring the original, but by simply passing the hand over the copying paper, beneath which the writing shall have been placed?

10.—BENZOLE.—Will some of your numerous readers be kind enough to inform me how I can separate benzole from the light oil of distilled coal tar?—E. F. E.

11.—FILLING FOR ICE BOX.—Is saw dust a good thing to fill in a small ice box with? or would it be better to leave the space entirely empty?—S. F. M.

12.—SHELLAC VARNISH.—Does it improve shellac varnish to put resin into it?—W. F. W.

13.—PINE TAR.—Will some of your readers give me the analysis of pine tar, and tell me what effect the steam or smoke arising from it will have upon the lungs, or on catarrh in the head?—L. F.

11.—KEEPING FLIES FROM HORSES.—How can this be done without nets?—F. N. P.

15.—IMPRESSION PAPER.—Please inform me how to make black impression paper, such as telegraphers use in making several copies of a message or report at one writing. I have made several lots of it by smearing thin, tough paper with lampblack mixed with butter or lard oil. It answers tolerably well for four or five impressions at one time, but it does not keep moist very long, and the color is not as black as that used by telegraphers.—J. D. E.

16.—ELECTRIC LIGHT.—I am a photographer, and feel a desire to learn more of this subject; I therefore make bold to request your answers to the following questions: 1. How large a number of cells of Grove's battery would be required to produce a light equal to the oxyhydrogen lime light? 2. Are the carbon points common charcoal? 3. Are the points connected directly with the two poles of the battery, or must the current first pass through a helix or some other arrangement? 4. Is there any special difficulty, aside from the automatic adjustment of the points, in arranging them so as to produce a good light with a sufficiently strong battery? 5. Is there an electric lamp in the market? If so, where can it be obtained?—W. R. B.

Full Files of this Paper

Can be found in New York, at the office of Geo. P. Rowell & Co., Advertising Agents, No. 40 Park Row.

Examples for the Ladies.

Mrs. Mary R. Hubbard, Troy, N.Y., earned, with a Wheeler & Wilson, in 1868, $731.47; stitching 31,092 shirt fronts, equal to 466,122 feet of seam. At 20 stitches to the inch, this would give 212,569,280 stitches, an average of 708,991 per day, 88,613 per hour, and 1,477 per minute, or sixty times as fast as hand sewing. Sixty years in one! Her machine has run three years by steam and three by foot power, without repair, and is as good as when bought.

In the recent severe fire in Waverly, N.Y., during which nearly the entire town was burned, one of Marvin's Safes had a severe test, as evidenced by a letter they have just received from there:

WAVERLY, June 19, 1871.

MESSRS. MARVIN & CO.—*Gentlemen:* I have just had the misfortune of losing my tannery by fire, and, among other losses, one of your very valuable safes. It withstood the most severe test, having remained in one position through the whole fire, and five cords of hemlock bark burned around it, heating it to an intense red heat. Upon opening the safe after the fire, I am happy to inform you that my papers and everything inside were in a perfect state of preservation. Even the wood work was left perfect.

Yours very truly, A. B. PHILLIPS.

Answers to Correspondents.

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 must be by volume and page.

F. E. R., of Cal.—Fresenius gives the following formula for making sulphocyanide of potassium: ($K, C_2 N S_2$ or $K, Cy S_2$). Mix together 46 parts of anhydrous ferrocyanide of potassium, 17 parts of carbonate of potassa, and 32 parts of sulphur; introduce the mixture into an iron pan provided with a lid, and fuse at a gentle heat; maintain the the same temperature until the swelling of the mass which ensues at first has completely subsided and given place to a state of tranquil and clear fusion; increase the temperature now, towards the end of the operation to dull redness, in order to decompose the hyposulphite of potassa which has been formed in this process. Remove the half refrigerated and still soft mass from the pan, pulverize it, and boil with alcohol. Let the alcoholic solution cool, when part of the sulphocyanide of potassium will separate in colorless crystals; to obtain the remainder, distil the alcohol from the mother liquor. Dissolve 1 part of the salt in 10 parts of water for use.

J. B A., of Ohio, says: "I enclose you a small specimen of ore found in this vicinity, supposed by many to contain silver, discovered in the first place by the plow turning up a piece of the rock. The owner of the land dug around the mass of rock to some extent. On one edge he found that some people had had a charcoal fire, for the purpose, no doubt, of smelting it. It has been stated by the Indians that there are valuable minerals near this place. Please let me hear from you through your columns." We have examined your specimen. It is not an "ore," but a variety of hornblende, without a trace of silver.—EDS.

W. C. C., of Md.—The mineral you send is disintegrated steatite. It may be useful for diminishing friction, for polishing marble and glass, and in the manufacture of porcelain.

J. C. of Pa.—What you call the magnetic fish is simply a shape of a fish cut from a very thin piece of gold beater's skin, horn, whalebone, or other material which is readily affected by moisture. Its motion when laid in the palm of the hand, is caused by the moisture of the skin.

R. B., of N. Y.—We doubt that any screw steamer ever sailed fifteen miles an hour, under canvas alone. What a steamer would average, with canvas and steam both employed, depends upon too many and variable circumstances to be definitely answered. No two vessels have the same sailing qualities, and winds are proverbially fickle.

J. C. G., of N. Y.—The actual flow of a liquid from an orifice in the side of a vessel is only about two thirds that of the theoretical flow, or that amount of flow which would take place were there there no contracted vein. This has been determined by a great number of observations, and is the usual estimate in calculating the flow of liquids through such orifices.

C. K., of Texas.—Find answer to your query about hardening tallow, on page 201, last volume.

D.—The mineral you send is an ore of iron. If found abundant and in *situ*, that is, not accidental (of which we are suspicious) it might be worth while to test its commercial value by a large experiment.

ANNEALING STEEL.—1st. For a small quantity. Heat the steel to a cherry red in a charcoal fire, then bury in sawdust, in an iron box, covering the sawdust with ashes. Let stay until cold. 2nd. For a larger quantity, and when it is required to be very "soft." Pack the steel with cast iron (lathe or planer) chips in an iron box, as follows: Having at least ½ or ¾ inch in depth of chips in the bottom of box, put in a layer of steel, then more chips to fill spaces between the steel, and also the ½ or ¾ inch space between the sides of box and steel, then more steel; and, lastly, at least 1 inch in depth of chips, well rammed down on top of steel. Heat to and keep at a red heat for from two to four hours. Do not disturb the box until cold.—B. P. G., of Mass.

CLOTH ROLLS.—Cover cloth rolls with No. 3 sand paper. To prepare it, go over each sheet on the back side, with a sponge wet enough so to damp stretch the paper, piling the sheets back to back, and face to face as fast as dampened, that they may get seasoned. The sheets being all ready, turn the pile upside down, and if the paper feels only slightly damp, proceed with the glueing on, taking care that the sheets are well matched. Much better than emery.—B. P. G., of Mass.

TEMPERING SPIRAL SPRINGS.—Heat to a cherry red in a charcoal fire, and harden in oil. To temper, blaze off the oil three times, the same as for flat springs.—B. P. G., of Mass.

BLUEING SMALL ARTICLES.—Pistol barrels and articles of that kind, are blued as follows: Having a quantity of charcoal ashes on an iron plate, or in a box, place over the fire, and heat slowly. Put the articles to be blued in the ashes, and as they get heat up, take out occasionally to see how the color is drawing. When the color is a blue, do not take them out, but leave them until they have become white again, when they should be taken out and allowed to cool. Now, by returning the articles and reheating, you will have the "second blue." The first blue will rub off easily, the second blue will wear quite a long time, but in order to get a good color, the articles should be highly polished, and free from grease of any kind, and in no case should the articles be dipped in oil or water, before or after blueing, unless you wish to spoil the color.—B. P. G., of Mass.

NOISY GEARS.—I think that the trouble with S. B.'s gears is in the teeth not being of the proper curve, or being irregular. If he will measure some of the teeth and spaces, I should not be surprised if he found quite a variation in them, and if so, the remedy would be a new pair that are right.—B. P. G., of Mass.

EXPLANATION WANTED.—If K. will key a 12 inch cast iron head on his boring bar, using a side tool with the cut of the tool ground at an angle of about 30° with the shank, clamped on the head in such a position that it cannot spring into the work, I think that he will not have any trouble in boring his cylinder, provided that his cylinder is firm.—B. P. G., of Mass.

NOISY GEARS.—If it is a ringing noise that S. K. wishes to stop, let him wind the arms of his gear wheel with strips of cloth.—R. S. B.

LATHE.—The only trouble with K.'s lathe is, that the A in the sliding carriage fits the A on the shears too tight; they bind on each other's sides, instead of on the top and bottom. If he will plane the sides of the A of the carriage off so that it will bind on top of the A, he will find his trouble from breaking feed gearing will end, as the friction will be less. —R. H., of Mass.

S. R. and D. R. R., asks: Can a locomotive engine with five feet driving wheels, run sixty miles per hour? and says further: "I know that higher speed has been obtained, but with much larger drivers. We have new straight boiler, double dome Baldwin engines, 15 x 24 and 16 x 24 cylinders. A hundred miles of the track is new fish bar iron, and the road is in good order. I don't believe an engine will feed with the ordinary pump (attached to the crosshead) running at that rate, nor do I believe that the drivers can be made to run five revolutions per second, which, if done, would only carry the engine 4,710 feet, or 570 feet less than a mile in one minute. Six revolutions per second amounts to only 372 feet more than a mile in one minute. An answer will settle the argument for and against, and your authority will be conclusive."—We do not believe the speed named was ever attained with five foot drivers.

POUNDING IN CYLINDER.—I am running a 75 horse engine Dunbar packing, Judson governor, and globe valves in the ends of cylinder. My engine commenced pounding in the cylinder. I took off the follower, and found the rings too loose between the piston and follower. I had new ones put in, and the trouble ceased. Am inclined to think the same is the trouble with S. E.'s engine.—E. F. S., of Conn.

INK.—Let A. S. take 2 ounces of Arnold's Japan ink, 1 ounce of a very pale preparation of India ink, 1 ounce of best carmine ink. Let it stand one week before using. This, when necessary, with weak tea, never with water.—R. W. B., of Wis.

FIXING PENCIL OR CHALK MARKS.—J. H. R. asks for a ready way of fixing pencil marks. The following rule will render chalk or pencil drawings permanent. Lay the drawing on its face, and give the back two or three thin coats of the following, No. 1, mixture; let it dry and turn it with the chalk or penciling upwards, and give that side one or two coats also. Lastly, give it one or two coats of No. 2. This last is optional; the first doing the required work. No. 1. Isinglass or gum arabic, 5 parts; water, 12 parts. No. 2. Canada balsam, 4 parts; turpentine, 5 parts.—G. G. R.

PLUMB RULE.—I see "A Maine Carpenter" asks if the Southern and Middle States use the old time honored implement, the plumb bob. I can answer in the negative. We sometimes see them used by brick and stone layers, and I suppose they prefer them because the roughness of their materials so quickly destroys the edges of the tool. I use the most improved adjustable spirit level and plumb, and when I wish to prove it, I use the same plan I gave in a former letter, which I thank you for publishing, and which I see the "Maine Carpenter" admits as good, though he speaks of a better one; which you have asked for, and which I hope soon to see.—A GA. CARPENTER.

DRAWING INK.—W. R. S. can make a very black and indelible drawing ink by dissolving shellac in a hot aqua solution of borax, and rubbing up in this solution a fine quality of Indian ink. After using, he should dip his drawing pen in alcohol, and wipe dry to keep it clean and bright.—W. W.

BELTS.—I answer F. E. H. that belts run to the highest parts of pulleys, because they are tighter on those parts.—J. B. L., of Mass.

ROACHES.—Borax is a sure roach killer, and is perfectly harmless to children. Sprinkle powdered borax about roach holes, and they will disappear in a few weeks.—W. E. S. F.

DITCH FOR FISH POND.—Make the grade not more than one in two hundred (1-200), else the water will be muddy, and will rapidly ruin the ditch.—W. E. S. F.

SOLVENTS FOR RUBBER.—Rubber will dissolve in spirits of turpentine, in ether, or in bisulphide of carbon.—W. E. S. F.

STAINS OF IRON AND QUININE.—Wash with dilute muriatic acid, and rinse thoroughly with water. This will remove all iron stains.—W. E. S. F.

FIREPROOF WHITEWASH.—Make ordinary whitewash and add one part silicate of soda (or potash) to every five parts of the whitewash.—W. E. S. F.

SOLDERING OLD WARE.—Let L. E. A. use sal ammoniac instead of zinc and muriatic acid, and the difficulties mentioned will be overcome.—W. E. S. F.

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.

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For sale.—Apparatus for Unloading Hay. It can put a load of hay in the barn in from 5 to 10 minutes, and can fill the barn to the roof without difficulty. May be used to load cars or canal boats. Patented May 23, 1871. Address Alex. Smith, Hoosick Four Corners, N. Y.

Wanted.—Price Lists of Plumbing and Gas Fitting Materials. Mill & Maran, Titusville P. O., Pa.

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For Sale.—A Patent on Steam Mangle. Address P. Rundquist, 954 6th Avenue, New York city.

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Ford's Portable Tobacco Press for Planters. Will sell Virginia, Maryland, Missouri. Address Ford's Tobacco Warehouse, Evansville, Ind.

Peck's Patent Drop Press. For circulars address the sole manufacturers, Milo, Peck & Co., New Haven, Ct.

Dickinson's Patent Shaped Diamond Carbon Points and Adjustable Holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24 and Nov. 20, 1869. 64 Nassau st., New York.

Air Cylinder Graining Machine.—A perfect tool for House Painters and Manufacturers of all kinds of Decorated Ware. Complete Machine for $50.00. Send stamp for Circular. The Heath & Smith Manufacturing Co., 44 Murray street New York.

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The Merriman Bolt Cutter—the best made. Send for circulars. H. B. Brown & Co., 25 Whitney ave., New Haven, Conn.

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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.

APPLICATIONS FOR EXTENSION OF PATENTS.

DOOR SPRING.—Edward P. Torrey, of Jersey City, N. J., has petitioned for an extension of the above patent. Day of hearing, August 23, 1871.

MACHINE FOR CLEANING RICE.—Wilson Ayer, Washington, D. C., has petitioned for an extension of the above patent. Day of hearing, August 30, 1871.

GAS GENERATOR.—John Butler, New York city, has petitioned for an extension of the above patent. Day of hearing, August 30, 1871.

EDGE PLANE FOR TRIMMING BOOT AND SHOE SOLES.—Isaac A. Dunham, North Bridgewater, Mass., has petitioned for an extension of the above patent. Day of hearing, September 6, 1871.

STEAM GENERATOR.—Finley Latta, of Cincinnati, Ohio, has petitioned for an extension of the above patent. Day of hearing, October 4, 1871.

Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing

MUNN & CO., 37 Park Row.

Inventions Patented in England by Americans.

May 16 to May 29, 1871, inclusive.

[Compiled from the Commissioners of Patents' Journal.

EYELET.—H. N. Smith, B. F. Carver, C. W. McCune, New York city.
HEATER.—S. A. Hill, C. F. Thumm, Oil City, Pa.
LOCK SEAL.—F. W. Brooks, New York city.
PRINTING BLOCKS.—M. Laemmel, New York city.
PRINTING TELEGRAPH.—M. Lefferts, New York city.
TELEGRAPH.—T. M. Foote, C. A. Randall, Brooklyn, N. Y.
VISE.—J. Simpson, Cleveland, O.
WIRE FASTENING.—H. W. Putnam, Bennington, Vt.
WORKING STONE.—T. W. Baxter, Chicago, Ill.

Foreign Patents.

The population of Great Britain, is 31,000,000; of France, 37,000,000 Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, while business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & Co., 37 Park Row, New York. Circulars, with full information on foreign patents, furnished free.

Recent American and Foreign Patents.

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

LAMP BURNER.—This invention relates to improvements in that class of burners in which an Argand flame is produced by two flat wicks confined by an exterior tube around a central wick tube, through which air is supplied rom below, an outer tube being also employed to regulate the flame by raising or lowering, while the wick remains stationary. An improved construction and arrangement is employed whereby the burner is made more economical and efficient than those now in use. Invented by Seabury B. Platt, of Derby, Conn.

FRICTION CLUTCH.—This is a new friction dog to be used in all catch or clutch boxes of cotton, woolen, and other machinery. A friction spring is applied to the loose sleeve and dog that operate the pawl, so that by the spring the dog will be carried to the same side toward which the shaft is turning, to let the pawl act in the same direction. When the motion of the shaft is reversed the dog will be swung to the other side, to reverse also the action of the pawl or throw the same entirely out of gear. William C. Burch and George D. Oatley, of Gloucester, N. J., are the inventors.

DISCHARGE APPARATUS FOR OIL TANKS, GRAIN CARS, ETC.—A series of holes is cut in the bottom or lower end of a hollow stem for the purpose of allowing the liquid or grain to pass out through the hollow stem and the discharge or hole in corresponding casting at the bottom of the tank, when the hollow stem is raised sufficiently to bring the holes above the top of the discharge casting, the discharge or escape of the liquid or grain being cut off when the hollow stem is screwed down into the thread or screw in the discharge casting. This arrangement of the hollow perforated and screw threaded lower end of the tube, with the casting, is employed in preference to the valves heretofore used, because it can be opened, although frozen up, by water lodging upon the inside of the tank when empty, which prevents the opening of the valves. Invented by W. J. Brundred, of Oil City, Pa.

FENCE.—This improved fence, invented by Henry Deyoe, of Machias, N. Y., consists in metal posts formed by two rods of iron, hooked under opposite sides of a stone or metal base, and shaped above it so as to rise side by side, and be clamped firmly together by a ring, to which posts the panels, permanently built together, are suspended at the ends on right-angled hooks projecting from rings placed on the posts by slipping down from the top, and secured at any point by keys. The vertical parts of these hooks are made to extend sufficiently from the posts to receive the ends of two panels or a board thereof, the one lapping the other, and a key may be used or tightening them up.

HORSE HAY RAKE.—The invention connects the rake to the frame of the truck by leather or other flexible straps, made fast at one end to the rake frame, as shown, and at the other end to the blocks or bars, pivoted to the frame so as to oscillate vertically. The rake is drawn by these connections, which allow the requisite lateral and vertical play of the parts, due to the uneven surface. The front cross bar of the rake is connected to a block or foot lever, pivoted near the front of the truck frame, by a cord or chain, which works over a guide or pulley for lifting the rake off the ground; and the handles of the rake are connected with a hand lever, pivoted to the frame by a bar and rod, by which the rake handles may be raised to cause the points of the teeth to catch in the ground to turn therake; or if, by lifting the handles at the same time, the front of the frame is lifted by a lever and cord or chain, the rake will be lifted wholly off the ground. M. W. Trescott, of North Canaan, Conn., is the inventor.

PLOW.—John Thomas Story, of Magnolia, Ark., has invented a plow for eneral farm work, the construction and arrangement of handles, beam, standard, and braces, in relation to each other, and the mold board and land side, admitting of a number of peculiar adjustments, by means of which the handles can be brought into any desired position, the plow beam can be swung on a pivot into a suitable position and locked therein, and the plowshare can be put into suitable position.

ROTARY ENGINE.—A circular case, with a thick rim, has in its inner wall four concave spaces, divided by projections, the inner faces of which lie in a true circle, coinciding with the face of a disk or drum, and have circular grooves extending across the rim, in which are placed cylindrical metal pieces, intended to bear against the rim of a disk for preventing the escape of steam from one space to another. They are pressed against the said disk by steam admitted to grooves behind them through the small holes. Being cylindrical, and the friction of their contact with the disk being greater than that of the contact with the walls of the grooves, they will revolve, and thereby wear less than if stationary, and the resistance to the disk will be less. There are as many exhaust ports as there are projections and cavities, and each is placed a little in advance of a projection. A recess is formed in the radial wall near the outer end, into which the steam port opens. The steam chest is placed on the outside of the end plate of the case. It has as many ports as there are recesses in the case. The steam or compressed air acts upon radially advancing and retreating blocks or buckets. Benjamin I. Henderson, of Salem, Mass., is the inventor.

WATER HEATER.—A water heater for green houses and other purposes nas been invented by John Lynch, of Boston, Mass., which consists of a general construction and arrangement of parts whereby the water is made to surround the fire box in a thin sheet, entering cells formed in the fire box, and the hollow back or bridge wall absorbing heat from a very extended surface, and economizing fuel. By the connection of two pipes, a perfect circulation is maintained.

CARRIAGE AXLE.—This is a sleeve-bearing and linch pin device, so arranged that, it is claimed, the axle is cheaper and more easily made than the common axle, is more cheaply repaired when broken, and the axle can be more readily handled in the fire. It also can be cut to the required length at once, thus saving the trouble of welding.

LET-OFF MECHANISM.—This is a friction apparatus to regulate the letting off of yarn from the yarn bearers of looms. A mejallic strap lined with leather and the leather lined with cloth overlapping the leather, is made to draw down, over and upon the yarn beam, by means of a lever and spring attachment which can be adjusted while the loom is in motion. The leather and cloth lining serve to adapt the friction strap to unevennesses in the surface of the beam, and thereby render the action uniform. Invented by George Bailey, of Putnam, Conn.

BED BOTTOM.—Robert V. Jenks and William Allen Miller, of Paterson, N. J.—This bed bottom is so constructed that the head part may be raised and held at any desired elevation. The bottom of the bed is formed of strips of webbing placed longitudinally, and at the head of the bed is attached to the pivoted part of the framework, a roller with ratchet wheel and pawl whereby the webbing may be stretched tight and kept strained. The tension of the webbing is what supports the pivoted section in an inclined position when raised, it being braced in the opposite direction by a cord wound about a belaying cleat in the side rail.

ADJUSTABLE MIRRORS.—This invention consists in a novel method of raising, lowering, arranging, and suspending one mirror, or when desired, two mirrors, so that a person may see at the same time the front and back of the head and bust, a great convenience in hair dressing. The glasses are, by the devices employed, easily adjusted to suit various hights of stature, and to allow the person to sit if desired. It is the invention of George S. Roberts, of Meredith Village, N. H.

WASHING MACHINE.—Francis M. Ellis, of Galva, Ill.—In this machine, a half cylinder tub, pivoted at the center, is made to oscillate by a handle. The tub contains a corrugated or ribbed board, which is moved with the tub. The clothes are squeezed between this board and a series of vertical fixed bars attached to the upper framework of the machine. It also comprises a rubbing apron for hand work, suitable covers, etc.

CAR COUPLING.—This is a simple and, we judge, effective device which obviates all necessity of entering between cars to couple or uncouple them. The draw head is bifurcated, the bifurcations embracing the coupling pin. A coupling hook is pivoted to the draw head, and is forced radially and horizontally towards the pin by means of a suitable spring. The end of this hook is inclined, so that the pin forces it back when the cars come together, until the pin passes the angle of the hook, when the latter is forced behind the pin by the action of the spring. A cord or chain attached to the hook extends back obliquely to a vertical shaft which rises through the platform of the car. A hand wheel placed on the top of this shaft is turned whenever it is desired to uncouple the car, and winds up the chain and draws back the hook from its engagement with the coupling pin. If it be desired to keep the car from coupling again, the shaft is held from turning back by a ratchet and pawl arrangement, similar to that ordinarily used on brakes. Invented by Eugene Campbell, of Medusa, N. Y.

REPEATING ORDNANCE.—Alfred H. Townsend, of Georgetown, Colorado Territory, has invented a gun constructed to throw numerous balls from different barrels. The breech piece consists of two plates having perforations which register with each other to receive the cartridge. At the point of junction of the two plates, passages are formed, connecting the chambers, to communicate the fire from one barrel to another. The barrels are made independent and arranged one upon another in diagonal planes. A plate, placed between the breech piece and the barrel, has corresponding perforations. The barrels are placed in two divisions, one on each side of a central line, and each inclined reversely thereto. The breech piece is held detachably by a spring. The cap communicates with only one of the chambers, which, being fired, ignites in succession, at very minute intervals, the entire series through the passages above described, whereby the inventor claims to obtain a succession of weak recoils instead of the violent shock sustained by an exactly simultaneous discharge. The piece being discharged, the balls are projected slightly divergent from the principal axis of the gun. The breech piece is then withdrawn and another charged one substituted, the admission of air, during the change, acting to cool the gun and expel gases.

STEAM PUMP AND FIRE ENGINE.—James W. Whitaker, of Kenosh, Wis.—The general principle of this invention is the raising of water into a vacuum caused by first filling a chamber with steam and then condensing the steam. The water which rises to fill the vacuum is then forcibly expelled by steam pressure. There are two chambers so adjusted as to discharge alternately into a receiving tank, from whence issues a nozzle through which the water is continuously expelled. The admission and condensing of the steam are effected through the aid of a four way cock or valve caused to act automatically by floats which, through double cranked rods, operate a weighted lever attached to the valve stem.

PISTON FOR PUMPS AND STEAM ENGINES.—A new arrangement of slides is worked by steam to turn a crossed ring which, acting on wedge-shaped noses of the expansion ring, spreads the latter, and thus enlarges the piston. A sleeve with radial arms is fitted loosely on the piston, the ends of the arms meeting the inner inclined surfaces of the wedge shaped noses. A block secured to the inner face of a piston head has small piston chambers formed therein, and the small pistons contained therein are caused to press upon one of the radial arms of the sleeve, thus forcing it partially around and causing the ends of the radial arms to press against the noses on the expansion ring. Steam is admitted behind the pistons through small slots. There is also a spring by which the piston may be permanently expanded in its primary adjustment. Invented by John Adam Huss, of Bowling Green, Ky., assignor to the Bowling Green Improved Cylinder and Pump-Packing Co., of the same place.

ANGULAR STRAP HINGE.—This is a new way of applying a support to the vertex of an angular hinge strap, where the sharp turn is apt to strain the fibers of the metal and allow it to be readily fractured. It consists in striking up the metal inwardly where the angle is to be formed. There may be two or more corrugations if desired, but for ordinary strap hinges or brackets, one is usually found sufficient to give the bend or angle the required degree of strength. By his mode, the inventor claims, a strap hinge may be made of ordinary band iron in the most inexpensive manner and still be of superior strength und durability. Charles F. Hawley, inventor, Kansas City, Mo.

HAIRPINS.—This invention consists in the application of knobs or enlargements to the ends of the prongs, the object of which is to retain them in the hair more securely than they can be without said knobs, as they are now made; also, to prevent them from cutting or puncturing the skin, as the pins do when made in the common way, sometimes much to the injury of the wearer, by reason of the poisonous action of the metal, or substances adhering to it, upon the scalp. Invented by Edward Hewitt and John McAuliffe, New York city.

CLOTHES DRYER.—John Johnson, of Perry, Ill., has invented a clothes dryer, which consists in a number of arms jointed to sleeves sliding up and down a notched shaft or post in such a way that pawls or toes on the inner ends of the arms will engage in the notches when the arms are extended horizontally, and hold the said arms in an extended position on the post; and, by lifting the outer ends, the toes will be disengaged, and the sleeves will slide down below a rack surrounding the post, which holds the arms in a compact bundle around the shaft.

CLOTHES DRYER.—A central standard or bar, has holes to receive hooks or nails by means of which the frame may be suspended from a wall or other support. To this central standard are hinged semicircular blocks, and to each of the blocks are pivoted the inner ends of four (more or less) bars, in such a way as to have a free lateral movement upon the blocks. The bars are arranged in sets, and the outer ends of each set of bars are pivoted to a vertical bar, in such a way as to have a free vertical movement. By this construction the frame is capable of being folded. John K. Derby, of Jamestown, N. Y.

HYDRAULIC MOTOR.—This consists in a vibrating blade or piston in a closed case, an induction port and exhaust port on each of two opposite sides, with valves or gates, and automatic apparatus for working the valves from the crank shaft, which is operated by the shaft of the vibrating blade. Other arrangements of valve operating gear may be employed, the essential part of the invention being the arrangement of the case, blade, and valves. Invented by Volney Kromer, of Grand Rapids, Mich., assignor to himself and Warren T. Reaser, of same place.

WHARF BOAT.—A movable bridge extends from the top of, or a trestle way on, the bank, to a tower rising from the deck of a wharf boat, having numerous platforms on one side, one above another, and floors within corresponding with them, on which platforms the end of the bridge may be suspended, and may be shifted from one to another as the water changes, to maintain it in a level position, or nearly so; the said tower also having suitable hoisting and lowering gear for transferring the freight from the boat to the bridge, and *vice versa*. This apparatus is well calculated for use on the Western rivers where the banks are changeable by the action of the water, and permanent apparatus cannot well be maintained. Invented by Edwin W. Halliday, of Columbus, Ky.

ROLLER AND MARKER FOR PLANTING.—Invented by Frederick Roth and Bernhard Fürst, of Lacon, Ill.—This invention is an improvement in rollers and markers, and consists in a frame which is so constructed that the rear ends of its side bars act as shoes or runners to support the machine when the marking device is elevated from the ground. Thus, there is no necessity of providing wheels or other means of support beside the main frame of the machine, as in the case of other combined markers and rollers which have a jointed tongue; which last is regarded as a valuable adjunct, for otherwise, upon ground full of inequalities, the markers would be at times pressed deeply into the earth, and at others lifted completely out of it, thus frustrating in a measure, the useful purpose of the machine.

CURRENT WHEELS.—The buckets or floats are hinged to the outer ends of the arms and swing back toward the shaft, so that on the lower side, where the water acts on them, they are supported by the arms, and thereby receive the force of the water; but on the upper and retiring side, in case the water be higher than the shaft, they will swing away from the arms. When they come down to take the water, they are prevented from swinging outward by the action of the water. This wheel may be wholly immersed in the water and secured to the bottom of the stream, or it may be at the surface. The gate consists of a semicircular or nearly semicircular case, having closed ends, pivoted to the supports of the wheel in the axis, so as to swing around the wheel, in opening and closing. For operating it, it has curved slots in each head, with toothed racks in which pinions work, the pinions being actuated by suitable mechanism. Invented by William Tuder, of Moffettown, Texas.

PROPELLER.—John S. Stites, Baltimore, Md.—This invention relates to the method of propelling vessels by means of pistons, working in cylinders placed within the vessel and passing through the bottom thereof, said cylinders being open at their lower ends, so as to admit water by the action of the pistons, against which the propulsion of the vessel is effected.

ROLLER SKATE.—Allen T. Covell, San Leandro, Cal.—This invention is an improvement in devices for operating roller skates, whereby the front and rear set of rollers are simultaneously adjusted for describing circles of greater or less radius. The invention is, more particularly, an improvement on the skate patented to Hiram Robbins, May 19, 1870, whereby the weight and number of parts are lessened, and their strength increased.

APPARATUS FOR FASTENING PULLEY AND WHEEL HUBS TO SHAFTS.—Edward G. Shortt, Carthage, N. Y.—This invention consists in a hub, provided with an eccentric bore, and combined with wedges running lengthwise of the hub, and curved and tapering in cross sections, and with a key which fits between the wider edges or heads of the curved wedges, within the hub which key, when driven into the hub, causes the wedges to clamp and center the axle.

METALLIC TILES FOR ROOFS.—Cornelis G. Van Pappelendam, of Charlestown, Iowa.—The principle of this improvement consists in forming a covered channel between two ridges and two tiles to exclude water. The tiles are made of galvanized iron or other suitable metal, and may be struck up out of sheet metal, or cast, as may be desired. They are made square or diamond shape, and placed diagonally upon the roof or wall. Upon each upper edge of the tiles are formed two upwardly projecting ridges, about three eighths of an inch in hight, the ridges running along the two edges of the tiles, and the second ridge being parallel with, and at a little distance from, the outer ridge so as to form a channel between them. Upon the under side of the two lower edges is formed a single downwardly projecting ridge. The side angles of the tiles are cut off, and they are arranged upon the roof, so that the downwardly projecting ridges of each upper tile are placed below and embrace the upwardly projecting ridges of the adjacent edges of two tiles. By this construction it will be impossible for water or wind to beat in and pass above the three ridges. Upon the body of the tiles may be struck up or otherwise formed, an ornament, in the shape of a tassel flower, or other suitable device. This ornament strengthens the tiles and prevents them from being rolled up by the wind, and, at the same time, adds greatly to the beauty of the roof or wall.

WATCHMAKER'S GAGING TOOL.—This is a simple and widely applicable tool for watchmakers, whereby glasses, mainsprings, arbors, wheels, and other parts of watches may be gaged. It is impossible to give a clear idea of the details of the instrument in a notice like this, but we regard the tool as likely to meet with great favor, and prove a very useful adjunct to the present outfit of the watchmaker's table. It is the invention of Theodore Noel, of Memphis, Tenn.

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116,002.—HINGE.—R. Adams, Southwark, Great Britain.
116,003.—CORN PLANTER.—P. H. Altstatt, Clark Co., Ind.
116,004.—VACUUM CUP.—Wm. Amer, Janesville, Wis.
116,005.—WHIFFLETREE.—J. R. Ames, Chest Township, Pa.
116,006.—FASTENING.—S. D. Arnold, North Britain, Conn.
116,007.—STEAM BOILER.—J. B. Atwater, Geneva, Ill.
116,008.—SOAP.—I. D. Balch, Cambridge, Mass.
116,009.—SASH HOLDER.—R. R. Ball, West Meriden, Conn.
116,110.—DOOR.—B. F. Barker, Belfast, Me.
116,111.—BLANK MACHINE.—E. Bartholomew, Mill Hall, Pa.
116,012.—DIE.—H. M. Beecher, Plantsville, Conn.
116,013.—BED CLOTHES RETAINER.—J. Birkenhead, Canton, Ms.
116,014.—MILKMAN'S SIGNAL.—E. B. Blake, Tarrytown, N.Y.
116,015.—EARTH CLOSET.—W. J. Bradshaw, Cleveland, O.
116,016.—BRICK KILN.—S. C. Brewer, Water Valley, Miss.
116,017.—ANIMAL TRAP.—W. W. Brigg, Home, Tenn.
116,018.—OFFICE INDICATOR.—Lewis Burger, Chicago, Ill.
116,019.—STEAM ENGINE.—G. F. Burkhardt, Boston, Mass.
116,020.—PAPER PULP.—J. Campbell, Chatham Village, N.Y.
116,021.—TELEGRAPH-WIRE COUPLING. A. Cary, New York city.
116,022.—ROTARY ENGINE.—Warren Case, Troy, Ill.
116,023.—SEAT.—Daniel Christian, Chagrin Falls, Ohio.
116,024.—FERRY BOAT.—Henry Clenny, Gallatin, Tenn.
116,025.—WATER ELEVATOR. R. F. Clow, W. H. Down, New York.
116,026.—CIGAR MACHINE.—S. L. Cole, Brooklyn, N.Y.
116,027.—BAND KNIFE.—F. Coulon, Rockford, Ill.
116,028.—HARNESS BUCKLE.—T. Crakes, Mishawaka, Ind.
116,029.—KNIFE SCOURER.—D. Crowell, Jr., Yarmouth Port, Ms.
116,030.—SCRUBBING BRUSH.—W. Devines, Williamsburg, N.Y.
116,031.—STEAM ENGINE.—A. L. Dewey, Westfield, Mass.
116,032.—WOOL DRYER.—J. M. Dick, Buffalo, N.Y.
116,033.—STRAW CUTTER.—J. H. Dickinson, Chicopee Falls, Ms.
116,034.—CLOTHES-LINE HOLDER.—E. Dingman, Liverpool, N.Y
116,035.—TEA-KETTLE COVER.—Zehrab Dixon, Bristol, Ill.
116,036.—COAL SCUTTLE.—Edgar Eltinge, Kingston, N.Y.
116,037.—HARVESTER.—Joel Farrington, Corry, Pa.
116,038.—GEARING FOR HARVESTER.—J. Farrington, Corry, Pa.
116,039.—PULP ENGINE.—M. R. Fletcher, Boston, Mass.
116,040.—TREADLE.—A. Fontayne, Cincinnati, Ohio.
116,041.—EXTINGUISHER.—D. M. Ford, J. A. Kley, Chicago, Ill
116,042.—GATE LATCH.—C. W. Fox, St. Louis, Mo.
116,043.—FERMENTING MASH.—C. H. Frings, Centreton, Mo
116,044.—FERMENTING TANK.—C. H. Frings, Centreton, Mo.
116,045.—BEDPLATE FOR PULP ENGINE.—P. Frost, Medfield, Ms.
116,046.—NAIL PLATE AND SHEET STRIPS.—J. Frowen, E. E. Hemmings J. Sheldon, Niles, Ohio.
116,047.—SURVEYING INSTRUMENT.—R. F. George, Palmyra, Va.
116,048.—PLOW.—M. L. Gibbs, Canton, Ohio.
116,049.—VENTILATOR.—H. A. Gouge, Brooklyn, N.Y.
116,050.—FELLY CLIP.—David Grim, Pittsburgh, Pa.
116,051.—ENGINE.—Thomas Hanson, New York city.
116,052.—TRACE LOCK.—G. L. Hart, New Britain, Conn.
116,053.—COOLING BEER.—J. M. Heiss, Baltimore, Md.
116,054.—GAS LIGHTER.—F. Heyl, P. Diehl, E. New York, N.Y.
116,055.—TEARING UP LEATHER.—E. S. Hidden, Millburn, N.J.
116,056.—SEWING MACHINE.—E. L. Howard, Malden, Mass.

116,057.—CLOTHES PRESSING MACHINE.—P.Howe,Boston,Mass.
116,058.—STOVE.—W.J.Hoxworth, S.H.LaRue, Allentown,Pa.
116,059.—RAILWAY.—H.T.Humphreys,West Limerick,Ireland.
116,060.—PRINTING PRESS.—T. H. Ide, Claremont, N.H.
116,061.—ROCKER FOR CRADLE.—R. A. Jackson, Alliance, O.
116,062.—HAND CAR.—David Johnston, Eddyville, Iowa.
116,063.—HARVESTER. S.Johnston,C.H.Jenner,Brockport,N.Y.
116,064.—WALL CHAIR.—J. L. Kapple, Chicago, Ill.
116,065.—REFINING IRON, ETC.—W. H. Kimball, Boston,Mass.
116,066.—MAGAZINE FIREARM.—J. L. Kirk, Mattoon, Ill.
116,067.—TRACE HOOK ATTACHMENT.—J.B.Kook, J.S.Shrawder, Fairviewville, Pa.
116,068.—FIREARM.—James Lee, Milwaukee, Wis.
116,069.—CONSTRUCTION OF CAR.—J. E. Leeper, Godfrey, Ill.
116,070.—SIDE-HILL PLOW.—G.W. Leonard,MiddleValley, Pa.
116,071.—WATER WHEEL.—G.W. Leonard, MiddleValley, Pa.
116,072.—ROOF GUTTER.—J. F. Lockwood, Taylorville, Ill.
116,073.—BABY WALKER.—C. Maschmann, Watertown, N.Y.
116,074.—SAW SET.—G. W. May, Baldwinsville, Mass.
116,075.—TENONING MACHINE.—A. C. McQuaid,Wenona, Ill.
116,076.—FASTENING.—Charles Morrill, New York city.
116,077.—WRENCH.—J. A. Morrison, Brady's Bend, Pa.
116,078.—FIREARM.—J.L.Moss,E.W.Johnson,Columbus,Miss.
116,079.—CENTER BOARD.—John J. Moule, Huntington, N.Y.
116,080.—GRATE BAR.—W. Muir,A.& P.Butler,Carbondale,Pa.
116,081.—CLOTHES DRYER.—J. F. Mullowny, Pittsburgh, Pa.
116,082.—DOOR BELL.—W. T. Munger, New Britain, Conn.
116,083.—STEAMING, ETC.—J. Murdock, South Carver, Mass.
116,084.—SAFETY VALVE.—A. F. W. Neynaber, Phila., Pa.
116,085.—SLEIGH BELL.—W. H. Nichols, E. Hampton, Conn.
116,086.—WATER SUPPLY.—F. Norboe, Chicago, Ill.
116,087.—BUTTON NEEDLE.—J. A. Ostburg, Boston, Mass.
116,088.—HARVESTER.—A. Padgham, Syracuse, N. Y.
116,089.—TENONING MACHINE.—G. W. Passel, Cincinnati, O.
116,090.—BORING BIT.—W. S. Pattin, Portsmouth, Ohio.
116,091.—NAIL MACHINE.—A.W. Paull, J. Morgan,Jr.,Wheeling, W.Va.
116,092.—HEMP MACHINE.—G. W. Pittmann, Brooklyn, N.Y.
116,093.—SUSPENDER.—T. O. Potter, J.W.Smith,Boston,Mass.
116,094.—METALLIC CARTRIDGE.—T.J.Powers,New York city.
116,095.—BOAT.—T. G. Pringle, New York city.
116,096.—HOISTING MACHINE.—H. J. Reedy, Cincinnati,Ohio.
116,097.—POLICE BATON.—H. C. Reichard, Pottsville, Pa.
116,098.—TUBE FASTENER.—G. H. Reynolds, New York city.
116,099.—SLIDE VALVE.—A. K. Rider, New York city.
116,100.—CULTIVATOR.—T. B. Roberts, Franklin, Ill.
116,101.—FEATHER RENOVATOR.—J. C. Rose and J. F. Silversmith, Albany, N.Y.
116,102.—SACCHARINE LIQUIDS.—G.L.Rundle, Greenville,N.Y.
116,103.—HOIST.—W. T. Sands, New York city.
116,104.—BOILER.—W. P. Skiffington, New York city.
116,105.—CARTRIDGE.—W. S. Smoot, Ilion, N. Y.
116,106.—FIREARM.—W. S. Smoot, Ilion, N. Y.
116,107.—BOTTLE CAPPER.—W. H. Sperling,Washington,N.J.
116,108.—BOBBIN.—John N. Stearns, New York city.
116,109.—GRAND PIANO.—G. Steck, New York city.
116,110.—ELECTRO-MAGNET.—A. J. Steele, Brooklyn, N. Y.
116,111.—WASHING MACHINE.—T. H. Stewart, Winona, Miss.
116,112.—FISH HATCHER.—L. Stone, Charlestown, N. H.
116,113.—SHUTTLE.—J. W. Strange, Bangor, Me.
116,114.—CAN FILLER.—L. C. Straub, Pittsburgh, Pa.
116,115.—SAD IRON.—J. E. Swift, New York city.
116,116.—MANURE SOWER.—N. G. Swift, Hart's Village,N.Y.
116,117.—GAME SIGNAL.—W. M. Tileston, New York city.
116,118.—FLUE SCRAPER.—H. Voelker, Newark, N. J.
116,119.—WAGON SEAT.—H. Wahlstedt, Princeton, Ill.
116,120.—HARVESTER.—J. N. and T. Wallis, Fleming, N. Y.
116,121.—CHIMNEY CLEANER.—L.Ward, Poughkeepsie, N.Y.
116,122.—GRAIN CLEANER.—John H. Weaver, Gap, Pa.
116,123.—ROUNDER FOR REINS.—D. Webber, Houlton, Me.
116,124.—BUCKLE.—D. Webber, Houlton, Me.
116,125.—COLORING WARPS.—N.D.White,Winchendon,Mass.
116,126.—BROOM.—W. E. Whitman, Augusta, Me.
116,127.—DUMPING CAR.—J.C.Wiswell, Lennoxville, Canada, and F. A. Wiswell, Beebe Plain, Vt.
116,128.—FLOOR COVERING.—D. L. Wolff, Chicago, Ill.
116,129.—FURNACE.—W. S. Wood, Newtown, N. Y.
116,130.—LAND PROPELLER.—Jacob Woolf, Burr Oak, Mich.
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116,138.—PUMP BUCKET.—W. C. Barker, Ypsilanti, Mich.
116,139.—SLATE FRAME.—Wm. N. Bartholomew, Newtown Center, Mass.
116,140.—BROOM HOLDER.—C. T. Beardsley, Hamden, Conn.
116,141.—MOLDING MACHINE.—B. S. Benson, Baltimore, Md.
116,142.—PURIFYING ACID.—C. F. Binder, Philadelphia, Pa.
116,143.—WATER BACK.—A. J. Blanchard, Boston, Mass.
116,144.—COTTON PRESS.—J. P. Bolin, Orangeburg Co., S. C.
116,145.—FUR BOX.—H. Braunhold, New York city.
116,146.—FIREPLACE.—P. Brecher, Louisville, Ky.
116,147.—CULTIVATOR.—T. E. C. Brinley, Louisville, Ky.
116,148.—WHEEL.—M. R. Brown, Mingo, Ohio.
116,149.—WATER WHEEL.—R. Buchanan, Winslow, Ill.
116,150.—SASH HOLDER.—C. M. Burns, Jr., Philadelphia, Pa.
116,151.—FIRE ENGINE.—L. and T. E. Button,Waterford,N.Y.
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116,153.—HAY RACK.—M. Carpenter, Wayland, Mich.
116,154.—CAR SEAT.—D. H. Chamberlain, W. Roxbury,Mass.
116,155.—TAP.—D. H. Chamberlain, W. Roxbury, Mass.
116,156.—ELEVATOR.—D. H. Chamberlain, W. Roxbury,Mass.
116,157.—UMBRELLA HOLDER.—G. F. Child, Dayton, Ohio.
116,158.—HEATING BLANKS.—J. B. Clark, Plantsville, Conn.
116,159.—POOL BOARD.—H. W. Collender, New York city.
116,160.—RUNNING GEAR.—J. L. Corbus, Quincy, Mich.
116,161.—ROLLER SKATE.—A. T. Covell, San Leandro, Cal.
116,162.—SASH HOLDER.—J. M. Cowles, Burlington, Iowa.
116,163.—PLOTTER.—J. E. Crupper, Berlin, Iowa.
116,164.—TABLE.—J. Daly, Troy, N. Y.
116,165.—FEEDING FURNACE.—G. F. Deacon, Liverpool, Eng.
116,166.—MEAT CRUSHER.—O. P. Dennison, Mulberry, Ohio.
116,167.—STEAM GENERATOR.—E. P. Doyen, Portland, Me.
116,168.—HOLDING BOBBINS.—G. Draper, Hopedale, Mass.
116,169.—BRAKE.—C. B. Eaton, Grafton, Ill.
116,170.—FLOOD GATE.—J. W. Edgerton, Thorntown, Ind.
116,171.—DREDGING SCOOP.—A. C. Ellithorpe, Chicago, Ill.
116,172.—MIXING MACHINE.—A. C. Ellithorpe, Chicago, Ill.
116,173.—PASTING MACHINE.M. Fitzgibbons, New York city.
116,174.—MOP HEAD.—B. French, Rochester, N. Y.
116,175.—TELEGRAPH.—R. H. Gallaher, New York city.
116,176.—GAS REGULATOR.—H. Gerner, New York city.
116,177.—LANTERN.—O. L. Gridley, Carl Engelskerchen, Buffalo, N. Y.
116,178.—DOVETAILING.—C. S. Griffin, J. W. Wilkins, Chelsea, Me.
116,179.—BLOW-OFF PIPE.—J. S. Griffith, St. Louis, Mo.
116,180.—ENVELOPE.—J. W. Groomes, Portsmouth, Ohio.
116,181.—SAW MILL.—S. W. Harris, Jamestown, N. Y.
116,182.—PIANOFORTE.—A. H. Hastings, Jersey City, N. J.
116,183.—HOG STOCK.—W. O. Hays, J. D.Scott,Sharonville,O.
116,184.—BRUSH.—P. Henrichs, Erie, Pa.
116,185.—BRUSH, ETC.—P. Henrichs, Erie, Pa.
116,186.—TORSION SPRING.—B. Hershey, Erie, Pa.
116,187.—TORSION SPRING. B. Hershey, R. F. Gaggin,Erie,Pa.
116,188.—LAWN MOWER.—A. M. Hills, Hockanum, Conn.
116,189.—SHARPENING SAWS.—R. Hines, L. Beyer, Washington, D. C.
116,190.—SHARPENING SAWS.—R. Hines, L. Beyer, Washington, D. C.
116,191.—SLEIGH.—C. H. Hudson, New York city.
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116,205.—VELOCIPEDE.—M. Martin, New York city.
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116,207.—COAL SIFTER.—A. D. McMaster, Rochester, N. Y.
116,208.—SCROLL SAW.—A. W. Mitchell, Detroit, Mich.
116,209.—WASHING MACHINE.—M. K. Morris, Louisville,Ky.
116,210.—PIPE CUTTER.—E. S. Moulton, Chelsea, Mass.
116,211.—DYEING FURS.—A. Muller, San Francisco, Cal.
116,212.—TACKLE HOOK.—W. Newcomb, Baltimore, Md.
116,213.—HORN.—W. F. Niles, S. G. Pitts, Leominster, Mass.
116,214.—DOOR LOCK.—T. A. Olson, Beloit, Wis.
116,215.—HAIR COMPOUND.—E.L. Parsons,Grand Ledge,Mich.
116,216.—CLIPPING SHEARS.—G. H. Pratt, Boston, Mass.
116,217.—PAVEMENT.—S. C. Prescott, Jersey City, N. J.
116,218.—METALLIC RODS.—T. T. Prosser, Chicago, Ill.
116,219.—SHOE PEG.—T. T. Prosser, Chicago, Ill.
116,220.—BENCH HOOK.—H M. Putnam, Fitchburg, Mass.
116,221.—POWER.—J. Richmond, Lockport, N. Y.
116,222.—SPECTACLE FRAME.—M. Reisley, Springfield, Mass.
116,223.—STATION INDICATOR.—A. C. Rodgers, Suffield, Conn.
116,224.—LAMP.—E. Russell, F. W. Platt, Waterbury,Conn.
116,225.—FIREARM.—G. W. Schofield, United States Army.
116,226.—SPITTOON TONGS.—A. H. Seipt, Philadelphia, Pa.
116,227.—SAFE.—W. H. Short, Montreal, Canada.
116,228.—PULLEY.—E. G. Shortt, Carthage. N. Y.
116,229.—GRAIN SEPARATOR.—M. Shreiner, Carlisle, Pa.
116,230.—UNLOADING HAY.—G. Smith, New York city.
116,231.—HAY ELEVATOR.—G. Smith, Rochester, N. Y.
116,232.—JACK.—J. U. Smith, Orion, Mich.
116,233.—STOVEPIPE SHELF.—M. Smith, Clinton, Mich.
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116,250.—BED BOTTOM.—E. L. Wright, Sterling, Ill.
116,251.—LOOM PICKER.—J. C. Fisher, Providence, R. I.

REISSUES.

4,427.—CORSET.—C. A. Griswold, Willimantic, Conn. — Patent No. 56,219, dated July 10, 1856.
4,428.—STOVE.—L. Hermance, Lansingburg, N. Y.—Patent No. 99,436, dated February 1, 1870.
4,429.—FEEDER.—R. M. Hoe, New York city.—Patent No. 25,199, dated August 23, 1859.
4,430.—SEPARATING ORES.—S. R. Krom, New York city.—Patent No. 81,794, dated September 1, 1868; antedated August 5, 1865; reissue No. 3,182, dated November 3, 1868.
4,431.—FERRULE.—H. O. Lothrop, Milford, Mass.—Patent No. 93,918, dated October 19, 1869.
4,432.—BEDSTEAD.—A. M. Rodefer, Hamilton county, Ohio.—Patent No. 12,693, dated April 10, 1855; extended seven years.
4,433.—SPARK ARRESTER.—E. Waud, Eugene City, Oregon. Patent No. 99,378, dated February 1, 1870.
4,434.—IRON AND STEEL.—R. Yeilding, Detroit, Mich.—Patent No. 83,119, dated October 13, 1868.
4,435.—LAMP BURNER.—W. H. Gray, St. Louis, Mo.—Patent No. 113,876, dated April 18, 1871.

DESIGNS.

5,007.—COFFIN.—W. G. Algeo, Rochester, Pa.
5,008 to 5,016.—CARPET.—R. R. Campbell, Lowell, Mass.
5,017.—PIPE WRENCH.—Thomas K. Cook, New York city.
5,018 to 5,021.—CARPET.—A. Cowell, Kidderminster, Eng.
5,022 and 5,023.—INCASED CAN.—J. G. Evenden, Chicago, Ill.
5,024 and 5,025.—FOUNTAIN.—J. W. Fiske, New York city.
5,026.—STEAM PUMP.—W. W. Hanscom, San Francisco, Cal.
5,027.—DISPLAY CARD.—S. Houghton, Worcester, Mass.
5,028.—GRATE HEARTH.—J. G. Ils, San Francisco, Cal.
5,029.—CARPET PATTERN.—J. C. Johnson, New York city.
5,030.—CAKE PAN.—G. W. Ketcham, New York city.
5,031.—WATER COOLER.—John Liming, Philadelphia, Pa.
5,032 to 5,035.—CARPET.—J. Magee, New York city.
5,036.—CARD SUSPENSION CLIP.—G. W. McGill, New York.
5,037.—CARPET.—E. J. Ney, Dracut, Mass.
5,038.—CARPET.—T. Pennell, Melrose, N. Y.
5,039.—TWINE REEL.—C. H. Tiebout, New York city.
5,040.—CARPET.—L. A. Upson, Enfield, Conn.

TRADE-MARKS.

327.—LINEN GOODS.—J. Bullocke, New York city.
328.—STOVE.—G. F. Filley, St. Louis, Mo.
329 to 331.—CLOTHIERS' TRIMMINGS.—Harris, Richmond & Shafer, New York city.
332.—INSECT POWDER.—J. M. Hughes, Brooklyn, N. Y.
333.—MEDICINE.—Lee & Brother, Ridgewood, N. Y.
334.—GOVERNOR.—J.A.Lynch,E.B.Buckingham,Boston,Mass.
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344.—BRUSHES.—J. Sherriff, Dedham, Mass.
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347.—CEMENT.—Hydraulic Cement Company, Akron, N. Y
348.—SIRUP.—W. Moller & Sons, New York city.
349.—SUGAR.—W. Moller & Sons, New York city.
350.—TOBACCO.—A. Pearl, New York city.

EXTENSIONS.

CARRIAGE WHEEL.—J. D. Sarven, New Haven, Conn.—Letters Patent No. 17,520, dated June 9, 1857; reissue No. 3,079, dated August 11, 1868; reissue No. 4,116, dated September 6, 1870.
MACHINE FOR MAKING HORSESHOES.—J. A. and I. T. Burden of Troy, N. Y.—Letters Patent No. 17,665, dated June 30, 1857; reissue No. 1,998, dated June 13, 1865.

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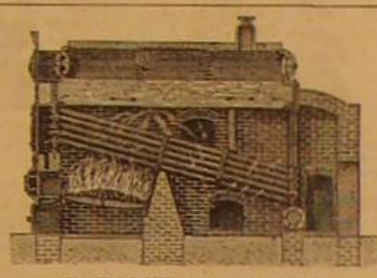
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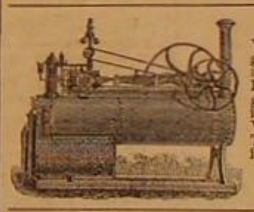
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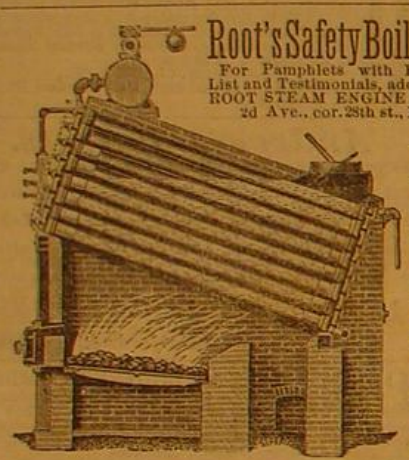
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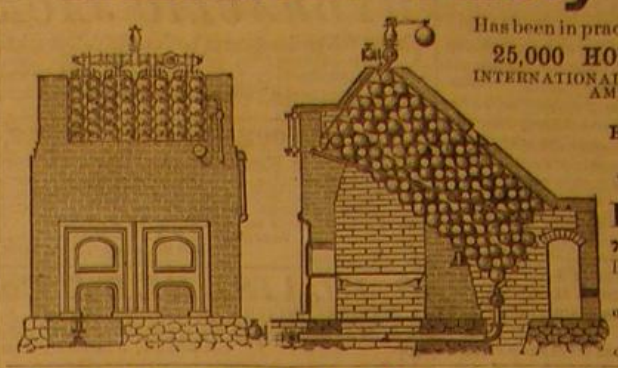
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The name is written not only in telegraphic characters upon sundry slips of paper, but in letters of light upon the scroll of fame,

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That are not born to die."

Truly the whole nation has a right to rejoice at the appropriate memorial erected to this great man, and to share in the delight of this memorable occasion. For upon the whole nation is reflected the glory of his invention, the effect of which upon the welfare of the human race is absolutely beyond estimate.

And though we would not rob others who prepared the way before him, of their meed of glory, we hesitate not to avow that the honors paid to Professor Morse have been well earned and justly paid, and that they alike reflect credit upon the telegraphic fraternity by whom they were originated, and upon their esteemed recipient who so gracefully accepted the ovation.

In response to the greeting of Professor Morse, numerous telegrams were received. Among these were messages from the Chambers of Commerce at Hong Kong, Bombay, and Singapore. A poetical one from Chicago we append:

"A thousand flashing wires tonight
Meet in one circuit—grand, complete—
And o'er them, with the lightning's pen
We write our father Morse to greet.

"But we, dear chief, a circuit form
Which far excels th' electrician's art.
Affection's battery warms the line,
Each "cup" a telegrapher's heart.

"Repeating stations there are none;
Unbroken flows the electric stream
That bears you this eventful night
Our love, our reverence, our esteem."



THE APPLICATION OF STEAM TO CANALS.---NO. 4.

BY GEORGE EDWARD HARDING, ESQ., C.E.

This paper would be incomplete without mention of the experiments of Fairbairn, in 1830 and 1831, as instanced in his "Remarks on Canal Navigation, illustrating the advantages of steam, as a moving power, on canals." The preliminary experiments of light single and double gig boats on the Forth and Clyde canal, moved at a high rate of speed, and variously loaded, as well as the partial success of the steamer *Cyclo s*, built under the direction of Mr. Grahame, of Glasgow, with a single stern paddle-wheel, induced Mr. Fairbairn to suggest the construction of a small steamer named the *Lord Dundas*, 68 feet in length by 11 feet 6 inches in depth, provided with a wheel thorough 3 feet 10 inches wide, and a paddle 9 feet in diameter, driven by a ten horse power steam engine; but he also recommends, as an after improvement, a steamer with two narrow paddles, close to the stern, one on each side of the rudder, urging that this plan would remove every impediment to the free access of water to the paddles, and allow an open outlet for the discharge, the paddles to be protected by fenders, sliding down on the outside of the wheels.

Mr. Fairbairn figures the cost of conveyance of a passenger by steamer, between Edinburgh and Glasgow, fifty-six miles, at two pence, or less than a fifteenth of the least possible expense by horses. Though the results given by these boats were not, in practice, so satisfactory as expected, yet Mr. Fairbairn never despaired of a future when steam should be as universal in inland navigation as it at present is in all other of the arts.

Following up the interest which about this period seems to have been excited on canal behalf, we have an influx of applications of machinery to inland water propulsion, many of which are but modified forms of the less elaborate devices we have already mentioned, in which the paramount idea of their authors would seem to be that of advancing the boat without creating a wash damaging to the canal banks, and with arrangements for discharging the water directly aft, or directly down, while some have curved platforms, or "wave quellers," to moderate the swell produced by the propeling machinery.

For actuating vessels on canals, one Henry Pinkus submits a railway constructed alongside, with one rail, on which a suitable carriage traverses. A tube conveys gas along the rail from a stationary engine and reservoir. The gas is brought through a longitudinal valve on the rail tube to a flexible tube from the carriage to a reservoir on board the vessel, and from the pressure here derived machinery is set in motion, which again, by an endless band, turns two horizontal wheels (one on each side of the rail) on shore, and supported on the carriage before mentioned. Finally, these wheels, by revolving, draw the carriage forward, and the carriage, in its turn, tows the vessel. We can imagine that this plan would never depend upon its simplicity for success.

The same inventor offers the plan of a steam engine on a vessel, driving a horizontal wheel, which, by an endless band, turns on shore a pair of horizontal wheels, similar to those described, and these, by revolving, tow along the vessel. The carriage holding these wheels has a curved guard arched over it, formed like the rail on which the carriage runs. This is to enable another carriage meeting it to pass over the first, thus providing for the use of the same rail by boats traveling in opposite directions. In place of the steam engine, the machinery on board may be turned by an electromagnetic engine, actuated by electric currents from on shore. Whether this "leap-frog" arrangement for passing boats could be extended to skipping playfully over the locks is not stated.

A claim, in 1841, proposes a locomotive steam engine on the towing path, to drag itself along a chain fixed at one end, and the boat by a towing line to the engine; while another alternately expands and contracts an elastic sack in a water channel along the bottom of the vessel, by the smoke from a furnace, and thus ejects sufficient water to propel the boat. Later on, there are variations of this. Still another drives an upright shaft in a vessel, which carries a horizontal grooved wheel, on which is an endless rope, moving a drum on a carriage on shore, by which its wheels are turned, so as to advance the carriage, which tows the craft along. The carriage is guided by a wheel in front, directed by a man. Steam is made to issue from a pipe against the air in one, and cogwheels, working into a rack rail on the banks, in another, while a third places an exhausted atmospheric tube at the bottom of the canal, and moves the boat above by a traveling piston. A fourth inventor makes his tubes of wood, and places them upon the banks, or on piles driven along the canal. In fact, "about this time," as the almanacs say, the numbers that considered themselves each the sole possessor of the idea of working canals by atmospheric pressure is amusing.

In 1847, we have flexible tubes placed under water on each side of a boat. They are alternately filled with steam and allowed to collapse. The boat is supposed to advance by the action on the water of the protuberant parts of each tube. There is certainly no needless complication of details about this. In this year we find proposed the towing of canal boats by compressed air contained in portable reservoirs, and an arrangement added to heat the air, in order to restore the caloric lost by its expansion.

The next year, a patent is granted for a tube laid along a canal, and water forced through it under pressure enters nozzle pipes fixed at certain intervals along the tube. Connected to the boat to be propeled is a receiver, with a series of open cells, and as these pass under the end of a nozzle pipe, a valve is opened, which allows the water to impinge on the cells successively, and thus force on the boat and receiver, until they set the next nozzle pipe in action, and close the valve of that which is passed. Still, notwithstanding the ingenuity of this scheme, one would desire much solicitation to invest in its success. Next, we have a shaft extending the entire length of the vessel, with propellers on its projections, working one at the bow and one at the stern. The advantages of this novel feature are not mentioned.

The last of 1851, a patent for fastening iron rails upon walings, supported on piles, and extending the entire length of the canal, on both sides, was issued. Wheels on each side of the boat, and driven by a steam engine, are rotated on these rails, and pull the boat. Instead of locks, the boat moves up inclined planes, gear wheels engaging in racks on the walings, while rollers at the bottom support part of the weight. Unless compensated for all variations of water level, we might expect to find occasional lines "high and dry."

In 1856, a provisional is filed for propelling boats by discharging a stream of fire from an inflammable composition in a tube into the water at the stern; but, from want of faith, or of means, the scheme was abandoned. At a later date, John Bourne patents an arrangement of propellers at the bow, or paddle wheels at the side, to work on the bottom in shallow water, "and thus clear it away," and propel the vessel.

With their usual ingenuity and perseverance, American inventors have explored this branch of engineering practice; but, like their trans-Atlantic brethren, have taken the question of more propulsion as the desired end, attaching thereto some device to still the agitation of the water; and very similar schemes in this field to those already touched upon, have been the result of their labors. The question is not that of a motive power alone, but simple application of the motor that will prevent waves at the bow, suction and settling at the stern, and afford a mean speed of from three to four miles per hour, when fully loaded, with a minimum quantity of fuel. The propeling machinery must be simple and compact, that it may be managed by men not especially educated for the purpose, and to economize both space and expense. These are the requisites, and a boat fulfilling the conditions will be sure of success.

Some twenty-five years ago, Captain Ericsson launched a boat with a screw propeller at each side of the bow, for the Champlain canal. There was no difficulty in the propeling force, but it did not carry sufficient cargo to be profitable. Henry R. Worthington, five years later, ran a steam canal boat from New York to Oswego, during one season. This vessel had a skew paddle wheel on each side of the bow, and a fighting crew, to overcome any prejudices which the opposition boatmen should venture to express. Notwithstanding the extreme force of the arguments employed, the enterprise was abandoned with the season, there not being sufficient capacity for a paying freight.

A boat was fitted with feathering side paddles, some sixteen years ago, by John Baird, for the purpose of towing barges on the Erie canal; but, not carrying cargo itself, and depending on the tunnage fees from the old boats, failed to be a pecuniary success.

In 1860, there was a line of sharp propellers built in Buffalo, N.Y., which, with an expenditure of from three to four tuns of coal per day, averaged six and seven miles per hour. The annoyances caused by the opposition of the horse boats, and the heavy expenses of fuel and engineers, caused their removal to a lake route. Wire rope traction and submerged chains have been frequently tried as well, and found wanting, the canal locks and numerous bends having so far proved insurmountable obstacles.

As late as last year, the duck foot, or expanding propeller, so many times tried in England, was attempted in Albany, N.Y., by Mr. Cornelius T. Smith, and also at Cumberland, Ind., by Mr. Marshall, without satisfactory results; while a Cincinnati doctor, abandoning his pills, conceived that he had hit upon the correct thing by the similar device of a reciprocating hinged shutter. The result made more noise and waves for the canal than greenbacks for his pocket, and our worthy disciple of Esculapius returned to his surgery.

At Lockport, N. Y., a wheel with spokes on the surface, made so as to rise and fall in a recess in the boat, and rolling along the bottom of the canal, was lately tried. It was driven by a chain, and so propelled the vessel. No provision for deep water or soft mud being made, the enterprise came to grief. A scheme now being tried consists of a canal tugboat provided with an endless band or chain on each side of the boat, carrying paddles, which, dipping in the water to propel the vessel, return through the air in a manner akin to similar plans which have been tried here and abandoned. There has been a large sum of money expended, and a frightful noise is produced, still, otherwise it is not considered a success.

PROFESSOR TYNDALL ON "SOUND."

In his fourth lecture on "Sound," at the Royal Institution, London, Professor Tyndall began by calling attention to the experiments of Saveur, in which musical vibrations were communicated from one body to another, when both bodies had the power of emitting the same note. The lecturer exhibited two wires of the same length and thickness, stretched to the same tension by means of screws, so that the two wires when made to vibrate by means of a violin bow, emitted the same note. He then placed a V-shaped rider of cardboard astride one of the wires, and on causing the other wire to emit a musical note, the second wire took up the vibrations and unhorsed the rider. He recommended the listeners to make similar experiments for themselves, and said that if they would sing into a piano, they would find that the wire which emitted the particular note sang by the voice, would be thrown into a state of vibration, and if a little rider were placed upon the wire, it would be violently agitated.

He next exhibited Savart's experiment, wherein a musical sound is produced by means of a descending jet of water issuing from a circular orifice in a brass plate fixed at the end of a glass tube; the sound vibrations consist of the intermittent flow of the water through the orifice. He pointed out that a jet of water issuing through a small orifice, forms a vein for a short distance from the place of exit, and then breaks into drops, caused by the rhythmic action of the water through the orifice. In his next experiment Professor Tyndall permitted a vein of water to fall vertically from an orifice; then he darkened the theatre, and illuminated the vein by means of a thin beam of light sent down through it from the electric lamp. The vein of water then looked like a luminous spear, about twelve inches long, and below this the water broke into drops, and speedily lost its luminosity. These drops could be made visible by illuminating the falling jet of water from without, by means of a series of electric flashes. The lecturer sounded a syren, and when the musical note reached a sufficiently high pitch, the luminous vein of water began to respond to the sound, and the spear shortened itself to four or five inches, resuming its original length when the sound ceased. Musical beats, produced by means of two organ pipes, caused the luminous spear to lengthen and shorten itself. The lecturer then passed from a vertical to a horizontal jet of water, and made the latter plainly visible by illuminating it with the electric light, so that i s shadow was thrown upon a white screen. At a certain distance from the orifice the stream of water broke into drops as before; the syren was then sounded, and when it reached the proper pitch the drops were drawn together, and the jet of water appeared as an unbroken cylinder of liquid from end to end.

Professor Tyndall next exhibited the action of sound upon jets of air, and mentioned the exceeding delicacy required in the manipulations, in consequence of the extreme sensibility of air jets. He was obliged to protect the jet from air currents by surrounding it with a tall glass jar, and he supported the apparatus on layers of flannel to protect it from vibratory motions connected with the building, as a passing cab would otherwise have caused much disturbance. He then, by means of pressure, urged some air, from a bag, through two bottles, one of which contained ammonia, and the other hydrochloric acid; a white smoke, consisting of chloride of ammonium was thus formed, and the jet of air was made visible to the whole audience, in consequence of its being charged with smoke. The jet of smoke laden air thus formed issued into the glass jar in a long, slender stream. An organ was then sounded, and the jet shortened itself at once from about fourteen to about four inches, and at the same became curiously forked, and did not lose this form all the time the sound continued, but resumed its original shape when the sound ceased. This jet responded at once to a slight tap upon the floor.

Next, the lecturer exhibited the action of sound upon naked gas flame. This action of sound upon flame was first noticed by Professor Lecomte, and was brought to its present state of experimental perfection in the laboratory of the Royal Institution. In the first experiment the lecturer caused a straight bushy flame to spread out, by whistling to it with his mouth, and pointed out that a smaller flame of the same kind would do the same thing, but required a higher note. A fish tail flame was also shown to be sensitive to sound, but required a higher note, and greater pressure of gas; in fact, in all these experiments the pressure of the gas must be very carefully regulated, and so adjusted that each flame is very nearly, but not quite, on the point of flaring instead of burning steadily. The most sensitive burner yet obtained by Professor Tyndall is one made of stealite; it requires a very heavy pressure of gas to bring the flame to the sensitive point, and it then gives a flame two feet long. The orifice is circular, and the jet a vertical one. A slight hiss from any part of the theatre of the Institution, made this flame shorten itself to seven inches, and the jingling noise made by shaking a bunch of keys threw the flame into wild commotion. A small bell sounded thirty feet off, in the gallery of the theater, knocked down the flame by the noise of every stroke, and a chirrup always brought it to its lowest point. Speaking irritated it especially words containing many S's, for it was especially sensitive to hissing sounds. The rustling of paper, the rubbing of hands, or the brushing of clothes, all made it shorter.

Notes of high pitch acted most powerfully on the flame. When a tuning fork was gently sounded, so as to give its fundamental note, no effect was produced; but when the fork was violently rubbed with the fiddle bow, so that it gave off overtones, the flame shortened itself, and began to flare. This tuning fork was one with a fundamental note of rather a high pitch. Finally, a musical box, playing an air from the opera of "Faust," was set to work; the high notes caused the flame to fall, while those of low pitch had no influence of the same kind.

The lecture was concluded with a few experiments on resonance, and the introduction of organ pipes. The lecturer observed that when a tuning fork was held over the open mouth of a glass cylinder containing air, when the column of air was of the right length to vibrate in unison with the fork it did so, and then, as the column of air and the fork both sang or vibrated together, a great increase in the volume of the sound produced was the result. When the column of air was made too long or too short for any particular fork, by pouring a certain quantity of water into the cylinder, or taking a certain quantity out, the sound was considerably enfeebled. In one of his experiments Professor Tyndall lengthened and shortened the column of air by admitting

hydrogen gas into an inverted cylinder, and then showed some experiments with it by means of a tuning fork. He also showed that with different forks, columns of air of different lengths are required to produce perfect resonance. In further illustration of this principle, he selected three organ pipes, and by sounding tuning forks and placing them over the mouths of the pipes, he showed that the columns of air in the pipes resounded to three particular tuning forks, each column singing to its own fork and no other. Afterwards, on causing the organ pipes to sound, they were found to emit the same musical notes as the three forks, each pipe being in harmony with its own fork, and no other. The music of an organ pipe is caused by the vibration of the column of air in its interior, and this column of air is thrown into musical motion by means of a vibrating tongue set in motion by the bellows.

(From the Albany Argus.)

FOWLER'S PROPELLER.

Our citizens have been much interested during the past two or three days in the performances of a steam yacth which came here from Bridgeport, Conn. The boat has been playing about the harbor, turning round as if upon a pivot, and moving backwards or forwards with equal facility without the aid of a rudder. Recently the vessel was visited by Canal Commissioner Wright, Canal Commissioner Chapman, Deputy State Engineer Sweet, Mayor Thacher, Captain Sanford C. Van Benthuysen, and other prominent parties, all of whom expressed themselves very much pleased with the movements of the craft. The party having the boat in charge is composed of Ex-Governor Joseph R. Hawley, of Hartford, Colonel William H. Mallory, Charles R. Bement, and Jacob Kiefer, of Bridgeport. These gentlemen are of the opinion that the new principle involved in the construction of the wheel by which the boat is propelled can be successfully applied to canal navigation.

In accordance with this view, an excursion was made by way of the canal from this city to Troy. Among the invited guests were Canal Commissioner Chapman, Assistant Commissioner George L. Ames, Deputy State Engineer Sweet, Oscar L. Hascy, S. B. Towner, S. P. Corlies, C. E. Davis, B. W. Wooster, John C. Ward, G. Hunter, Robert Walker, E. Brainard, S. S. Carslake, Warren F. Leland, and several others interested in the commerce of the city. The boat is handled so readily, that there was no difficulty in approaching the locks, or passing other craft in the channel. In a clear course, she made five miles per hour without producing a swell along the banks to exceed six inches. Arriving at Troy, David M. Greene, an engineer of great experience in connection with steam navigation, was invited to examine the vessel. All the tests made were of the most satisfactory character, and it was agreed upon all hands that the experiment was a success in itself, independent of its application to canal navigation.

The invention is known as the "Fowler wheel." The ingenious inventor is Mr. Frank G. Fowler, formerly of Illinois, now of Bridgeport, Conn. Originally his device was intended for use as a windmill, and it was found to save a good percentage over any previous contrivance. It occurred to Mr. Fowler that if he profited in obtaining power from the wind, he might profitably send force through the wheel into the water. He had the fortune, less common now than of old, to be unable for a long time to find appreciative listeners and co-operators. He made one or two experiments upon canal boats, but his wheel was then in a comparatively crude condition. In Connecticut he met Colonel William H. Mallory, of Bridgeport, a gentleman who had been a successful inventor himself. The Colonel and Mr. Fowler have been working together for two or three years. The wheel has been materially improved and fully secured by patents in this country and abroad.

A yacht called the "Pioneer" (the one now in Albany) was built two years ago expressly for this purpose. She is seventy feet long, fourteen feet wide, and schooner rigged. Without her masts and unloaded, she draws four feet. It is not pretended that she is built for speed, for it was intended, if the new wheel did not prove valuable, to convert her into an ordinary tug, with an Ericsson screw. The boiler is an ordinary tubular horizontal, with return flues. The engine has one cylinder only, fourteen inches square; that is, the cylinder is fourteen inches in diameter, and the piston has a stroke of fourteen inches. An experimental condenser now in the boat has temporarily reduced the power of the boiler, and it is difficult to raise more than thirty or forty pounds of steam; and with only one fourteen inch square cylinder, no great speed can be obtained from any wheel whatever. But when the boiler carried seventy or eighty pounds, the boat made at the rate of eleven miles an hour on a mile measured by the Coast Survey, which will do very well for a boat of seventy feet.

Let us attempt to convey an idea of the invention, if it can be done without a drawing. The stern of the boat is cut away underneath about as much as for the ordinary screw. The latter has a screw nearly horizontal. The shaft of the Fowler wheel is perpendicular in the stern, and the wheel works on a horizontal plane. This one has three arms, each with its adjustable blade. Experiments were made with four and two, but three were found to be the most economical. The wheel is four and a half feet in diameter. The extremity of each arm is inserted, by a movable joint, in the center of a thin strong steel blade standing perpendicularly. The blades are twenty-eight inches in depth, twelve inches at the top and ten at the bottom, and slightly rounded at the counters. The blades stand with their sides toward the center shaft. Above the arms there is an eccentric on the shaft, which is held fast as the wheel revolves. From the ring or strap around the eccentric, strong rods extend to the outer edges of the blades. Now as the shaft revolves, the blades, as they pass around the circle, change their set, so to speak; that is, the edge of a blade to which the eccentric rod is attached moves from and toward the shaft. As a blade moves forward, it acts upon the water much as a man's hand does when he is swimming. It may be said to hook or pull upon the water, and pull the boat forward. As the blade goes to the rear, its angle upon the arm or radius is changed, and in passing around the rear of the shaft, the blade drives the water to the rear, pushing the boat forward. In the revolution there are two points at which the blade is parallel with the keel and exerts no power.

We have described the boat as moving straight forward upon the line of her keel. The eccentric is governed by a wheel on deck, just like the ordinary steering wheel. If it be desired to change the course of the vessel, the eccentric is shifted. This shifts the set of the blades, and the line of force exerted is put at any desired angle with the keel. In an instant, with a whirl of the wheel, the power is exerted at right angles with the keel, and the boat whirls around. Or without a word or signal to the engineer, the power is completely reversed and the wheel is pulling straight astern. In a few seconds the boat is going astern.

There is no reversing gear on the engine.

The power can be exerted in any direction, that is, at any angle with the keel, with an easy turn of the wheel, which two fingers can govern.

There is no rudder on the boat; the steering is done by shifting the direction of the power.

The Ericsson screw works in a plane vertical to and at right angles with the keel. The Fowler wheel works in a horizontal plane. The latter can adjust the breadth and depth of its blades so as to exert the same power with half the draft. It can place the blades below the ice, and at the same time farther from the bottom than the screw works.

The proprietors claim greater economy in construction, unequaled facility of turning, less draft than the Ericsson with the same power, and equal if not greater speed.

They are making several applications of the wheel, and they are very hopeful that they have the invention which is to settle the future of the Erie canal. The simplicity of the engine, quickness of turning, and light draft, with great power, are adapted to this end.

In Buffalo, at the shipyard of David Bell, two revenue cutters are building, for the revenue service. They are of 350 tons burden and of the same model, as nearly as possible. One is to have the Ericsson screw, and the other the Fowler wheel. They will be completed before the first of August, and they are to be taken down the St. Lawrence and delivered in New York. The test will be exceedingly interesting.

The Fowler steering propeller company have two tugs building at Philadelphia, 73 by 16, with each an 18 in. square cylinder. Also a small vessel in Maine designed for seine fishing for menhaden or "bony fish." The navy department has in preparation plans for two monitors of peculiar construction, with this wheel, which has, for fighting, wonderful advantages over any other. The company has also built a steel launch, 33 by 8, on the precise model of the largest launch of the navy, and, they claim, to have made with it speed greater than that of any steam launch in this or any other navy.

Animal Mechanics.

Rev. Samuel Houghton, M. D., Dublin, D. C. L., Oxon, F. R. S., recently gave the first of three lectures at the Royal Institution, on "The Principle of Least Action in Nature, illustrated by Animal Mechanics."

Dr. Houghton said that he would give a few examples to show what he meant by "The Principle of Least Action in Nature." If we suppose the earth to be a lazy, intelligent, living animal, swimming round the sun, we only require to know three points to mathematically calculate its whole orbit, on the assumption that it is a living animal swimming round the sun in such a way as to get through its journey with the least trouble to itself. On the same principle, his hypothesis was that in every arrangment of joints, muscles, bones, and parts, the arrangement must be such that the muscle will occupy exactly the position it would take if it were a living intelligent animal, which had sought the place where it could do its work with the least trouble to itself. By means of the hypothosis it is possible to calculate the position of the bones, sockets, and muscles, and it is one which he believed would prove to be a valuable key to unlock the secrets of animal mechanics.

He would give another illustration. One day he watched some oyster women in the Mumbles harbor, near Swansea. They filled their baskets with oysters, and then the ground they had to traverse consisted of two parts. The first part consisted of slippery shingle, and the second of plain common.

What surprised him was that they did not walk straight to the common as he would have done, but went off in a slanting direction, and made a "tack." After seeing this he measured the angles made by their path, and by the one he would have taken; then he mathematically determined the relative roughness of the two roads, and found they had chosen the best they could possibly take to save unnecessary waste of power. He did not suppose they had any more consciousness that they were doing so than a planet or a ray of light; they were not, however, lazy animals, but good industrious women, doing the maximum of work with the minimum of effort, their path being determined by Him who made them.

As another illustration he would call attention to the hexagonal cells made by the bee, whereby the largest quantity of cell space is made with the minimum amount of wax.

Nature, or the intelligence which underlies nature, has to produce a certain amount of muscle to do a certain amount of work, so it is obviously to the interest of the creatures, formed by nature, to do their work with the least possible quantity of muscle.

Before it is possible to advance one step in the scientific investigation of animal mechanics, it is necessary to ascertain the coefficient of muscular force. In the case of a rope, its coefficient would be the number of pounds weight necessary to break it across. Suppose a rope, 1in. square in cross section, made of muscular fibre, were hanging from the roof of the theater of the Institution, what weight would it lift from the ground by its contraction? That weight would be its coefficient. It cost him twelve years of hard work to determine this point, and to obtain the following figures for human muscle:

Arm	94·7	pounds to the square inch.
Leg	110·4	" " "
Abdomen	107·0	" " "
	104·03	pounds, the real coefficient of muscular force.

Until the foregoing coefficient was obtained he could take no steps in the application of geometry to anatomy. He was obliged to make his experiments with human beings only, because none of the hairy animals with long tails had intelligence enough to aid him by doing what he required of them. As regards men, he had to measure the power of their muscles during life and the size of their muscles after death. In walking across the room a vast number of muscles are brought into play, so the difficulty is to ascertain the power of each particular muscle; and from such movements the inquirer cannot work back to know the force per unit of cross section of each muscle.

By work in hospitals, where some of the patients suffered from diseases in which muscular contractions were a leading feature, he gained some of his data, and in other directions he sought for more. He learned how to work the treadmill so as to get through the task with the least trouble to himself, and he could now do it in a lazy manner as well as the cleverest burglar in London. He also knew the easiest part of the wheel to work at. The key by which he first obtained a clue to these secrets was an ounce of tobacco, which key he found competent to unlock the heart of the surliest of burglars.

He not only had to determine the power of the muscles of young healthy men during life, but to measure their dimensions after death. Many of his examinations after death were necessarily made upon elderly persons, wasted by long sickness, and this tended to give false results. Therefore he, to get accurate results, had to watch for chances of examining subjects who died suddenly by violent deaths, or who were executed by the hands of the law, but in Ireland he found many impediments to this line of action. In the case of violent deaths by accident, the cause of death was usually so obvious that the coroner could not order an examination of the remains, and the friends of the deceased were usually so anxious to "wake" him that they would not permit scientific dissection of the body. Then as to those who suffered by the hands of the law, in Ireland murders of a social or private nature incurring the penalty of death are almost unknown, and men are usually only executed for agrarian crimes; in such cases the criminal has with him the sympathy of such large masses of people that it would be very dangerous for a scientific man to dissect the body of any patriot who had shot his landlord. While beset with these difficulties a clever but rather wild scheme entered his head, of taking a farm in Westmeath, refusing to pay his rent, shooting his landlord, and then dissecting the body at his leisure. But he saw that certain inconveniences might attend this plan; in short, he believed, upon his honor, that public opinion in Ireland would not tolerate the shooting of a landlord in order to obtain the coefficient of muscular force.

However, he had at last succeeded in obtaining the coefficient; and the use which could be made of it, he would explain in his next lecture.

Guillois' Dental Cement.

Professor Charles James Fox, in the *British Journal of Dental Science* says:

It is of the same nature as that commonly called osteoplastic, but it differs from it in this particular, that it can be mixed to a consistence much resembling putty, and in that state can be manipulated for some minutes without setting irretrievably. If you mix the other osteoplastics as thick as this, they set rapidly or crumble; if you use them in a thinner condition, they run about on the gums and teeth. When once set it is so hard, if it has been properly manipulated, as to turn the edge of the instrument, should it be deemed requisite to remove it. As to its durability, it is of course impossible to say much, seeing that it has only been introduced into England for a few months; but this much may be said, that, taking four months' experience with other cements, and four months, with this, I have found it so superior that I have entirely discarded all other osteoplastics, amalgams, etc. In small cavities in the incisors, or in shallow cavities where osteoplastics would wash out in a short time and dissolve away, Guillois' cement remains at the end of four months as good as when it was put in. I cannot tell what further experience may prove, but so far—and only for four months' experience do I speak—I have not had one failure, which is more than I can say of any other."

This cement has also been successfully used in this country for some time past. A writer in *Dental Cosmos* says that it is susceptible of a polish, and that it can be colored to imitate the natural teeth, so that a filling composed of it can hardly be detected. It is believed to be a good substitute, in very many cases, for gold fillings.

Charles Reade's Rational Roof.

The following, from the pen of the above named novelist, has rather a "Reade-y" tone, as musicians and perhaps architects will say, but it contains some good suggestions:

It is a sure sign that a man is not an artist, if, instead of repairing his defects, he calls an intellectual superior to counteract them. The fire escape is creditable to its inventor, but disgraceful to the builders. They construct a fire trap without an escape; and so their fellow citizens are to cudgel their brains, and supply the builder's want of intelligence and humanity by an invention working from the street. The fire escape can after all, save but a few of the builder's victims. The only universal fire escape is—the rational roof.

To be constructed thus: Light iron stair cases from the third floor to top floor and rational roof. Flat roof, or roofs, metal covered, with scarcely perceptible fall from the center. Open joists and iron girders, the latter sufficiently numerous to keep the roof from falling in, even though fire should gut the edifice. An iron lined door, surmounted by a skylight; iron staircase up to the door, which opens rationally on to the rational roof. Large cistern or tank on roof, with a force pump to irrigate the roof in fire or summer heats. Round the roof iron rails set firm in balcony, made too hard for bairns to climb, and surmounted by spikes. Between every two houses a partition gate, with two locks and keys complete. Bell under cover to call neighbors in fire or other emergency.

Advantages offered by "the rational roof:"

1. High chimney stacks not needed.

2. Nine smoking chimneys cured out of ten. There are always people at hand to make the householder believe his chimney smokes by some fault of construction, and so they gull him into expenses, and his chimney smokes on—because it is not thoroughly swept. Send a faithful servant on to the rational roof, let him see the chimney sweep's brush at the top of every chimney before you pay a shilling, and good-bye smoking chimneys. Sweeps are rogues, and the irrational roof is their shield and buckler.

3. The rails painted chocolate and the spikes gilt, would mightily improve our gloomy streets.

4. Stretch clothes' lines from spike to spike, and there is a drying ground for the poor, or for such substantial people as are sick of the washerwomen and their villainy. These heartless knaves are now rotting fine cambric and lace with soda and chloride of lime, though borax is nearly as detergent and injures nothing.

5. A playground in a purer air for children that cannot get to the parks. There is no ceiling to crack below.

6. In summer heats a blest retreat. Irrigate and cool from the cistern; then set four converging poles, stretch over these from spike to spike a few breadths of awning; and there is a delightful tent and perhaps a country view. If the Star and Garter, at Richmond, had possessed such a roof, they would have made at least two thousand a year upon it, and perhaps have saved their manager from a terrible death.

7. On each roof a little flag staff and streamer to light the gloom with sparks of color, and tell the world is the master at home or not. This would be of little use now; but when once the rational roof becomes common, many a friend could learn from his own roof whether a friend was at home, and so men's eyes might save their legs.

8. In case of fire the young and old would walk out by a rational door to a rational roof, and ring at a rational gate. Then their neighbor lets them on to his rational roof and they are safe. Meantime, the adult males, if any, have time to throw wet blankets on the skylight, and turn the water on to the roof. The rational roof, after saving the family which its predecessor would have destroyed, now proceeds to combat the fire. It operates as an obstinate cowl over the fire; and, if there are engines on the spot the victory is certain. Compare this with the whole conduct of the irrational roof. First it murdered the inmates; then it fed the fire; then it collapsed and fell on the ground floor, destroying more property, and endangering the firemen.

Foreign Bodies within the Eyeball.

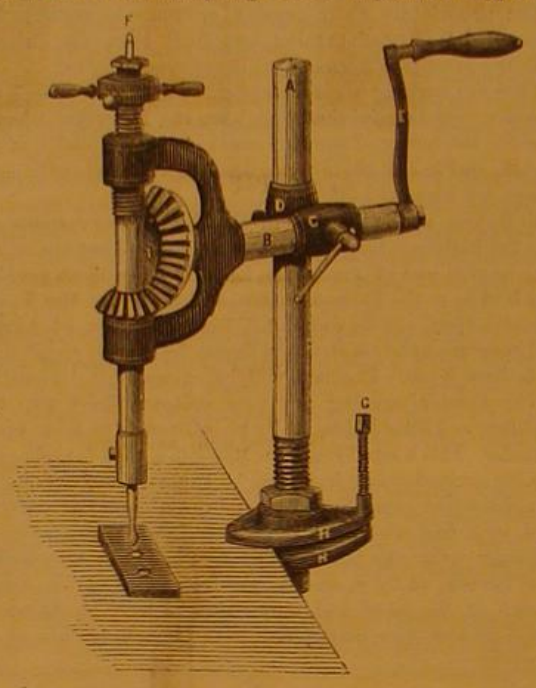
The most dangerous thing which can happen to the eye, is the lodgment of some foreign body within it. Amongst all classes of mechanics, such injuries are constantly occurring, from chips of metal flying off from the instruments they are using, or the work on which they are employed. So also in the stone workers, metal grinders, polishers, engineers, etc.; all of whom are thrown out of employment by the loss of an eye, and reduced from comparatively affluent circumstances to almost beggary. Amongst children, pieces of percussion caps, pins from the ends of darts, small stones or shot from bow guns, etc., only too often strike the eye with sufficient force to penetrate and destroy the globe. It is impossible for a person himself or those about him to decide whether a piece of iron or other foreign body has entered the eyeball and remains there. This the ophthalmic surgeon alone can do by looking into the eye, through the pupil, by means of a peculiar mirror, called the ophthalmoscope. He can then see the foreign body, and perhaps make a drawing of it, which the patient may recognize as corresponding to the portion which has flown off from the instrument or tool he was using at the time he met with the injury. Now this deciding whether or not the foreign body is in the eyeball is all important. If it has merely cut a hole in the eyeball, and dropped out back of the eye, the patient may escape with perfect vision; but if it, no matter how small, has entered the eyeball, there is not one chance in a million of the eye's being saved, and an even chance whether the other eye is not also lost, from what is called sympathetic inflammation attacking it.

In many parts of the system a foreign body, like a needle, splinter, bullet, etc., may remain perfectly quiet and do no harm. Not so, however, in the eye; here it is fatal to sight in the injured, and perhaps the other eye also. Its presence may at once destroy the eye by exciting acute and active inflammation. After such destruction, and when only a stump of the eye is left with the foreign substance in it, this remaining portion of the globe is liable, at any time, to repeated attacks of inflammation. Even if the sound eye has not been previously attacked, in some one of these outbursts of inflammation in the stump, this insidious and dangerous sympathetic trouble comes on, taking at first the form of weakness, inability to bear the light, slight pain and discomfort. These symptoms increase in severity, and a gradual change takes place, the eye degenerating and sight being lost. The only remedy for such sympathetic inflammation is the removal of the cause, namely, the eye or the stump, with the foreign body in it. This, if done too late, may not save the second eye. An eye with a foreign substance within the eyeball never should be allowed to remain. The present operation for its removal is so simple and effective, and the subsequent wearing of an artificial eye so facilitated, that there need be, in these days of ether, no fear or dread of the operation. It is only in the rarest instances that a foreign body has been removed from within the eyeball.

A glass eye can be worn generally within a fortnight of the removal of an useless or painful stump or globe. Cold water and the solution of atropine are all that can be recommended, besides quiet and protection from light, before proper surgical assistance is obtained.—*From Dr. Jeffries' work, "The Eye in Health and Disease."*

IMPROVED HAND AND LIGHT POWER DRILL.

Our engraving illustrates an improved drilling machine, adapted to hand or light power drilling. It can be clamped to almost any part of a machine, or to a bench, and may be made to drill holes at any angle from its point of support.



A is an upright which, by means of clamping jaws, H, and the set screw, G, may be fixed to the framework of a machine, bench, etc.

Sliding collars, D and C, are pivoted together with set screws to hold them in position when set as desired. This part of the apparatus forms a universal joint by which the drill may be pointed in any direction.

The spindle is carried by a head on the hollow shaft, B. The crank, E, or a pulley in its place, if desired, drives a shaft passing through the hollow shaft, B, and keyed to a miter gear, meshing into a pinion on the spindle.

The feed is applied in the usual manner by a hand wheel. In drilling small holes, the crank is used on the shaft, B, as shown. When large holes are to be drilled, the crank is placed directly upon the spindle at F, with a ratchet attachment, by which greater power with less speed is secured.

We are informed that a large number of these drills are in use in machine shops in and about this city, and are giving excellent satisfaction. The sliding collars, C and D are now made as a split sleeve. They are manufactured by Messrs. Holland, Cody & Co., No. 8 Gold street, New York.

An Important Invention.

A recent issue of James R. Osgood & Co.'s popular illustrated periodical, *Every Saturday*, says the *Record*, brought to its many readers an agreeable surprise. They found that in order to get at its diversified contents, instead of opening its mammoth folds, with much trouble and impatience, they had only to turn the leaves like those of a book, and find its treasures displayed to their gaze. This change makes a revolution in the business of publishing huge illustrated papers, and the means by which it was effected must rank among the most important recent improvements in newspaper publishing. We give the following interesting account of the invention:

The machine which produces this result is the invention of Messrs. Chambers & Co., of Philadelphia, and was made by them under arrangement with Messrs. Osgood & Co., especially for *Every Saturday*. It is the only machine of this kind in the world, and is really a wonder in its working, accomplishing various processes of folding, pasting and trimming at one operation. The two sheets of which *Every Saturday* is composed are fed in at opposite ends, are taken up by the machine and carried toward each other, while by a series of automatic movements they are folded, trimmed and pasted, *in transitu*; and arriving simultaneously at the centre of the machine, the smaller sheet is placed accurately inside the larger one, and both receive their final fold and are deposited carefully in the box placed for them, a perfect paper.

This operation is repeated, when the machine is at its highest speed, thirty times a minute, producing 1800 copies an hour, without mistake or variation.

Extract from the Diary of a South African Diamond Hunter.

A writer has been contributing to *All the Year Round* an account of a brief experience in the South African Diamond Fields, in the form of a diary of events, toward and untoward, the most of his adventures coming under the latter category. He says this diary gives a good notion of a digger's daily routine. If English convicts had to keep such hours, from five A. M. to 7 P. M., what a groan would run through philanthropic England! Of one thing he is certain, that sorting pebbles is harder work than picking oakum.

We give an extract in his own language—a bit of very graphic description:

"Let me describe the diamond fields in detail. The land I am now looking at on the other side of the Vaal is a long, low hill, sloping gradually down to the water, and covered with low, prickly shrubs. The spot is by no means beautiful or inviting to cattle or man. It is neither picturesque nor promising, yet it contains the very essence of wealth, the choicest treasures of royalty, power, and beauty. There, since the beginning of the world, trodden under foot by savages and wild beasts, unheeded, while Europe has suffered its storms and convulsions, these diamonds have slumbered. The upper part of the sloping hill is composed of orange colored gravel, with here and there boulder stones, detritus of old water courses, cropping out. This gravel is very attractive to the eye, and consists for the most part, of agates, cornelians, clear yellow stones, and bits of jasper. For the first day or two, you feel inclined to make a collection of the best of these; but this avarice wears off when you begin to find the good and sound stones are few and far between, and are nearly as scarce as the diamonds, which, like all good things, are shyest of all. Whenever a spot of this gravel is selected, either by new comers, or from a diamond having been found, the people make a rush, and the whole of the ground is at once divided into lots twenty-one feet square. The new and hopeful hands begin at once to pick and loose up the virgin ground, and after throwing by the big stones, they sift the smaller gravel through a large screen, and get rid of all pebbles bigger than a pigeon's egg. Of course, the man lucky enough to find a diamond bigger than this, is sure to see it in the sieve. All that goes through the sieve is the small gravel or wash stuff. This residuum is carted down to the river early in the morning and washed in a cradle, which consists in a couple of sieves, the upper one coarse in the mesh, the lower one fine. These sieves are placed on a frame set on rockers. The gravel is placed in the upper sieve, and one man rocks the cradle, while his companion pours water on all the gravel and fine dust which has washed through the two sieves. The upper sieve is looked over, and the contents thrown aside, while the gravel from the under one, containing pebbles from the size of a hazel nut to that of a big pin's head, is reviewed on the table, at which we will suppose I and my comrade Ash are itting. We are in a bower made of branches and an old sail. We each grasp a flat piece of zinc, and commence by drawing a small portion of the gravel towards us, like children playing with shells. With one motion of the hand we spread out our store carefully on the table, and with another, like disappointed gamblers that we are, we sweep it contemptuously off; so the diggers here go on hour after hour, day after day, month after month, and perhaps never, after all, see the welcome gleam of the long sought diamond. The manual labor is not so great, but oh! the monotony and weary watching of the stones. It is dreadfully tiring; one's back aches, all one's limbs feel benumbed, and the shoulder blades have soon their own special grievances.

"January 1st.—Hurrah! At last, after washing and washing, and scraping and scraping over some tuns of gravel and pebbles, we have found—not a Koh-i-noor, oh, dear no!—quite the reverse, only a small diamond about as big as a mustard seed. Still it is a diamond, and it is a good omen. There are more where that came from. Hurrah! we shall rock the cradle now with renewed hope. We may make our fortunes yet. I am afraid we have got the gambling spirit of the true digger upon us now. The fever has seized us at last, and the chill and ague of the first reaction of disappointment has gone forever. Another month we may be laughing and dancing with hats full of diamonds, or be driving back our oxen to Natal in rueful rags, footsore and half starved Never mind, my boys, rock away. We don't care now, even if there is a rock ahead. Heaven helps those who help themselves."

MR. ALEX. S. MACRAE, of Liverpool, England, writes us as follows:—"A very practical and a most useful adaptation of common salt (chloride of sodium) in partial substitution for alkali in the manufacture of soap, is now being most economically and advantageously used in this country. A soap can be produced in the bar, or molded into pattern, cheaper than by any other known process; and plain and fancy soaps of every odor, color, and design, are being freely circulated, at a figure costing the public no more, when boxed, than $2·88 or $3·36 per cwt. of 112 pounds. This, too, where the manufacturers have to pay 30 cents per cwt. for carriage on the salt!"

Improved Stovepipe Cleaner.

To be able to avoid the dust and filth caused by taking stovepipes down, in order to clean them, is a desideratum for which all good and tidy housekeepers will devoutly thank the inventor of this simple device. By its employment, a pipe may be thoroughly cleaned, and kept clean, both in the horizontal and vertical part, so that the inconvenience of taking down and putting up—the latter operation being one that tries both patience and good temper—may be avoided.

A curved disk of the same diameter as the pipe, having a short stem which passes through a hole in the elbow, occupies when not in use the position shown at the right in Fig. 3, where a portion of the pipe is shown broken away. Its curvature corresponds to that of the pipe, so that in this position it does not, in the least, interfere with the draft.

The stem has an internal thread into which a rod, with a handle formed thereon, being screwed, the disk may be forced along the horizontal part of the pipe, carrying along with it the soot, into the chimney flue.

The end of the pipe which enters the chimney is cut off as a quill is cut in forming a toothpick; this forms a chute which carries the soot well into the flue, while, at the same time, it allows a free upward motion of the gases of combustion when they pass into the flue.

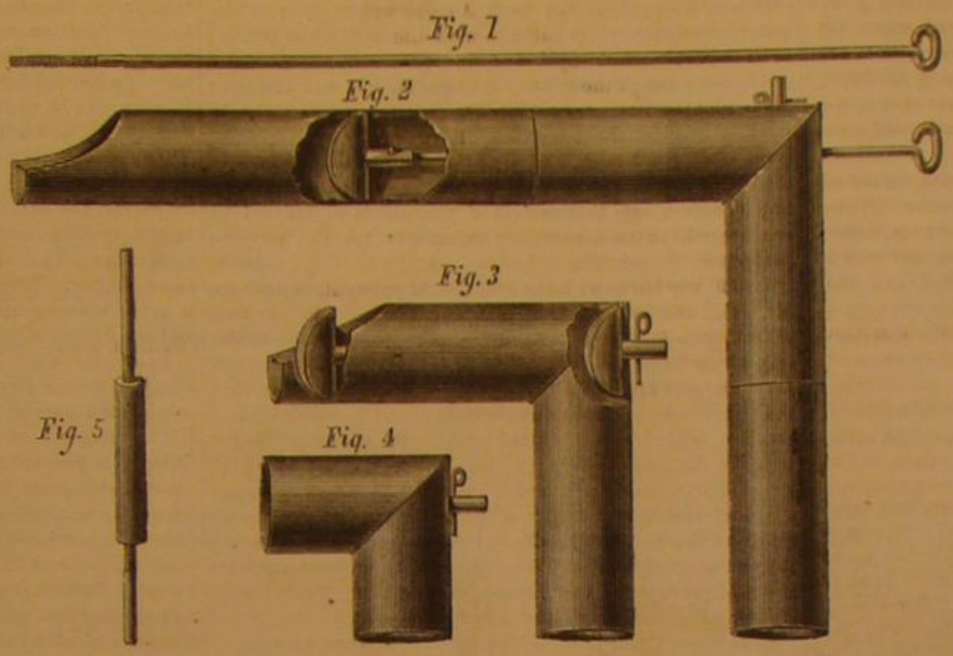
If one rod be too short, others are joined to it by means of the coupling sleeve, shown in Fig. 5.

If, instead of pushing the soot into the chimney flue, it be desired to draw it back, so that it will fall through the vertical part of the pipe into the stove, whence it can be easily removed, the disk, with the proper length of rod attached, is left in the position shown at the left of Fig. 3. When so left, the soot accumulates behind it; and when drawn back, the pipe is cleaned as desired.

The same principle is applied to the vertical part of the pipe. Pins placed in holes through the stems of the disks hold them in place when not in use.

A wire guard stretched across the chimney end of the pipe, prevents the disk from being forced entirely out of the pipe.

This improvement was patented by Daniel Murphy, of Richmond, Va., April 25, 1871. Address him for rights or further information.



MURPHY'S STOVEPIPE CLEANER.

Vulcanized Rubber.

About thirty years ago, says the *English Mechanic*, Mr. Thomas Hancock was shown some pieces of india-rubber, for which it was claimed that, while their elasticity was unimpaired, they were unaffected by heat and cold, and were rendered able to resist, in a great measure, the action of the ordinary solvents of caoutchouc. In order to discover the means whereby this change had been effected, his spare time was devoted, night after night, to labors in his laboratory at Stoke Newington. His first attempts consisted in dissolving caoutchouc and sulphurin oil of turpentine; but after making some hundreds of experiments in this direction without success, it occurred to him that as the india-rubber was not injured by the heat of the boiling turpentine, it would not be injured if dipped into a bath of melted sulphur at 240° Fah., about 76° less than that of the above named solvent. He accordingly placed some pieces of sheet rubber in an iron vessel containing sulphur at a temperature of 240°, and found that after a time they had absorbed the sulphur throughout their whole substance, but that there was no change in the natural qualities and characteristics of the rubber. He replaced the pieces, however, and raising the temperature considerably, left them exposed to the action of the sulphur for some hours, and had the satisfaction of finding them perfectly changed, the ends nearest the fire of those remaining in the bath longest having turned black and acquired the consistency of horn. Thus a discovery made accidentally by Mr. Goodyear, in America, was worked out in this country by the persevering efforts of Mr. Hancock, and from that time to the present, the applications of vulcanized india-rubber have rapidly increased in number, and its manufacture has attained an importance which, in all probability, will be still further augmented.

Such was the process by which the first specimens of vulcanized rubber were produced, but several other methods of imparting similar properties to caoutchouc were soon afterwards discovered; notably, that by Mr. Parkes, discovered about two years after Mr. Hancock obtained his patent. In this similar results were obtained by steeping raw rubber in a solution of sulphur in bisulphuret of carbon, or in coal naphtha—a process which had the further advantage of dispensing with heat.

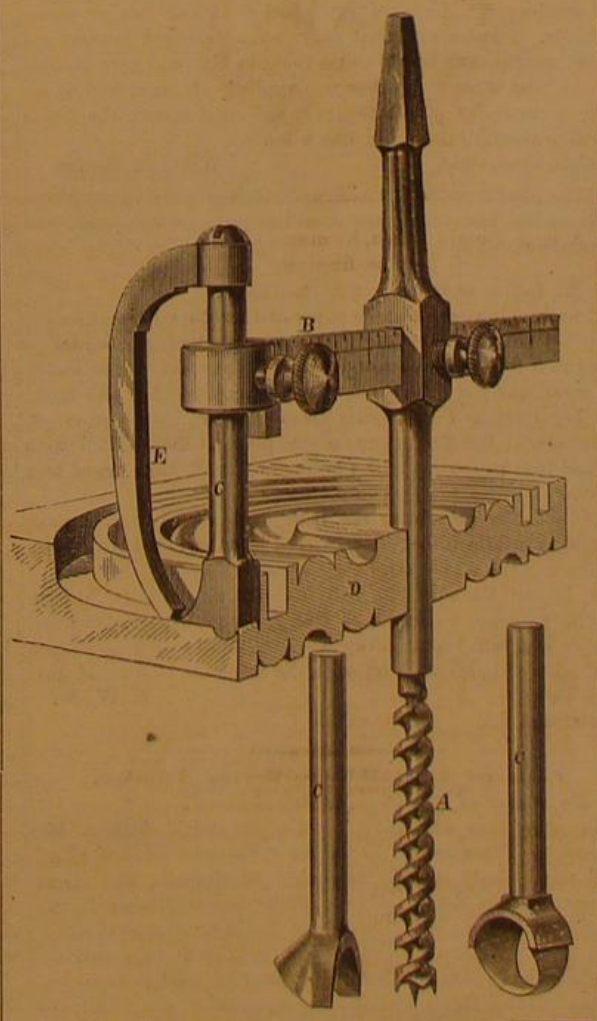
Since the date of the first patent (1843), the method of preparing the rubber has been greatly improved, but, as it is not our purpose to explain the manufacture itself, we proceed to describe some of the applications of vulcanized rubber in mechanics.

The principal rubbers imported are Para, Java, and African, of which Para is the finest and most expensive, being chiefly used for waterproofing purposes, and for the construction of such articles as life belts, water or air beds, drinking cups, etc. Its specific gravity, as imported, is about 0·922, but when thoroughly cleansed and vulcanized, it is 0·986, whereas with ordinary "gums" (as they are incorrectly termed), *i. e.*, those used for mechanical purposes, it ranges from 1·013 to 1·520 after vulcanization. So that while Para has a specific gravity, per cubic foot, four ounces less when vulcanized than in the sulphured but uncured state, A or No. 1 quality of the ordinary rubber has a specific gravity eleven ounces less per cubic foot when vulcanized, its bulk being consequently increased to a larger extent than that of the Para. On the other hand, those rubbers known as "mixed mechanicals" (*i. e.*, containing pigments or ingredients other than sulphur), increase in density during vulcanization, and it is necessary in molding them to patterns to allow for shrinkage. As a rule, the amount of this can generally be ascertained from the manufacturers sufficiently accurately for those who wish to construct their own molds, though it is better in practice, we believe, to allow the rubber curers to make the molds themselves, especially as they charge only cost price for them.

DORN'S CIRCULAR CUTTER FOR WOOD WORK.

Our engraving illustrates a very handy bench tool for wood workers, by the use of which a great variety of ornamental circular work may be performed.

It consists in the adaptation of variously shaped tools to an arm, projecting from the shank of a bit, as shown.



A is the bit, having a rectangular enlargement on the shank, mortised for the reception of the graduated arm, B. This arm carries various cutting tools, C, whereby circular grooves of semi-circular, semi-ovoid, rectangular, and other sections may be cut as desired, of any radius within the capacity of the tool; or plain disks may be cut out, as heretofore with this class of tools.

The shank of the bit above the cutting and twisted portion is made to accurately fit the hole bored in the center of the piece, D, and serves thereafter as the axis of the cutting tools. A gage, E, prevents the tools from plowing too deep, and enables the cutting to be performed smoothly. By using the tools in various combinations, the ornamental patterns may be multiplied at will.

Samples of the work done by this tool show that it is an important addition to the present stock of wood worker's tools. This improvement was patented through the Scientific American Patent Agency, June 6th, 1871, to R. H. Dorn, who is also the owner of the Broadbent patent on a similar tool, which was also patented through this office, August 8, 1865. For further information address R. H. Dorn, Port Henry, N. Y.

EXPERIENCES OF A BUREAU OFFICER.

(Extract from a speech of Hon. S. S. Fisher, late Commissioner of Patents.

In the spring of 1869, at the suggestion of the then Secretary of the Interior, I was appointed by the President to the office of Commissioner of Patents. When the position was first tendered to me I visited Washington to confer with the Secretary. The rush of office seekers at that time was something fearful. Crowds thronged his ante-chamber and the halls leading to his room. Eager faces were to be seen on every side, and the messenger at the doors was beset with petitions to secure immediate admission.

As I did not enter upon the discharge of the duties of my office until the first of May, and after the new administration had been two months in power, I had some hope that I should escape the importunities to which others had been subjected. In this I was mistaken. The crowd that had surrounded the door of the Secretary, had, in a measure, apparently disappeared, but it had only divided into four smaller streams, that daily beset the portals of the Commissioner of Pensions, of the Land Office, of Indian Affairs, and of Patents. Not that we were fortunate enough to be waited upon by one fourth only of those who had besieged our official chief. He was but a poor office seeker that staked his chances upon a single bureau. The approved plan was to have several sets of recommendations, to apply to all the Commissioners, and to draw a bow which prudent forethought provided, not with one or two strings only, but with four. The modesty of the gentlemen was remarkable. There are four grades of examiners in the Patent Office. Of these the lowest is that of second assistant examiner, to which belongs a salary of $1,600. The next that of first assistant examiner, with a salary of $1,800. The next, principal examiner, at a salary of $2,500; and the highest that of examiner-in-chief, at a salary of $3,000. The applications on file were legion, and it so happened that by far a greater portion of them were for the post of examiner-in-chief, an officer who, in the language of the law, must be a person "of competent legal knowledge and scientific ability." Scientific ability and competent legal knowledge seem to have been entirely compatible with ignorance of English grammar and Webster's spelling book, for some of the letters were wofully deficient in the former, while, as a specimen of contempt for the latter, it appeared that more than one of the applicants was unable to spell correctly the name of the office for which he applied. One asked to be appointed an "examener" of patents, and this specimen of orthography was unfortunately thrice repeated in his communication. The attempt to tabulate these bundles of applications in an intelligent form, was an almost hopeless task. It was impossible to accept the applicants' own estimate of themselves. On paper they were brimful of scientific ability and competent legal knowledge, but a very short oral cross-examination was sufficient to cast a doubt at least upon the mind of the Commissioner. Of one I asked, "Have you had any practical mechanical scientific experience?" "None." "Have you made mechanics a subject of theoretical study?" "No." "Have you had any experience in procuring patents or in the practice of the Patent Office?" "None whatever." "Have you studied or practiced law?" "No." "Well, sir, will you tell me what reason you have to suppose yourself competent to discharge the arduous duties of an examiner in charge of a class in this office?" "Well, I suppose I could learn!" What would have become of the class of inventions of which he proposed to take charge, and of the public interests, while this gentleman was pursuing his studies at their expense, was a question that it was unnecessary to press. One of these gentlemen put the matter upon the right ground. He made no secret of the fact that it was salary and not the public service that had attraction for him. He wrote; "I understand that there are clerkships in the Patent Office, called examiners, with a salary of $2,500. I desire to apply for one of these positions." But if the applicant's description of his own qualification was not to be wholly relied upon, still less were the recommendations which he tendered in support of his claims. An examiner already in the Patent Office, fearing that his place might not be secure, had sought to fortify himself with a few more endorsements. Among others, his member of Congress wrote in his behalf. He said that it gave him great pleasure to recommend his young friend, Dr. Blank; that he hoped he might be allowed to retain his place, as he was "a young gentleman of great promise." Now, as it happened that the examiner so warmly recommended was a white haired and spectacled gentleman of sixty, the value of this indorsement can be appreciated. In another case, the entire delegation from one State, including both Senators and all the members of the House, had united in recommending in terms of equal commendation two per-

sons for the same place. The attention of some of these gentlemen was called to the circumstance, when they stoutly denied any knowledge whatever of the applicants, although there could be no doubt but that their letters and signatures were genuine. It might be supposed that, although these gentlemen might have incautiously put their names to paper, that in their oral interviews they would be more sincere. Unfortunately it was found that even less dependence could be placed upon their verbal statements. A member called with his constituent, whom he urged with vehemence and with some temper, as a person eminently fit to hold any position in the bureau. He was assured that no vacancy existed, and that there was no opening for his friend. They left, but scarcely had the door closed upon them when the member returned alone, to say, confidentially, "You needn't give yourself any trouble about appointing Jones. If you have a vacancy that you can give to my district, I can name a better man. You know we have to do these things," and a few moments afterwards he was crossing the street arm in arm with Jones, to whom he was no doubt explaining how obstinate the head of a bureau was in these matters of appointments, and how great were his own labors on behalf of his deluded constituent.

I spent several nights in reading the batch of recommendations on file and in abstracting them for reference. When the task was completed I found myself no nearer the desired information than at first, and practically without any real information as to the capacity or character of the men from whose number selections were to be made.

Correspondence.

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

STEAM ON THE CANALS.

We are in receipt of communications from various inventors, stating that they have *good* plans for canal boat propulsion, which they lack means to patent, and asking us to appeal in their behalf to the public. Now the public is an incredulous, unsympathizing source to appeal to. It refuses to be convinced on such matters without evidence. The best way, for such inventors to get their inventions along, is to make as good drawings and explanations of their devices as possible, and get copies of them, with dates affixed, witnessed by persons upon whose integrity they can rely; and then bring their plans to the notice of practical men with capital, making the best arrangements they can to obtain the necessary funds to perfect and patent their machines. A share in a really good invention will nearly always secure the needful money to proceed with it.

To the Editor of the Scientific American:

As a practical engineer and machinist of thirty years' experience, an inventor and patentee of several useful machines, I feel interested in the solution of this old but very knotty question. I consider steam as the only motor which can be used advantageously at the present moment, although I believe science will, at no very distant period, develop some other source of power, cheaper and more portable. Therefore, from whatever source the power may be derived, the manner of applying it for the propulsion of canal boats is the only thing that needs to occupy the attention of inventors. I have seen, in Belgium, a boat propelled by water forced out of its sides by pumps. The boat seemed to go well, but as I had other matters in hand I did not interest myself in obtaining any information on the economy of the system. I know this system is very old; but it seems to me to be very natural and very simple to take the water out of the canal at the bottom of a boat and force it out at either end of the boat with just sufficient force to obtain the desired speed. I have never heard any good reason why successive attempts in this particular direction have failed; but many reasons present themselves to inventors of experience. How difficult it is to enlist the capitalist or the public! In fact, the originator of an invention is generally neglected and forgotten; and years after he has passed away, the time arrives: a necessity is felt for self-preservation, and the capitalist is alive; and the whole public is alive with inventors. It is simply necessary for a man to go through some old books, put a few old notions together, take out a patent, and he is an inventor. So, at the present time, we have boys and girls, men and women, dreaming of the one hundred thousand dollars, and every one has some scheme to win the prize.

I read, in "Answers to Correspondents," lately, "Your proposition for the propulsion of boats by forcing water through a longitudinal channel by a pump or screw, is an old device." This is very true; but is that any reason why it should be discarded as useless? I think not. Surely mechanics have advanced somewhat since the time those experiments were tried.

I believe that the system is good; and it is only the mechanical arrangements for forcing out the water in a proper manner which are at fault. And after studying all the varieties of propositions, wheels, screws, poles, floats, chains, etc., I feel obliged to return to the simple directing force pump, steam at one end of the piston and water at the other, without a single lever or joint; and I believe the jets of water may be so directed, after a few experiments, as to counteract each other, to prevent damage to the banks of the canal.

I will give a rough sketch of my ideas on this system; it is old enough, and I do not think a valid patent could be sustained for propelling boats by water, forced out behind, before, at the sides, or any other parts of the boats. B t I am sure there is plenty of room for a good pump, specially designed for this purpose; that would be a good patent. Now I intend to try my skill in this direction, and I shall, in a short time, illustrate my design in your valuable journal.

The following is a rough sketch of the principle. I propose to make small, compact, double cylinder steam pumps, and to place a number of them in the center of the boat. Each set of pumps will be complete in itself, with separate inlet and outlet pipes for steam and water, so that they may be worked separately or collectively. It is possible that one or more of the pumps may become useless from some substance getting into the valves; they can then be stopped and arranged without impeding the progress of the vessel. Each set of pumps has its own jet, and the jet of water may be directed slightly inclined towards the bottom of the canal, and the currents might be made to meet each other, so as to prevent flushing the sides or banks of the canal. Experiment only can decide the size, form, and direction of the several jets, to produce the least possible commotion in the water. A suitable valve must be placed to each set of pumps, so as to reverse the direction of the water without reversing or stopping the pumps; some may go one way and some the other, and the jets may be made to turn round to assist in steering or turning the boat when necessary.

Such is a brief sketch of my idea, and I shall feel greatly obliged if you or any of your correspondents can show any radical defect why this system of propulsion should not be encouraged, and the necessary machinery for the purpose perfected.

I perfectly agree with the remarks of your correspondent, Mr. John Bamber, of Rochester; and I would suggest that all aspirants for the prize should send a good working model (say a boat three feet long) of their invention, and that each inventor send a detailed description, with his model, so that the Commissioners would understand it and be able to select the best, second, and third, and advance the money necessary to make the experiments. I, for one, could not afford to spend $10,000 in experiments, but I could afford to make a model sufficient to give a clear notion of my invention, and this would be sufficient expense to put an inventor to; and as no scheme would be attended to without a model, it would prevent the Commissioners from being flooded with crude notions, and no end of correspondence.

Lake View, Chicago. JOSEPH LAURIE.

To the Editor of the Scientific American:

Your articles in the SCIENTIFIC AMERICAN, relating to the Erie canal, brought to my recollection a trial made upon the Western Pennsylvania canal, about twenty years since, by a Mr. Adams, its simplicity attracting attention. Nothing but the ordinary boat could be seen, excepting that, at a short distance from the sides, what the spectators called a "fence," made of sheet iron, was placed near the bow, in a straight line parallel to the sides, to prevent the motion of the water (caused by the passage of the boat) from striking the banks. This simple arrangement had the desired effect. The propeller, from what I could learn, was something of the nature of the bicycle. I cannot say whether it had two or three wheels. I understood that they were arranged to carry no more weight than would cause them to bite and give motion to the boat when the power was applied. It appeared to be only a matter of power to get the desired speed, the fence cutting through the water like a knife.

Columbus, Ohio. WILLIAM HENRY.

[The plan described would undoubtedly prevent injurious side swells, but we think it would require greater power for propulsion.—EDS.

To the Editor of the Scientific American:

I noticed in your valuable paper of June 24, "Forwarder's" article on canal (steam) navigation, wherein he ("Forwarder") says that it is the "bow of the boat" that makes the swell or wave, and not "the screw" used for propelling the boat. He is correct, as I can testify from my own observation. I have observed different tugs plying on the Chicago river, and found that it was the bow and not the stern that made the wave.

Now I, for one, have not been trying to invent a new screw or paddle wheel. But what I have invented is a device to destroy the waves after they are made.

I hope "Forwarder," will discontinue calling Chicago naughty names, as it will be Chicago who will produce the Moses who will lead the New Yorkers out of (canal) bondage, and who will also walk off with the $100,000, that is, if any one does. H. W., Jr.

Chicago, Ill.

Fallacies of Building---Drying Lumber.

To the Editor of the Scientific American:

In your issue of June 3, I notice an article from a Mr. James, of Paterson, N. J., on the "Fallacies of Building," and particularly on the seasoning of timber. He seems to have serious doubts of our ability to cut timber in the forest and place the lumber in a building the next week, and have it keep its place. A book was once written to show that a steam vessel could never be used to cross the ocean. It is difficult to make an egg stand on the small end until you know how. Great difficulties in theory vanish, when we can witness the facts.

Having expended more than twenty years' time and a large amount of money, to investigate and establish the science of properly seasoning, shrinking, and drying of lumber and timber, I will state some facts, that have come under my observation, which run somewhat counter to the views of Mr. Henry.

There are few subjects in which the community at large have a deeper interest than in the proper preparation of wood for our dwellings, furniture, etc., whether we consider it in the light of durability, elegance, comfort, or health. It is one, however, on which a great diversity of opinion exists. It is passing strange that a subject of such universal importance has not been more agitated, and settled on a sure basis. Each man has his own theory. Who is right? If we examine the doors, windows, furniture, etc., of our dwellings and public buildings, we ought to be ready to affirm that nobody is right, providing they practise as well as they know how. I noticed in one of the most expensively built palaces in New York, that the panels of the doors had nearly shrunk out of the matching, before the building was sufficiently dry for occupation. Who believes that this is necessary?

My own experience prompts me to say: That the drying of lumber does not season it, and seasoning lumber is not drying it. That any amount of common air drying does not necessarily (if ever) produce a thorough shrinkage, even though the time be a hundred years. That time has nothing to do with either seasoning, shrinking, or drying, but is alone the result of condition and heat. That lumber may be thoroughly seasoned without being either dried or shrunk. That lumber may be made as dry as desired, and yet not be seasoned at all, and with only a partial or very slight shrinkage. That common air never seasons lumber (though it dries it), and can never more than partially shrink the wood. That seasoning, shrinking, and drying, are each separate and distinct operations, and in most cases do not depend at all upon each other. That they are all necessary, though not in the same degree. That the order of their value to the wood, is in the order named; the seasoning being of the greatest, and the drying of the least value.

To season wood, is to coagulate or chemically change its albumen from a fermentable and destructive agent to an insoluble and preserving substance, which should always be left in the pores of the wood. When thus treated, its tendency is to prevent the future shrinking and swelling of the wood, and it greatly adds to its beauty of finish. It is also a protection against eremacausis, or dry rot, where timbers exposed to its influence, such as car beds, railroad ties, bridge timbers, etc., and is the cheapest mode of preserving timber known. Creosote can also be added in the same preparation, and at an almost nominal cost. If this albumen be removed from the wood by steaming, boiling, or soaking in water, it greatly injures the value of the wood, and it can never afterwards have the same strength or beauty of finish.

Common air, therefore, can never season lumber, for want of a sufficient degree of heat, since albumen in wood cannot be properly coagulated at a heat less than 160°.

The shrinking of wood, which is the next in the order of value, can never be thoroughly performed if the outside of the wood be dried first, which is always the case in common air drying.

When the outside is dried first, it forms an enamel or band of dried wood, which will not yield to a thorough shrinkage when the inside becomes dry. This enamel also prevents a rapid drying of the wood, as it closes the outside pores, and permits the free passage of moisture from the inside. If lumber could be dried in the air, with a person to sprinkle water on it frequently, to prevent the forming of the enamel, it would secure a more perfect shrinkage in the end, though the water thus used would greatly damage the wood in color, strength, and durability. But under no circumstances can common air be depended upon, to properly prepare lumber for buildings, or any other good work, no matter how many years of time are allowed.

I was furnished by the Rogers Locomotive Manufacturing Company, at Paterson, N. J., with a sample of their best air dried lumber, to see if I could shrink it in dry steam. As strange as it may appear, it shrank $\frac{7}{16}$ of an inch to the foot in two days, as a part of 30,000 feet of lumber in the same room. A sample of black walnut timber from the car shops of the Hudson River Railroad shrank $\frac{5}{16}$ of an inch to the foot in one day. Some staves from a pail and tub factory, that had been dried both in the air and in a hot air kiln, shrank more than an inch to a pail in one day; and entirely green staves were equally well shrunk and dried in the same room and in the same length of time. Some gunstocks at the United States Armory at Springfield were more thoroughly shrunk in 2½ days in dry steam than others that had been dried in the air under cover for 8 years. Those sticks that were prepared from the green in 2½ days could be selected in the dark, from the 8 years air dried, by their superior finish. Some timber at Pittsburgh, known to have been air dried for more than 60 years, and used for building gun carriages, was tested by baking, with some of the same size that had been prepared from the green in 48 hours in dry steam, and to the surprise of many, the 60 years' air dried wood shrank nearly double that of the steam dried. Thousands of such cases can be furnished to those who are skeptical, or new tests can be made for their especial benefit. One person who was skeptical dried a piece of lumber 3 years in a yard and one whole year in a hot air kiln, and yet the dry steam shrank it $\frac{3}{16}$ of an inch to the foot, and diminished its weight.

But the drying of lumber has very little importance, in comparison with its being seasoned and shrunk. Six green gun stocks, as a part of 9,000 in the same inclosure (16×20 feet), at the Springfield Armory, shrank in weight the first day, 12 lbs. 13 ozs.; the second day, 5 lbs. 5 ozs.; the third day, 2 lbs. 13 ozs. The same stocks shrank in size, the first day, $\frac{3}{64}$ of an inch; the second day, $\frac{2}{64}$; the third day, none, thus showing that the shrinking in size stops before the timber is quite dry. There is therefore no advantage in drying timber after the shrinking in size stops, under a seasoning heat of dry steam.

One of the great advantages of seasoning and shrinking of lumber by dry steam, is, that the lumber can never after-

wards be exposed to a higher degree of heat or a more thoroughly shrinking atmosphere, unless it is actually burned to charcoal. Another advantage is, that a day in dry steam has produced better shrinkage, on an average, than a year in the air. Practical men can readily sum up the interest on capital, storage, checks, splits, warps, and decay, and see if that do not amount to more than $1 per thousand feet, which is about the average cost of thoroughly seasoning, shrinking, and drying of lumber by dry steam.

We live in a fast age. We do not depend upon canals now for rapid traveling. Lightning speed suits us much better. Improvements are constantly being made. We should not discourage but rather aid their introduction. We can hardly afford to go back or cling to the old and expensive process of air drying lumber, when we can have far better seasoned and shrunk timber, in days, than by the common air in years; while after the air has done its best, the dry steam will add more to its value than the entire cost of preparing the wood from the green, and yet with all the advantages of the dry steam, it is the cheapest, most rapid, and thorough process known to science.

If these views shall be found to conflict with those of Mr. Henry or any other person who may read your valuable paper, I shall be pleased to discuss with them any of the points I have made, through the SCIENTIFIC AMERICAN or otherwise.

H. G. BULKLEY.

Chicago, Ill.

Paine's Electro-magnetic Engine.

To the Editor of the Scientific American:

Having noticed several articles in your paper with reference to Paine's electro-magnetic machine, I believe I cannot do better than describe a visit which I paid it about three months ago.

Entering the office in company with a friend, at about twelve o'clock one day, I was told that the machine was not running then, but would be in operation at one. Proceeding there alone, at about that time, I was, after the formality of sending up my name, conducted by a small boy, through numerous by-ways and passages, to the second story of a back building, where I was met by the illustrious inventor and a few select friends. Mr. Paine began by showing the small model machines, which he set in motion by a battery of four cups, of about a gallon capacity each. These models revolved very well, but apparently with no power, for they could be stopped easily. I then began to reason with him on the absurdity of his position, and adduced in my support the experiments of Joule, Mayer, Faraday, and others. He, evidently, had no very high opinion of these, and pronounced the conservation of force an old fashioned idea, which had been overthrown in these enlightened days by his "experiments," though what the latter were I have never determined.

After conversing some time, to no purpose, he prepared to overthrow me and my authority at one blow, by an exhibition of The Machine. This was standing in front of a chimney, on one side of the room, with the axis of its wheels parallel to the wall. The wheel to which the magnets were attached was, unlike the models, inclosed in a cast iron case, which enveloped it closely above, but spread out into a rectangular base below. The latter rested directly on the floor. The axis of the wheel projected on each side, and, to one end, a pulley was attached, and to the other, the brake for operating the magnets. The machine had the general appearance of a fan blower with an enlarged pulley. The battery was attached to two binding screws, fixed to a standard on the chimney, and the current was supposed to pass from these, along wires, to the break piece, and thence to the magnets. A belt on the pulley connected with a shaft overhead, whence another belt proceeded to the pulley of a small circular saw.

As soon as the connection was made with the battery, the whole apparatus began to move, and soon the saw attained great velocity, shaking the building with violence. The latter effect was caused by a heavy fly wheel on the saw arbor, which probably was not well balanced. When well in motion, boards were applied and sawed with the greatest ease. To show the excess of power, they were sometimes placed on edge and passed over the saw, so as wholly to envelop it, and the cut made from end to end, without the velocity being at all diminished. On throwing off the belt from the saw, the machine still proceeded at the same velocity, with entire indifference to external resistance. On mentioning this to Mr. Paine, he informed me that when the saw was attached, and the resistance greater, the increased pull on the magnets brought them nearer together, by bending the heavy iron frame; and, as magnetic attraction varies inversely as the square of the distance, it only required a small change of distance to account for the increased power. I clearly indicated that I was skeptical on this point, and suggested that it would also work without variation if the power proceeded from some well governed steam engine in the neighborhood. On this he intimated that, if I were not careful, a force might proceed from his body which would act in conjunction with gravitation in causing me to be projected through the window, and strike with violence on the ground below.

The exhibition being over, on going down stairs in company with the rest, I tried the door of the room below, but found it locked, and the windows covered with papers. I desired to get in, but was met with the assurance that the room was rented by a man who was then absent.

This, I believe, is the last visit paid by an outsider to this wonderful invention. I have been there several times since, but there has been no admittance to me, or to any one else. I have since been to the owner of the building, and find that Mr. Paine rents the room to which I sought admittance, and also rents power in that same room, which is directly below that containing his machine. The engine from which the power comes generally stops work at twelve, and starts again at one, but sometimes works all day.

My visits there have established the following facts: First. That my friend and I were denied admittance at twelve o'clock, but were invited to come at one. Second. That the shaft in the room below does not revolve between the hours of twelve and one. Third. That the room below, containing power, was rented by Mr. Paine, but that he kept it carefully locked, and misguided me as to the tenant. Fourth. That the working parts are concealed in an unnecessarily strong case, well adapted to the concealment of another source of power. Fifth. That part of the apparatus is attached to the wall, so that the machine must always occupy the same position on the floor. Sixth. That the models have not a power proportionate to their size. Seventh. That the machine runs at the same velocity, whether producing one horse power or a fraction of a horse power, and this without a governor.

These are the facts of the case. Where the power of the machine comes from I am unable to say. Is there some secret connection between this machine and the shaft below, and does the battery serve only to make this connection? Or does the battery, when applied, connect the apparatus with a larger battery? I leave these questions to others; but, unless the reasoning and experiments of a host of our greatest men be false, and unless the greatest development of modern science be overthrown, this machine cannot but derive its power from some extraneous source.

In a late communication to your paper, Mr. Paine sets himself up as the peer of Faraday, Tyndall, and others, and gives as the reason, his long devotion to science. He evidently does not consider that to be ranked with such men requires something more than devotion; it requires brains; brains to discriminate between true science and quackish nonsense; brains to discover and originate. And pray what fact, among the thousands of science, does Mr. Paine pretend to have proved beyond doubt? Let him answer. As to Mr. Paine's "science," I assert that it is a tissue of error and ignorance, from beginning to end. Even his vaunted invention of metallic foil, wherewith to envelop his magnets or wire, can operate in no other manner than to the detriment of his machine, as any such metallic coating lengthens the demagnetization, which is the very thing to be guarded against. This is due to an induced current, which forms in the coating, and, being in the same direction as the primary current, operates in the same manner to keep up the magnetism. His reason for the machine's keeping at the same velocity also shows great ignorance of the subject. In the first place, the law of magnetic force, under these circumstances, is stated entirely wrong. For this case, the true law is complex, but most nearly approaches to that of inversely as the distance, instead of as the square of the distance. (See Joule, and also Tyndall, in the *London, Edinburgh and Dublin Philosophical Magazine* for 1850.) And, in the second place, approach of the poles would not necessarily increase the efficiency; in this kind of machine there is a distance of maximum efficiency; and if the magnets revolve at a distance greater than this, the attraction becomes too small; and if at a less distance, the times of magnetizing and demagnetizing the magnets become too great, and the machine goes too slowly. The distance in this machine is, undoubtedly, within the limit, for Mr. Paine prides himself upon its smallness, and so further reduction, could it take place, can act in no other manner than the opposite of that claimed. But it is my opinion that all the force brought to bear on the magnets could not move them one two-hundredth of an inch, when attached to such a frame.

As to Mr. Paine's disregard for the conservation of force, I have little to say. His assertions are made directly in the face of this principle, and yet he has never adduced one experiment, or even a plausible reason, to prove what he says. He takes you into a building where shafts are revolving by the vulgar power of steam, and directs you to look while he evokes power from nothing. You must not touch anything; you must not enter the room below; you must not be there while the engine next door is at rest; but you must simply look, and by that renowned maxim of fools, that "seeing is believing," you must believe that the whole structure of science has fallen, and that above its ruins nothing remains but Mr. Paine and his wonderful electro-magnetic machine.

Newark, N. J. HENRY A. ROWLAND, C. E.

Social Science versus Mental Emaciation.

To the Editor of the Scientific American:

In a recent number of the SCIENTIFIC AMERICAN, an article appeared under the title of "Social Science," the drift of which, if rightly understood, was, beyond doubt, in the right direction.

Again, in the number for June 10, another appears under the title of "Mental Emaciation." If it be the work of the same mind as that on social science, that mind has clearly lost its way in passing from one topic to the other, both, by the way, being very closely related.

The conclusions of that on social science were, if properly comprehended, that the criminal, because of certain changes in the structure of the brain, ought to be regarded rather as a diseased person, than as one sinning against light and knowledge; or, in other words, as a criminal *de facto*.

Mental emaciation pre-supposes the possession of mental endowments at one period of life, in a state of decadence at another; and, in the judgment of the writer, at a date too early to be included in, or accounted for, by the inevitable decline due to advancing life.

The business of the mechanics, artisans, and laborers of the world, if properly understood by the writer of this note, is to give form to materials to subserve some useful, ornamental, or æsthetic end to their fellow men, or inferior animals in their service. All the inventions and contrivances figured or described in the past issues of the SCIENTIFIC AMERICAN, are in fact, variations of forms of a few materials, to attain some desirable end or result to mankind.

Now, the human brain at birth is like these few materials—formless—for most purposes of utility, except the perpetuation of the race. And the business of educators, from the primary school to the university, workshop, factory, or farm, is simply to give forms to the material structure of the brain, to the end that it may be competent to evolve certain results in after life. And education does not often, or always, stop with leaving school, university, farm or shop. Each individual occupation followed in after life by any one, is but a school to make its follower more proficient all the time he or she is engaged in it. And that is the basis of "specialisms" in human occupations. And the specialist attains success precisely as his attention is turned to narrow single purposes or objects.

It would be manifestly unjust to charge the conductors of the SCIENTIFIC AMERICAN with being political emaciates, for the very satisfactory reason that politics have not probably been objects to which they have devoted special attention. In other words, they have not been political specialists. And the censure cast by them on business men at fifty years of age, as being "mentally emaciated," is not, in a large majority of cases, merited.

Mental phenomena depend on forms (molecular) given by educational influences to brain matter; as insanity and crime, in most cases, are either shown, or inferred, to depend on changes in the structure of brain material.

Believing that the SCIENTIFIC AMERICAN does not seek to do any class of men, however large or small, injustice, I certainly think it due to the large class whom it charges with mental emaciation that it should know and acknowledge its mistake, and make the *amende honorable*.

Zanesville, Ohio. Z. C. MCELROY.

Patent Knot and String Envelope.

To the Editor of the Scientific American:

In glancing over your excellent paper, I noticed two diagrams of a letter opener, the vast improvement of the latter attracting my attention immediately. Now if I (taking my idea from the inventor of 1871, as I have no doubt he took his from the inventor of 1858), should add a short stick to the knot so conspicuous in the patent of 1871, could I also obtain a patent?

W. H. S.

New Haven, Conn.

[We presume you could, if the same liberal minded examiner that passed the knot patent still retains his office.—EDS.

The Viaduct Railroad.

The last meeting of the directors of the Viaduct Railway Company was a secret one, but it has since been ascertained that the proceedings were as follows: A majority of the members were present; the president, Judge Hilton, stated that several corps of surveyors were actively engaged in making the necessary surveys of the proposed route, though nothing had been sufficiently matured to be presented to the Board for action, and that he had been under the impression that the committee from the Chamber of Commerce, appointed at their meeting last week, would have been present on the occasion to lay their views before the Board respecting the extension of the road to the Battery or some other point at the lower end of the island, but he had not heard from the committee in any way.

It is understood that 150 engineers are engaged upon the surveys. Considerable misunderstanding seems to prevail outside the city as to the precise nature of the Viaduct road. It will run, on an average, about twenty-five feet above the surface of the ground, on brick arches, between transverse iron ribs, supported by heavy iron lateral columns, of elegant design, themselves supported on inverted arches of solid masonry built into the ground. The space under the arches it is intended to convert into stores and markets, having entrances on both sides of the line. The stock subscription books are now open, as will be seen from an advertisement in another column.

Effect of Cold on Iron.

An esteemed correspondent, Mr. John Towle, of Bristol, Vt., sends us the following: "When I have broken iron for the foundery, such as old stoves, plows, and the like, it breaks with lighter blows in the winter, when full of frost, than in the summer, when it has been heated in the sun. And in straightening horseshoes in winter, I have had them break with one blow of the hammer, while in the summer they will straighten easily, and not even crack. These facts are evidently proofs that iron and steel are more brittle in frosty than in warm weather." Mr. Towle's facts show the behavior of iron, under percussive force, to be widely different in extreme temperatures. But its tensile strength, under steady pressure, has recently been shown, by experiment, to increase when the iron is cold.

Compressed Leather.

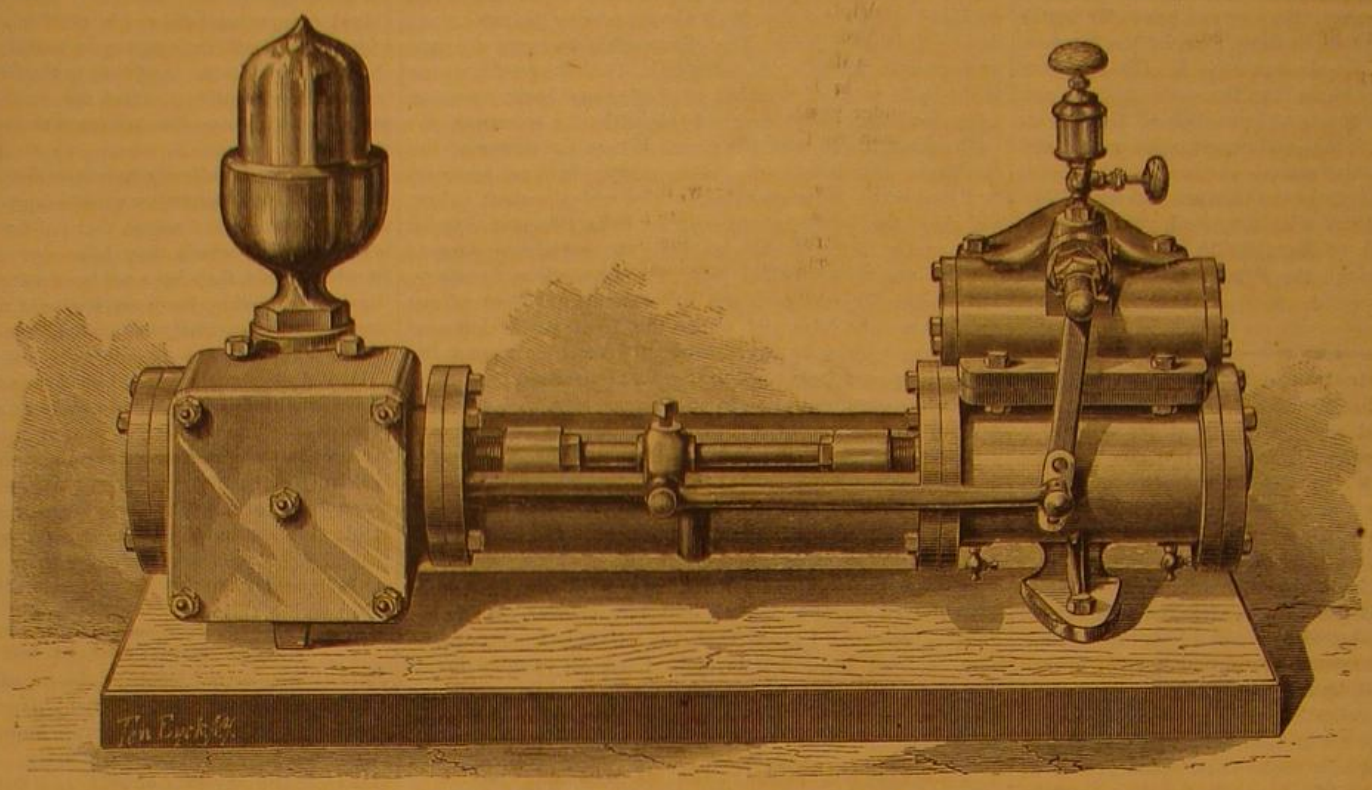
A new process for using the clippings and refuse from saddlers' and shoemakers' shops, is manipulated as follows:

The leather shavings are washed clean, cut up fine, and soaked in water and sulphuric acid, one per cent of the acid being sufficient. The immersion must continue till the shavings become plastic, and the leather then can be pressed into molds, with only a moderate amount of pressure. It can be rolled into thin sheets, and will be useful for many purposes; it will not, however, resist molsture. A little glycerin rubbed in will prevent its cracking.

Cameron's Steam Pump.

The independent steam pump—or donkey pump, as European engineers are pleased to term it—although a comparatively recent invention, is now so well known and so extensively used as to be considered an almost indispensable adjunct to a steam boiler. Its relations vary, however. In some cases, the donkey draws its nourishment from the boiler; while in others, the boiler draws its nourishment from the donkey.

The great range of applicability of steam pumps, for moving fluids in almost every possible condition, is increasing daily. For instance, it is now the practice in the oil producing regions to lay pipes (two inch is the size generally employed) from the wells to a point intersecting the nearest railroad, for the conveyance of the crude oil. In some cases oil is conveyed in this way a distance of fourteen miles, forced by a single pump placed at the end of the line, the pipes lying on the surface of the ground and following its undulations. The pressure is, of course, very great, and depends upon the quantity delivered in a given time, but the plan works so successfully that the question is being seriously considered, of connecting the oil districts with the great commercial centers in this way.



CAMERON'S PATENT STEAM PUMP.

The steam pump shown in the annexed engraving is int nded chiefly for feeding boilers—a duty that requires a safe and reliable instrument. It is constructed with a view to the fact that we are making steam machinery faster than we are educating men to take care of it properly; and consists, therefore, of the fewest possible parts, and these of the simplest character.

The steam cylinder is shown on the right hand, and the pump cylinder on the left. The piston rod is an unbroken piece, extending from one cylinder into the other, and carrying between the two cylinders an arm, which performs the office of the eccentric in a rotative engine. The steam chest is bored out in the ends, and is fitted with a piston or plunger, which carries the main slide valve back and forth with it. This plunger is operated by a small slide valve seated in the steam chest casting, on the further side, which receives its motion from the arm on the piston rod, through the horizontal and pendant links which vibrate a shaft that extends through the steam chest and carries a toe that engages with the small valve. The horizontal link is connected to the arm on the piston rod, by an eccentric hook than can be lifted when it is desired to stop the machine instantaneously.

The only parts of the steam engine inclosed are the main steam piston, the main slide valve, the plunger, and the auxiliary slide valves. The pump cylinder is equally simple; it is fitted with a piston and four valves. By removing the bonnet shown in the cut, the whole interior of the cylinder is not only exposed, but is rendered accessible for the removal of any foreign substance.

The pump valves, four in number, may be removed by unscrewing the two plugs shown on the top of the cylinder, and lifting out the spindles on which the valves play. The valves and valve seats are made of solid composition.

There is not a screw or little piece of any kind, inside the machine, that can get adrift to disarrange it or give trouble.

These pumps are double acting, and the duty being the same in each direction, their operation is smooth and regular. Their parts are manufactured on the principle of gunwork, each piece being interchangeable.

They are sometimes arranged to feed boilers, in situations where the throttle valve is operated by a float or similar contrivance that varies with the water level, where they are relied upon to stop and start under care of the attachment with the utmost confidence.

This excellent steam pump bears testimony to the restless ingenuity of our American mechanics, which is never satisfied until the whole field is exhausted. It is the latest addition to the already large variety manufactured by the well known firm of A. S. Cameron & Co., whose works are situated at the foot of East Twenty third street, New York, and cover more than an acre of ground. The whole establishment is devoted exclusively to the manufacture of steam pumps, under six distinct patents, granted at different times to Mr. A. S. Cameron; and it is managed on the co-operative plan, each workman being interested in the profits.

COATES AND LASCELL'S WATER ENGINE.

The utilization of the power of small streams with great heads has long been a subject of interest and importance. In many of the mining districts of California, there are streams which fall abruptly from great hights, but the flow of which is so small that, to apply it to work through the medium of overshot wheels or turbines, would involve very great expense, while a large portion of the fall would necessarily be sacrificed. Endless chains, carrying buckets, pressure wheels with buckets worked by cams, and many other devices have been employed with greater or less success, to render the power of such streams available; but there is no doubt that the cylinder and piston is essentially the best thing ever invented for the purpose.

The limited elasticity of water, however introduces difficulties in working cylinder engines not met with in the employment of steam; and it is only in comparatively recent times that these difficulties have been so far surmounted as to give smoothly working water engines.

The engine illustrated herewith works without shock or jar, and can, undoubtedly, be made to economize a very large percentage of the power of any stream, falling from a hight not too great to admit of its being safely conducted to the cylinder in pipes.

The principal merit of the design of the engine is its simplicity and compactness. We need not dwell upon this point, as it is sufficiently shown in the annexed engraving.

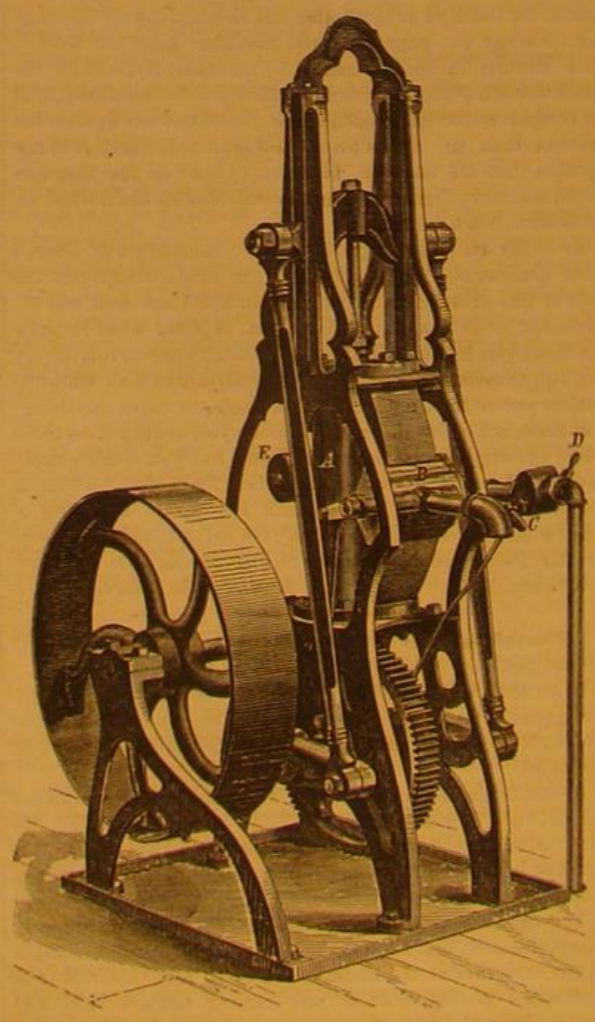


Fig. 2 shows the construction of the valve of the Coates and Lascell engine, which the inventors claim meets all the requirements of the case, claims which, upon personal inspection of the machine, we think, are well sustained.

The valve is balanced and self-packing. It therefore runs lightly and without leakage. The engraving comprises a longitudinal and a cross section, by which the construction is clearly shown.

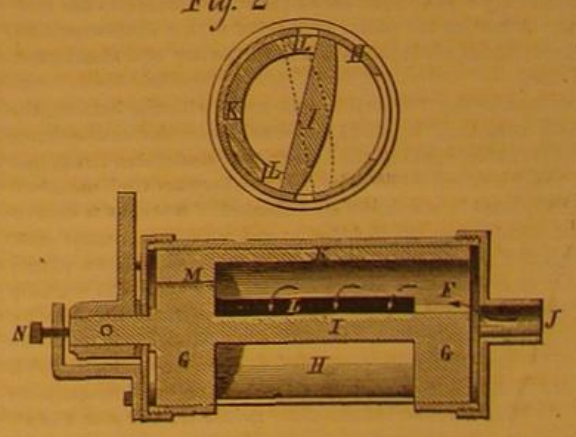
The induction port, F, is located at one end, in one of two transverse disks, G, at the end of the valve, which disks fit closely the interior of valve chest, H. The disks are connected by a flat plate, I. A hollow trunnion, J, admits the water which flows in the direction of the arrows into the valve chest. A plate, K, curved in cross section, as shown, and flush with the perimeters of the disks, G, which it connects, is convex on the outside and concave on the inside, and parallel with the plate, I. In the plate, K, openings, L, are left between the plates, I, and K, and are the eduction ports of the valve.

The plate, K, diffusing the pressure, increases the strength and resisting capacity of the valve. An orifice M, is made through the disk opposite the hollow trunnion, by which water passes through to the back of the disk, and thus balances the end pressure of the valve very nearly, only enough being allowed to act against the washer or packing placed around the stem to keep the joint from leaking. By the aid of the set screw, N, this packing may be relieved of pressure if necessary. Occasion for using this screw, however, occurs rarely, it being found that the packing is regulated by the adjustment of hydrostatic pressure above described.

At the beginning and end of the stroke, the crank travels much faster than the piston, while through the middle of the cylinder the travels of both are nearly equal; and when a governor is used, or the water throttled so as to give the engine any given rate of speed, the crank must necessarily travel much the slowest, as it must wait for the cylinder to fill the otherwise rapidly increasing area, caused by the rapid travel of the piston through the center of the cylinder. Now, to obviate this difficulty, Mr. Lassell has introduced an auxiliary pipe and valve, D, Fig. 1, which is opened by means of a separate eccentric, so adjusted that when the piston has traveled one fourth the distance from the end of the cylinder, this valve gives the additional supply of water necessary to equalize the crank's motion. The defect thus overcome is analogous to that which occurs when what is called wire drawing takes place, the piston traveling faster than the steam.

The advantages of water pressure engines over steam are that: They are always ready to run, no waiting to get up steam; no engineer is required to attend them, as opening and shutting the stop cocks is all that is required to start and stop them; there is no waste of power or fuel, where

Fig. 2



power is used intermittently—when a job is finished, the engine is stopped, and started when another is ready; there is no danger of accidents from explosions, no dirt, dust, or ashes, to annoy; no room required for storage of fuel, etc.; they can be used where steam would be inadmissable; the reduction of the rates of insurance would, in many places, pay the running expenses of a water engine; they are much cheaper than steam engines.

A modification of this engine has been made to adapt it to blowing church organs. The crank has been dispensed with, and the parts are so arranged that the organist can start and stop it from his seat as easily as he can pull a stop of the organ. It has a governor valve also, which is connected with the organ bellows in such a manner that the speed of the engine is governed by the bellows of the organ, resulting in perfect adaptation of supply to demand.

These engines have a counting machine attached, to register the number of revolutions, by which the engine acts as a meter, measuring its own consumption of water.

For further particulars, address the Cold Water Engine Co., Watertown, N. Y.

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MECHANICAL POWER AND SPECIFIC WORK.

Upon no other point are men so constantly making mistakes as upon the subject of mechanical power applied to a specific purpose. A man having to put a barrel of pork in his wagon, and finding himself unable to lift it, makes an inclined plane of a plank, rolls up the barrel, and thinks he has gained mechanical power thereby. If visionary, he may, perhaps, go further, and argue that as there has been a clear gain of power, there can be no impossibility in constantly repeating the gain, and so, by the aid of suitable mechanism, solving the problem of perpetual motion.

The plank may serve as the type of all mechanism, and if it can be clearly explained what is really gained by its application, we shall have the clue to the general use of all machinery.

In the first place, the barrel is to be raised to a given hight; which, without the aid of the plank, the man finds himself unable to do, no matter how long or how arduously he may labor. If we can now comprehend the reason why he cannot raise it without the plank, we shall be better prepared to comprehend what is the peculiar office of the inclined plane, and shall be able to place it in the same category with those of all the (inappropriately so called) mechanical powers, of which machines are composed.

We must, however, first comprehend the fundamental fact, that the mere exertion of force (bearing in mind that force is not mechanical power) never does any work whatever. A ball may rest upon a table forever, constantly exerting a pressure or force towords the earth's center, but never doing any work. Work is the movement of masses, and the word movement implies distance through which bodies are moved. It is only, then, when force is applied through distance that work is done; and as to traverse space or distance requires time, we only arrive at a standard of measurement of mechanical power, expended in the performance of work, by taking for the unit a body moved against a given constant resistance (1 lb.), through a given distance (1 ft.) in a given time (1 m.); or the foot pound in common use, equivalent to a pound of matter raised one foot in hight in one minute of time.

When we say simply that force performs work, we do not express the whole truth. When we say force, exerted through distance, *in time*, performs work, then we cover the whole ground.

But while any force, operating through any distance, in any length of time, great or small, will perform *some* work, we find that the amount accomplished depends primarily upon the magnitude of the force, and the length of time through which it can be exerted. In mechanics, we increase the time a force acts by increasing the distance through which it acts, and *vice versâ*.

But force (static) and resistance (static) are correlative terms, and if by any means we lessen the action of one, we also lessen the action of the other, since there cannot be any exertion of force unless it is opposed by an equal exertion of force.

Therefore, a force applied to the elevation of a weight, or the overcoming of a resistance, must be a little more than the resistance; that is, the force in pounds, multiplied into the distance in feet it must act to perform the work, must be more than the resistance in pounds, multiplied into the distance through which it is to be overcome. If these products are equal, the body will not move, but will be in a condition to move with the application of the slightest degree of force, the velocity with which it will move depending upon the difference between the opposing forces. The reason why the weight cannot be raised by the unaided strength of the man, in the above illustration, is that his muscular force, multiplied by the distance the barrel is to be raised, is less than the weight of the barrel multiplied by the same distance.

Now, when the barrel rests on the plank while being rolled up, the resistance is divided into two components, one of which acts in the direction of the earth's center, and the other against the muscular energy employed in rolling the body along the inclined plane. The muscles only are called upon to overcome a fraction of the resistance required to be surmounted in directly lifting the body from the ground; but this fraction of the weight, multiplied by the distance through which the barrel is rolled, is precisely equal to the entire weight, multiplied by the hight to which it is raised; and as work is force overcome through distance, the expenditure of mechanical power, measured in foot pounds, is precisely the same in both cases. All the plank has done has been to render possible the application of the limited power of the man to the specific purpose of raising the barrel.

And this is all the lever, the screw, the wheel and axle, or any combination of these elements into a complex machine, can do. They are instruments for the application, not the generation of power. They are "mechanical powers" only in the specific sense that they enable us to apply power to definite purposes. They transmit only; they create nothing. When, then, a man speaks of dynamic power being multiplied through leverage, he is talking utter nonsense. Static pressure may, however, be so increased.

We have never yet met a man who permanently believed in the possibility of a self-moving machine, who could comprehend the distinction between static force, or pressure, and pressure acting in time and through distance, or mechanical power.

Many of those who can make the distinction fail to do so in their reasoning, and thus err in conclusions. Our correspondence reveals to us the fact that many inventors of ingenuity, and well versed in mechanical resources, are wrecking their hopes upon this rock. The law of virtual velocities lies at the very bottom of the science of dynamics, and mechanics cannot comprehend too early that, in the words of Grove, "Mere pressure never does work."

EXTINGUISHING FIRES BY CARBONIC ACID.

It is well known that fires in coal mines have been extinguished by pumping in vast volumes of carbonic acid and afterwards cooling down the adits by water. How far such a method would succeed in the open air and with burning houses is a question that can only be determined by actual experiment. One of the best ways of driving carbonic acid out of caves and wells is to let down a red hot cannon ball. The rarification and expansion produced by the heat soon displaces the carbonic acid, and renders a descent into such a place possible. This experiment, frequently shown in the chemical lecture room, would seem to throw some doubt upon the probable success of any attempt to play a stream of carbonic acid upon a burning building. Another question to be considered is the one of heat of the combustible material. If it were possible to stop the combustion by a stream of gas, the great heat would re-ignite everything the moment the air was allowed free access, unless as, in the case of the coal mine, great volumes of water were poured on to cool everything down below the point of ignition. If this be true, it would be easier to put out the fire by water in the first place than to be at the expense of double engines for gas and water. Another difficulty may arise in the transportation of carbonic acid through iron tubes. It is well known that this gas can be easily split up or dissociated by passing through a system of heated tubes, and although it is not probable that the same thing would take place with cold iron mains, it might be well to institute an experiment or two before laying down a few hundred miles of pipe. When a fire is put out by water, the intrepid firemen are often deluged with water to cool them and to protect them from danger. In the case of carbonic acid, every living being would have to keep at a safe distance, and a bad leakage or an unfortunate aiming of the pipe might produce disastrous consequences.

We understand that at the last session of the Legislature, a law was passed authorizing a company to lay pipes, three feet beneath the level of the streets of New York, for the purpose of extinguishing fires by carbonic acid. It is intended to convey the gas in the same way as illuminating gas is furnished to consumers, from large reservoirs or gasometers, and to have—we cannot call them hydrants—but something on the same plan, for attaching hose all over the city, ready to put out any fires that may occur.

Whether private houses are to be furnished with double pipes so as enable the gas men to deluge them if occasion should require, we are not informed. Nor is anything said in the act of incorporation about furnishing free soda water by saturating the Croton reservoir with the gas. The whole scheme looks suspicious, and we should really like to know if the project has ever been seriously entertained.

HOW BODIES MAY BE FROZEN BY HEAT.

The fact that there now exist several machines which through the consumption of coal produce ice, is one quite inexplicable to many; and perhaps while we are enjoying our iced drinks, so grateful in the hot weather suddenly come upon us, an explanation of this apparent paradox may not be unacceptable. That heat should directly or indirectly produce cold seems, at first thought, an impossibility; nevertheless, in the laboratory of nature this is an operation constantly going on; and it is in this wise:

Whenever a body changes from a solid to a liquid state, or from a liquid to a vaporous condition, large amounts of sensible heat disappear. Either the temperature (sensible heat) of the body itself falls very much lower than it was before its change of state, or sensible heat is abstracted from surrounding bodies to maintain the expanding substance of its former temperature. The heat abstracted and stored up in the body, so that it no longer produces the effects popularly included in the term "heating," has been called latent heat. Its amount varies greatly in different solids, liquids, and vapors.

Now there are two ways in which bodies may be expanded, namely: by adding to their heat—sensible or latent, or both—or by removing the pressure their surfaces sustain. Or we may, if we choose, both impart heat and remove pressure simultaneously.

Thus the gas chlorine, when submitted to a pressure of about four atmospheres, becomes a liquid, and will remain so as long as the pressure is continued. During the act of compression, it gives off a certain amount of heat, which is the exact equivalent of the mechanical power employed in reducing its volume. When the pressure is removed, it expands to its original bulk as a gas, and in so doing takes the same amount of heat, from other bodies, as it lost when compressed. Air, when compressed, gives off heat, and absorbs the same amount again when it expands. In reducing the volume of bodies, we may not only use compression, but we may also abstract heat by bringing them into contact with colder bodies, thus powerfully aiding the mechanical power in bringing about the desired result.

But mechanical power is only another name for heat, the source of all terrestrial power. If we employ a water wheel to generate our power, we find this possible only because heat has raised the water for us. If we use wind as a motor, it is heat that puts the air in motion; and if we employ steam, we must do the same thing. If we use an electro-motor we find our materials prepared for us through the same agency.

The various ice machines employ volatile materials such as expand into gas at ordinary temperatures, or at least do so when atmospheric pressure is removed from their surfaces. In thus expanding they abstract heat from water placed in suitable vessels, brought in contact with the absorbing bodies. The expanded gases are next compressed, the heat given off during the compression being absorbed by some other body—most generally water. The condensed and cooled materials are then allowed to expand in contact with the vessels containing the water to be frozen again, and so on repeatedly until ice is produced.

Thus we see that heat indirectly produces cold, and this is only an expression of a general law. Nothing can gain heat without loss of heat in something else, and though the gain or loss may be latent and not appear in the temperature, yet we may be sure that the sum total is always the same.

CO-OPERATIVE COLONIES.

It seems to us that coöperative colonies might be made the means of improving the condition of a very large proportion of those who crowd our commercial centers, and who have nothing to rely upon for support but their physical toil. There are large areas in this country where a very small amount of labor will supply ample food and clothing for a large family. In many of the Southern States, there are lands where an industrious laboring man could, with the produce of a very few acres, and the wages of such work as he might get to do, live in a measure of comfort which, with constant toil, early and late, he never could attain in any large city.

Some three years since we visited the State of Delaware, and noticed particularly the results of the intelligent cultivation of the worn-out lands of the section through which we passed. A judicious rotation of crops, together with a supply of fertilizers derived from the bodies of king crabs, and other materials of which the shores of Delaware Bay afford an almost unlimited supply, will, it has been demonstrated, render the lands adjacent to the bay extremely productive.

We saw clover, corn, wheat, peanuts, and sweet potatoes growing in great luxuriance; while peaches, grapes, pears, and berries, find there an unequalled climate and soil, the entire country teeming with these fruits.

In addition, the salt marshes abound with game birds; the tidal rivers swarm with fish, so easily taken that large quantities are caught with a small expenditure of time. The shores of the bay furnish such supplies of oysters that we saw them sold at twenty-five cents a bushel. The climate is so mild that cheaper houses, less clothing, and less fuel suffice. Truly, thought we, for men who get their living by their muscles, this is a veritable Canaan.

The coöperative colonies, which have been formed lately in this city, designing to avail themselves of the natural advantages of productive sections of our vast territory will, we hope, some of them prove so successful that they will demonstrate the value of such coöperation.

To be successful these associations should, as much as possible, embrace a variety of the mechanical trades of the most general utility. They should have their own tailors, shoemakers, carpenters, blacksmiths, cabinet makers, and wagon makers. They should admit only those of sober and industrious habits, fully impressed with the value of coöperative effort and really understanding what coöperation means. They should be particularly careful to exclude all that is liable to breed discord, and should adopt such codes of regulations as can be practically adhered to by all well disposed members.

We are inclined to believe that many of these associations are organized in too hasty and crude a manner to be successful, and that they do not sufficiently scrutinize the character of their members.

In the selection of localities, those which afford the best opportunities for diversity of industry will, in the end, always prove the best.

We are the more inclined to favor these organizations from the fact that they are making an intelligent effort to better the condition of the laboring classes, and that they are composed of select and peace loving workingmen, who see that in the strikes and other means employed by trades unions to force higher wages, the true interests of labor are not really advanced.

STEAM ON THE ERIE CANAL.

We find it necessary to repeat what we have already said in regard to the propulsion of boats, under the conditions specified in the New York State law offering the $100,000 prize.

Many of our correspondents apparently think it is sufficient to confine their thoughts to the invention of a means of propulsion, without regard to speed. We have already shown that the minimum velocity required by the act (three miles per hour) involves a modification of the form of the square box boats now in use. The advance of such a boat at the required speed would create injurious side swells, no matter what means of propulsion were adopted.

Some of our correspondents appreciate this difficulty and regulate their plans accordingly. One suggests the employment of side wheels, with outriggers carrying longitudinal shields running parallel to the sides of the boat and outside of the wheels, the shields to be as long as the boat. This would undoubtedly prevent side swells to a very great extent, but it would make the width of the boat so great in proportion to its tunnage that it could not carry the stipulated load and get through the locks.

Another correspondent proposes a wheel with radial flukes, which shall engage the bottom of the canal and thus propel the boat. This device is old, and besides does not provide for the obviation of side swells.

As we understand the law, the speed may exceed three miles per hour, provided the inventor can so construct his boat that greater velocity can be safely attained.

Inventors will see that the conditions under which success can be attained are few, and those of failure numerous. It would be wise for many of them to give the law more careful scrutiny than they appear to have done.

BUILDINGS FOR MANUFACTURING PURPOSES.

Some two or three years since we called attention to the necessity of a special profession of "Architectural Engineering." Our interest in the subject has now been revived by a failure of an expensive building, designed by a supposed competent architect, for a special manufacturing business, to answer the purpose for which it was built. The proprietors have, we are informed, been compelled to expend considerable money and lose valuable time to rectify its defects, besides having to change machinery from floors upon which it was originally placed to others less convenient.

The fact is that men who can build graceful and handsome churches are not therefore necessarily competent to design a factory, esp cially one intended for new branches of industry. To imitate is not to design. But every new building intended to be occupied by machinery long used and well understood, must, although the same ground plan is observed, be more or less varied in detail to adapt it to the peculiar circumstances of its location, the soil upon which it stands, etc. It requires more than artistic talent and knowledge of the properties of materials to do this. Knowledge of the nature of the operations to be carried on in the building, judgment matured by experience, and inventive skill, combined with skill in the art of building, are necessary.

Some of the finest manufacturing buildings in the country were in their internal arrangements entirely designed by men familiar with the peculiar industry for which they were constructed, but who were quite unfamiliar with architecture as an art.

Utility rather than beauty must be the controlling idea in erecting such buildings. Yet whenever without sacrificing convenience and strength to appearances, beauty of design can be secured, it is of course very desirable. To combine these elements requires no mean skill, and it is evident that to greatly excel in this class of work a man must have made it a special study.

EX-COMMISSIONER FISHER'S EXPERIENCE IN THE PATENT OFFICE.

We commence this week the publication of extracts from a speech recently delivered before the Young Men's Christian Association, Cincinnati, by Hon. S. S. Fisher.

The incidents he relates occurred while holding the office of Commissioner of Patents, and his amusing experience is not unlike that of the chiefs of other bureaux under the Federal Government. We have withheld the publication a week or two, undecided if we could afford the space the lecture would occupy. But his description is so graphic and racy, and portrays such a good insight into the peculiarities of office seekers generally, that we decide to make copious extracts, which will be continued through several numbers.

INSPECTION OF THE BOTTOMS OF WELLS.—Sufficient light to enable any one to see the water or earth at the bottom of a well, can be directed down the shaft by means of an ordinary looking glass. If the well be under cover, two glasses will be required, and our own ingenious readers will, by a little experimenting, soon be able to arrange them in the right positions.

[Special Correspondence of the Scientific American.]

BURDEN HORSESHOE PATENT EXTENDED---VALUE OF THE INVENTION.

Washington, D. C., June 26, 1871.

On the 14th of June the famous patent of Henry Burden, of Troy, N. Y., for a Horse and Mule Shoe Machine, was extended by Commissioner Leggett. No contestant appeared in opposition to the extension. The patent was issued June 30, 1857, and reissued in 1865.

Mr. Burden died in January last, and the applicants are his two sons, Mr. James A. Burden and Mr. I. Townsend Burden. He was a man of strong intellect, great energy, and untiring perseverance. To perfect the machine referred to was the ambition and success of his life, and no efforts or sacrifices seemed to him too great for its accomplishment. Others had labored in the same direction, but had failed of success, and abandoned their undertakings. It required the inventive talent and extraordinary persistence of such a man, together with his unusual pecuniary resources and mechanical facilities, to work out the difficult problem. Mr. Burden's first efforts to this end were made prior to 1835, in which year he was granted a patent for a machine, which however proved a failure, and involved a heavy expenditure. In 1843, he received a second patent on another device, but this also failed when put to practical use. In 1853, his determined efforts suffering no abatement in the intervening time, he decided to abandon the particular line of devices he had hitherto chosen in his experiments, and to adopt certain others involving different mechanical principles. The happy result appeared in his patent of 1857. He subsequently devised important improvements, which were embodied in another patent issued in 1862. As an automatic feeding, bending, and molding machine, the patent of 1857, just extended, was all that could be desired, but in the process of creasing and punching the nail holes some difficulties arose, which were overcome in the patent of 1862.

When first entering on his experiments, and this was as early as the year 1835, Mr. Burden carried on extensive iron works, of the highest grade, at Troy: but during the years, from 1853 to 1857, his general business was in many ways sacrificed to the one great object he had so long and sanguinely had in view. Many stories are told of his intense and enthusiastic application at that time; how for days and weeks his meals were brought to his place of business; how he often worked, sometimes in company with his favorite mechanics, 24, and even 30, hours without intermission; and how he many times called up all his workmen at midnight to open the mills and manufacture some new device or modification. His rolling mills were often idle for weeks, that all his hands and shops might be devoted to the horseshoe machine, in its embryo, but surely developing, condition. His machine and pattern shops were at that time fully equal to any, if not the best, in the country; and were provided with the most approved implements.

The present machine turns out, with unerring certainty and perfection, one shoe in a second of time. The average weight of a shoe is one pound, and it is not uncommon for one machine, in the ordinary running of the shop, to transform 10½ tuns of bar iron into perfect shoes in 12 hours, which is equal to the hand work of at least 600 men for the same time.

To estimate the saving to the country from a general adoption of this important article, it must be borne in mind that the prevailing prejudice against its use compelled the inventor to place it in market at a price returning him no profit whatever, and not even covering the cost of manufacture. In other words, he offered it at the price of the material, looking for his returns exclusively to the regular profit on the manufacture of the iron, the machine materially increasing the business of his extensive puddling and rolling mills.

With some modifications, this plan has been adhered to up to the present time, and it is contended by the firm that the public, in proportion to its adoption of the machine horseshoe, is saved the entire cost of the manufacture by hand, the profits to the manufacturer being derived from the invention only so far as the iron is thereby put in a more saleable form.

The average charge for making a horseshoe by hand is estimated by some at sixteen cents, by others as high as twenty cents (the material of course not included); the average price of the Burden shoe has been 8½ cents, so that the latter brings to the consumer a saving of at least two thirds on the entire cost. During the last year, the machine shoe has been sold at still lower rates, averaging less than five cents.

Since the introduction of the invention, 82,000 tuns of iron have been used in the manufacture, and the sales have amounted to $9,000,000, showing a saving to the public of $18,000,000.

It would be difficult to estimate the expenditures and losses during the many years of experiments. In the four years previous to the issue of the patent, the losses caused by the interruptions of the general business of the establishment amounted to at least $100,000. A famous litigation suit, in protection of the invention from an infringement, cost the inventor the sum of $25,000.

The prejudice, already referred to, against the article, both among the blacksmiths and the consumers, was general, and often bitter and violent. In New York city the excitement at one time rose to such a pitch that a blacksmith who had resolved to make trial of the shoe, was killed by his fellow workmen. This opposition was caused in part, and not unreasonably so, by the defective quality of the shoes put on the market by other parties, and even by Mr. Burden himself, on his first attempts to introduce them; and to overcome this, when the manufacturing process had become perfected, was a difficult task, and involved great labor and heavy expenditures. Mr. Burden's sons and other responsible agents visited all sections of the country, and personally conferred with the leading master workmen. Charging the machine with the expenses of inventing and perfecting it, of making and selling the product, and the market price of the iron, and crediting it with all the proceeds of the sales, it is pretty clearly shown that the inventor and his heirs have sustained a heavy loss.

The value of this invention in its relation to the military operations of the late civil war may not be generally known. Many thousand men were spared for active field service whose services would otherwise have been required in the shops. Quartermaster-General M. C. Meigs says: "The army depended, to a very great degree, upon shoes made by this machine, and they gave satisfaction wherever used. It is not possible to state its value to a government. It is one of those inventions which add to the military strength of a nation, not to so great a degree, but in the same manner as the steam engine, the steamboat, and the locomotive."

Assistant Quartermaster-General J. A. Donaldson writes: "During our civil war, as Chief Quartermaster of the Military Division of the Tennessee, and afterwards of the Missouri, I had ample opportunity of testing these shoes, and found them superior in every particular to those made by hand. In the great operations of our armies—when it would have been impossible to manufacture a sufficient number by hand—such, for example, as Sherman's Atlanta campaign, and his March to the Sea—the Burden horse and mule shoes were an essential element of success, and I cannot speak too highly of them."

During the war, about 14,000 tuns of shoes were used in the Government service, the price paid being even less than market price to private individuals, and the saving, as compared with the cost of the same if made by hand, was about $4,000,000.

The history of this invention, if fully written, would finely illustrate the workings of a strong inventive intellect, impelled by an energy well nigh heroic and borne over obstacles and through labyrinthine delays by the presence of a never failing hope. Mr. Burden knew no misgivings, and failures only stimulated to greater exertions. But what we know of the inventor's life is sufficient to excite our admiration and quicken our appreciation of the measure of human vital force that may be embodied in one important invention.

Mr. Burden was born in Scotland in 1791, and came to this country in 1819. He received a thorough education in mathematics and engineering, and in boyhood displayed much inventive genius. In 1820, he invented the first cultivator in the country; in 1840, the railroad spike machine, which became widely known, not only from its intrinsic value, but also from an extended litigation to which it gave rise. Other valuable inventions might be referred to. A thorough mechanician and mathematician, he wasted nothing in blind and random labors.

During the war, Mr. Burden took much interest in furnishing to the various Sanitary Commission fairs, held in the leading cities, miniature horseshoe machines, and the suitable white metal for manufacturing diminutive shoes, which were sold in great numbers as ornaments or mementoes. It has been stated that the sum of $20,000 accrued to the Sanitary Commission from these sales; and many will remember that, at the New York city fair, they were conducted with great success by Mrs. General McDowell. ‡

STEAM FIRE ENGINES.

The boiler and works of a steam fire engine with a running gear are so constructed as to dispense with a reach or perch pole, and to allow the forward wheels to be turned completely under the frame in such a manner as to place the weight of the parts upon the axles, and relieve the frame of all strain except what is necessary to preserve the proper relative position of the axles. This construction of steam fire engines renders them less liable to be injured or disabled by the giving way of parts, and adapts them also to be turned or managed with greater facility, accuracy, and safety, while the engineer and firemen have such access to the engine and boiler, respectively, as greatly facilitates the performance of their duties. The parts composing the engine are arranged directly over the front axle, and the boiler on the rear axle, the axle being connected by curved reaches or braces. Thus the front wheels may be turned completely round the engine, which facilitates turning in narrow limits, and enables the tongue and connected parts to be placed out of the way of the engineer. This construction also allows the engineer and fireman to work entirely separate or without one being in the way of another, and removes the weight of both engine and boiler entirely from the reaches, enabling them to be made light so as to reduce the aggregate weight and cost of the machine. The saving effected in repairs, and the increased speed with which this engine may be driven, alone, are claimed to equal or exceed in a brief period its entire cost.

Invented by Lysander Button and Theo. E. Button, of Waterford, N. Y.

Brick Kiln.

This invention consists in improving the construction of brick kilns, so that the over burning of some and insufficient burning of other bricks can thereby be prevented, as well as the unnecessary waste of fuel. It consists in the application to the top of the kiln of a series of horizontal intersecting flues, and of registers above the crossings of the flues, whereby the products of combustion can be directed in their course. Upon a brick kiln of suitable size and shape, and built up of

raw brick in the well known manner, with furnaces, eyes, and crevices for the proper distribution of heat, is placed a course of bricks, in such manner as to leave horizontal, longitudinal, and transverse flues, which intersect each other. The outermost flues are quite close to the verge of the kiln. All the flues are in proper connection with the smoke crev ices, so that all the products of combustion enter the same. Upon this course is laid another course, set on edge and close together, so as to cover the flues made in the first course. The brick of the top course are preferably fire brick, so as not to be injured by rain water. Cement may by used, to securely close the joints in the top course and prevent the escape of heat through crevices. Samuel C. Brewer, of Water Valley, Miss., is the patentee of this improvement.

Preparing and Bleaching Paper Pulp.

John Campbell, of Chatham Village, N. Y., has invented an improvement in preparing and bleaching paper pulp and other fibrous materials. His invention has for its object to improve an apparatus for preparing and bleaching such substances, patented in 1869, so as to make it simpler in construction, cheaper, and more effective in operation; and it consists in a combination of a receiver and supply tube, with an induction air pipe.

The paper pulp or other material to be bleached is placed in a suitable vessel, and agitated and thoroughly mixed by a paddle wheel, working in a compartment with an inclined or curved floor, in the ordinary manner. An air pump or blower may be used, or anything that will force the atmospheric air through the mass. The inventor prefers to use two, one at each end of the engine or vessel holding the material to be bleached.

The pipes from the blower are led into the engine in such a direction that the currents of air, in addition to hastening the bleaching of the material by rapidly combining with said materials the chemicals used, will also drive the mass in the same direction in which it is driven by the paddle wheel. With one or both the air pipes is connected a tube, provided with a stop cock, near its intersection with the said air pipe. To the upper end of the tube is connected a cup or receiver, to receive the chemicals to be introduced into the engine or vessel holding the material to be bleached. With this construction of the apparatus, a chlorine solution, of one third less strength than is used in any other process, is placed in the engine, and the chemicals to be introduced into the solution are placed in the receiver. The paper pulp or other material to be bleached is placed in the engine, and the paddle wheel and fans are set in motion. Then, by adjusting a stop cock, the chemicals in the receiver are introduced with more or less rapidity, as may be desired, into the air pipe, and are carried by the blast of air into the engine, and thoroughly and rapidly intermingled with the material, thus producing ozone oxygen with great rapidity, without the use of a chlorine gas generator, and, it is claimed, bleaching the mass of pulp in fifteen minutes.

When the bleaching is completed, the stop cock admitting the chemicals is closed, and the stirring and air blast are continued for a sufficient length of time to drive off all the remaining gases before they have had time to injure the material.

The Progress of Discovery.

Science has long been known to have a romantic aspect, and her wonders are becoming daily more numerous. Poetry and the exercise of the imagination, are exhibited by many of her most enthusiastic votaries; and a glance at our letter files will show her comic side, although humor must be considered as her last attribute. We condense a letter from a correspondent, address unknown, into the following statements, remarkable for their originality, and the courage with which they are advanced:

Fat in the body is stored up during sleep. Nature makes us sleep more (if we let her) before a rain storm than at any other time, to give us an extra supply of fat for heating and *waterproofing* purposes. When we feel unusually drowsy (not having fatigued ourselves, or taken a narcotic), we may feel perfectly certain that rain, hail, or snow, will fall in our district within twenty-four hours.

Our correspondent rightly claims these discoveries as his own, and says, with obvious truth, that he "never met, or heard of, any one who could foretell the approach of rain, etc., by the above method." Neither did we. He is sound in the last assertion, without doubt.

The Rights of Labor.

"In this land of liberty," writes a correspondent of the Haverhill *Gazette*, "a man should have a right to sell his labor—the work of his hands—at any price he pleases; he should be the sole judge—no one else has a right to interfere. It is the old oligarchy of slavery. What is the difference whether you are a slave to an individual or to a society? The result is the same. Every man has a right to fix the price at which he will work, the number of hours he will work, and all the conditions relating thereto. It is a matter which concerns himself alone, and the capitalist has the same right; he is the sole judge how much he can afford to pay. No society or combination has a right to interfere. The whole question of wages is and should be a personal matter between the employer and the employé. What right has an outside—a third person—to say at what price or how many hours per day, one man shall work for another? None at all.

"If I can get three dollars for working ten hours per day, and am strong, robust and hearty, and believe it for my interest and the interest of my family,—if I can better educate them, impart to them more culture and refinement, and give them a higher social position, by *working fourteen hours for four dollars and twenty-five cents*, who has a right to say I shall not work the fourteen hours per day? How or where does any one—the legislature or a society—find the right to step between me and the man who wants my labor, and say how much he shall pay or how much I shall receive? It is time this question was settled. The sooner it is settled, the better it will be for laboring men. Capital can stand it better than labor, because it does not require daily food, meat, and drink to live upon."

Can Filling and Soldering Apparatus.

Leopold Charly Straub, of Pittsburgh, Pa., has invented a new and improved can filling and soldering apparatus, which is an important improvement if, as claimed, it will economize time and material during the operation, and produce satisfactory workmanship.

The invention consists, first, in the arrangement, on a rotary frame, of a series of swivel disks, on which three or more cans can at once be supported, one to be filled, one closed, and the third soldered. It also consists in the application to the said rotary frame of certain gearing and spring catches, whereby the can which is being soldered can be rotated under the soldering apparatus to receive the binding material around the cover. A hinged hopper for filling, and a new arrangement of soldering apparatus is also employed. These cans are simultaneously operated upon. One can under the hopper is filled, the next receives the cover, and the third is soldered. When one has been soldered it is released, another empty can is brought into position, and so on continuously.

Steam Sewing Machines.

Steam power for driving sewing machines is extensively used, especially in the larger establishments. An example is seen at the great dry goods concern of A. T. Stewart & Co., in this city. On the fourth floor are about 500 females and a small number of male assistants, engaged in various branches of cutting and fitting female apparel. The majority of these employés are operators on sewing machines. The machines are ranged in rows, and are moved by steam. An operator can start or stop the running of a machine by the use of her foot on a pedal, which connects with a friction roller attached to a shaft which is worked by steam. The employés are enabled to make very good wages by means of this ingenious invention.

THE returns to the department of agriculture indicate an increase in the acreage of wheat, compared with that of last year, of four per cent, nearly three-fourths of a million acres, nearly all of which are west of Mississippi. In New England there has been a small decrease, while in Massachusetts the condition of the crop is 14 per cent below the average; in Connecticut 6; in Georgia 25, and in California 42. None of the principal wheat-growing States indicate a poor yield, and unless subsequent disasters occur, the crop will be fully equal to that of last year.

No plant yields anything like as much nutriment from the same extent of soil as the banana. Alexander von Humboldt estimated that it returns twenty times as much as the potato, and a hundred and thirteen times as much as wheat.

Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—SETTING BOILER.—I wish to set a boiler, and should be pleased to have your opinion upon the following: My boiler is fourteen feet long, thirty-two inches in diameter, having no flues at all. To save fuel, I thought of having it arched over with a fifteen or seventeen inch arch perpendicular, to return the heat over the top. Will it injure the top sheets of the boiler to wall it up in this way? I don't intend to carry more than twenty to twenty-five pounds of steam.—A. M.

2.—LEAKY BOILER.—I am using a large upright boiler, which leaks badly at the ends of the tubes. Calking does it no good. I am under the impression that I saw something advertised in your paper for stopping leaks in boilers. I have looked over my back numbers, but cannot find it. If you can inform me of anything that will do any good you will much oblige—R. C. P.

3.—RECOVERING MERCURY FROM OLD BATTERY PLATES.—Can any of your readers give me a cheap method of recovering the mercury from old battery plates?—G. E.

4.—STRAIGHTENING SHADE TREES.—I have been informed that there is a process for straightening shade trees by slitting the bark. Will some one tell me on which side of the bend the slits are to be made, at what time of the year, etc.?—L. P. O.

5.—DRESSING MILLSTONES.—What is the best method of laying off and dressing millstones thirty-six inches in diameter, so as to secure the highest production of corn meal, ground very fine, in a given time?—C. W. D.

6.—SOLUTION OF OZONE.—Will some chemist inform me, through your columns, how to prepare ozone (on a small scale) and retain it in solution in a solvent, or in any fluid—for instance, in a solution of chlorinated soda? What is the simplest process for preparing the ozone, and then impregnating the above solution with it? Any other particulars will oblige.—B. F. R.

7.—CASE HARDENING.—What is the process of case hardening, and is there any way of hardening a large body or mass of steel or iron by a bath, solution, or other mode available in such a case?—L. H. M.

8.—CHEAP HORSE POWER.—I would like practical directions for constructing, at the least possible expense, one or two horse power for farm use, to cut feed, saw wood, churn, etc. Farmers cannot go to the expense of an iron wheeled concern, costing a hundred dollars or more, but want something that an amateur mechanic can make.—E. G. A.

9.—GALVANIZING COPPER PLATES.—Please to inform me of the simplest and best method to galvanize copper plates for amalgamating.—J. H. H.

10.—AN IMPORTANT WANT.—A metal or alloy for culinary utensils, such as pots or kettles for stewing acid fruits, is a great desideratum. Neither iron, brass, nor copper will answer. Porcelain lined kettles would meet the conditions of the case if they were durable; but the porcelain soon cracks and flakes off, then galvanic action sets in, and a hole is soon eaten through the kettle. Many cooks stew fruits in tin pans, but the tin soon wears off and the pan is ruined. Some metal not affected by fruit acids is needed.—J. H. P.

11.—IRON SLAG.—I am desirous of utilizing our iron slag. As it runs from the furnaces it is too brittle. I wish to find an amalgam that will hold it together and toughen it, if such a thing be possible.—H. N. M.

12.—BURSTING OF CASTINGS.—I am making cast iron wheels six feet in diameter. The bodies of the wheels are light, but the hubs are pretty heavy; and they all burst apart after being taken out of the sand for cleaning. They always break in the rim, although the wheels are quite cold when taken out. We use No. 1 pig iron.—L. A. P.

13.—COAL.—Which coal is the best and most economical (the price being the same), anthracite or bituminous? And does bituminous coal burn out or destroy a boiler faster than anthracite coal? Since the high price of anthracite coal, many have used the Cumberland coal in this section of the country. Some like it and some do not. I went the other day to buy some Cumberland, and the dealer did not talk very favorably regarding it, saying that "there was sulphur in it that destroyed the plates of the boiler," etc. I have used both, and cannot tell which is the cheapest. But I like the bituminous for making steam, as I have a small boiler, and have to make steam fast, and think there is not blaze enough to anthracite coal to heat the tubes of the boiler. If any of your correspondents, having tested the two coals, would furnish some facts, they would be of great value to many in this part of the country besides myself.—G. H. W.

14.—HARDENING CEMENT.—Is there any artificial means by which hydraulic cements can be made hard in a few days?—B. & D.

15.—WASHING FLANNELS.—I am fairly annoyed in the washing of my flannels. They will shrink, no matter what I do to prevent it. I have tried various remedies to no purpose. Now, I would respectfully ask, Can flannels be washed without shrinking them? If so, how?—H.

16.—CHEAP BATTERY.—Will some kind reader oblige me by telling me how I can construct a cheap battery and instruments to learn telegraphy? I would like to learn it, but I have not the time nor the money to do so. I think I could make the apparatus if some one would tell me how.—T. G. B.

17.—COATING GLASS.—Is there any process by which to deposit a metallic coating on the interior surface of a glass demijohn, the neck of which is too small to admit one's hand? Silver will do, if nothing cheaper can be used, for the purpose. All that is required is a metallic film of some kind that can be deposited from solution.—C. E. G.

18.—CEMENT FOR AQUARIUM.—What will make a good cement for an aquarium?—C. E. G.

19.—QUARTER TWIST BELT HOLE.—Will some one tell me how to draft a quarter twist belt hole in a floor?—J. E. D.

20.—COAL SMOKE INJURIOUS TO GRAIN CROPS.—Are the gases contained in coal smoke injurious to wheat or other grain on which it settles? A piece of ground lying at the end of the switch of our railroad where there is a good deal of coal smoke from engines every day, had on it a crop of wheat, sown in the very best condition, and looking well until harvest; but it is almost altogether a failure, as the grains are not more than half filled. Wheat of the same kind, but grown in different fields, is very good, the soil in this field being of the richest quality. Some think the gases from the smoke (of which there is a great deal over this field), at a certain period in the growth of the grain, will injure it.—D. C. R.

21.—MARBLEIZED SLATE.—Will some correspondent tell me what is the paint and glazing used in marbleizing or polishing slate or iron mantels? What do they coat iron beams with to keep them from rusting under ground?—A. D. L.

22.—CIRCULAR SAW.—LONG STEAM PIPE.—I am operating a circular saw mill at this place. The mill is run by a 12 by 20 engine, and is located 180 feet from our boilers. The steam is supplied through a three inch wrought pipe, placed out of the ground, on posts from eight to twelve feet high. The pipe as yet has never been cased in, and in consequence we work a great deal of water through the cylinder. We intend casing the pipe in a wooden trough ten or twelve inches square, and packing ashes around the pipe. Will this prove to be of much advantage, and will it prevent the steam condensing so much? We are now compelled to work with our cylinder cocks open to get rid of the water. Is there no method of superheating the steam, should our casing not prove sufficient to prevent condensing, or is there no method of separating the steam from the water before it reaches the cylinder? What is the probable loss by transmission of steam that distance? I have a saw that is cupped or dished, which makes it heat in the center in sawing. Is there any way of remedying it?—R. L. C.

23.—HARDENING BRASS.—How can I harden brass after it has been annealed, without hammering or rolling it?—W. R. P.

24.—OILING BELTS.—Will some of your numerous readers, experienced in the use of leather belts, give information as to the best, that is, the quickest and cheapest method of oiling belting? Also, is there danger of putting too much oil on the leather?—C. H. C.

25.—ELECTRIC MACHINE.—How can I make an electric machine that I can turn by hand, and create electricity sufficient to run a diminutive electric engine? I am a gunsmith, with good facilities for such work. I wish to get or make a nice machine for experimental purposes.—H. L. C.

26.—WELDING STEEL.—Can I weld two pieces of sheet steel, eighteen inches wide and one eighth of an inch in thickness, burr joint (?), so as to have a durable joint?—M. L.

Inventions Patented in England by Americans.

June 6 to June 10, 1871, inclusive.

[Compiled from the Commissioners of Patents' Journal.

BRETELLES.—R. H. Eddy, Boston, Mass.
DINING CARRIAGE.—G. M. Pullman, Chicago, Ill.
HOISTING MACHINE.—J. Scott, Pontiac, Mich.
JOURNAL BOX.—B. C. Baker, Toledo, Ohio.
LUBRICATOR.—H. A. Clark, Boston, Mass.
PAPER BINDER.—E. Dyer, Providence, R. I.
PINCERS.—A. Clarke, Philadelphia, Pa.
PNEUMATIC SIGNAL.—A. G. Myers, New York city.
SLEEPING CARRIAGE.—G. M. Pullman, Chicago, Ill.
STAMPING MACHINE.—E. Dyer, Providence, R. I.
TRUSS.—T. A. McFarland, Erie, Pa.
WATER INDICATOR.—F. Millward, Cincinnati, Ohio.

Foreign Patents.

The population of Great Britain is 31,000,000; of France, 37,000,000 Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000 Patents may be secured by American citizens in all of these countries. Now is the time, while business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & Co., 37 Park Row, New York. Circulars, with full information on foreign patents, furnished free.

Examples for the Ladies.

Mrs. Mary B. Hamlin, of Troy, N. Y., earned with a Wheeler & Wilson Machine, in 1870, $1,113.49, stitching shirts.

The List of Local Newspapers

Published by Geo. P. Rowell & Co., Advertising Agents, No. 40 Park Row, New York, offer great advantages to those advertisers who wish to attract custom from the rural population among which the papers circulate. They are furnished free, to any address, on receipt of stamp.

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.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

Boilers.—Allen's patent will prevent scale from forming, and not injure the iron. In 3 gallon cans, price $6. J. J. Allen, Philadelphia.

Wanted.—Assistance to get out Canal Propeller. Address Jos. Hough, Norristown, Pa., who has a double acting one now planned out.

Wanted.—Partner to build the Revolving Cylinder Steam Engine. Had a test of five years. W. H. Morton, Hamilton, Ohio.

The RAILROAD GAZETTE is read and preserved, and therefore it pays to advertise in its columns.

The "Ball & Fitts" Water Meter, warranted accurate and reliable, and acknowledged by those who have examined and tested them the best water meter ever used. Manufactured by Union Water Meter Co., Worcester, Mass.

Power Punching and Shearing Machines.
For car builders, smith shops, rail mills, boiler makers, etc. Greenleaf Machine Works, Indianapolis, Ind.

J. A. Whitman's Water Wheel Governor beats them all for bis. and price. Auburn, Me.

I have received, through the agency of Munn & Co., a patent on the best Summer Cook Stove in the market. The exclusive right, except for this State, for sale cheap. J. D. Kellogg, Jr., Northampton, Mass.

Electrical Instruments, Models, etc., made to order, and Gear Wheels and Pinions cut, by W. Hochhausen, 113 Nassau st., Room 10, N. Y.

Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth st., Brooklyn, manufacture Presses and Dies. Send for Catalogue.

Bright and industrious American, Scotch, English, German, or French boys, of 16 years or older, who desire to learn the machinist trade, in a first class establishment, will please address, for terms, P.O. Box 685, Hartford, Conn.

The Bucket-Plunger Steam Pump discharges at both strokes, with only two water valves. Valley Machine Co., Easthampton, Mass.

Wanted.—A machine to make galvanized iron eave cornice. Address T. J. Heizmann, Altoona, Pa.

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.

Peck's Patent Drop Press. Milo Peck & Co., New Haven, Ct.

Lord's Boiler Powder is only 15 cts. per pound by the bbl., and guaranteed to remove any scale that forms in steam boilers. Our Circular, with terms and references, will satisfy all. Geo. W. Lord, 107 W. Girard ave., Philadelphia, Pa.

Improved mode of Graining Wood, pat. July 5, '70, by J. J. Callow, Cleveland, O. See illustrated S. A., Dec. 17, '70. Send stamp for circular.

Ford's Portable Tobacco Press for Planters. Will sell Virginia, Maryland, Missouri. Address Ford's Tobacco Warehouse, Evansville, Ind.

Air Cylinder Graining Machine.—A perfect tool for House Painters and Manufacturers of all kinds of Decorated Ware. Complete Machine for $50.00. Send stamp for Circular. The Heath & Smith Manufacturing Co., 44 Murray street New York.

For the most perfect Band Instruments in the world, send to Isaac Fiske, Worcester, Mass. Illustrated Catalogues free on application.

The Patent for the best Hydrant, or Fire Plug ever invented, for sale. For descriptions, terms, etc., address Lock Box 356, Lockport, N. Y.

Best Scales.—Fair Prices. Jones, Binghamton, N. Y.

Steam Watch Case Manufactory, J. C. Dueber, Cincinnati, Ohio. Every style of case on hand, and made to special order.

L. & J. W. Feuchtwanger, Chemists, 55 Cedar st., New York, manufacturers of Silicates of Soda and Potash, and Soluble Glass.

For Hydraulic Jacks, Punches, or Presses, write for circular to E. Lyon, 470 Grand st., New York.

Belting that is Belting.—Always send for the Best Philadelphia Oak-Tanned, to C. W. Arny, Manufacturer, 301 Cherry st., Phil'a.

Send your address to Howard & Co., No. 865 Broadway, New York, and by return mail you will receive their Descriptive Price List of Waltham Watches. All prices reduced since February 1st.

Ashcroft's Low Water Detector, $15; thousands in use; can be applied for less than $1. Names of corporations having thirty in use can be given. Send for circular. E. H. Ashcroft, Boston, Mass.

To Cotton Pressers, Storage Men, and Freighters.—35-horse Engine and Boiler, with two Hydraulic Cotton Presses, each capable of pressing 75 bales an hour. Machinery first class. Price extremely low. Wm. D. Andrews & Bro., 414 Water st. New York.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro, 414 Water st., N. Y.

Improved Foot Lathes, Hand Planers, etc. Many a reader of this paper has one of them. Selling in all parts of the country, Canada Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N. Y.

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

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Glynn's Anti-Incrustator for Steam Boilers—The only reliable preventive. No foaming, and does not attack metals of boilers. Price 25 cents per lb. C. D. Fredricks, 587 Broadway, 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.

Answers to Correspondents.

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 must be by volume and page.

ROACHES.—On page 394, current volume, query No. 3—"Is there any sure poison for roaches, that may be used without danger to children and domestic animals?" Being somewhat of an entomologist, I may be excused for stating that the *Blatta*, vulgarly called the cockroach, belongs to a genus of nocturnal orthopterous insects; these are prolific, laying masses of eggs, carefully wrapped all around. These hatch, and when the young scamps are no larger than ants, they will penetrate into boxes, chests, etc., through the smallest apertures, and enter upon their depredations. They speedily attain their full size, split on the back, and change their skin, but not their habits. Although they become winged, they seldom fly, trusting to their legs, which they use nimbly in their half adult condition. During the day they hide away in cracks or anything that will afford them shelter; so soon as darkness comes on, they sally out in swarms. About a month ago, my attention was called to my kitchen and pantry. Going in with a light, I was astonished at the numbers scampering and swarming into the corners, up to the ceiling, and on the walls, a legion of dark imps that hate the light. I thought I would accommodate the pestiferous creatures with a feast; I accordingly mixed up a quantity of freshly burned plaster of paris (gypsum, such as is used by dentists, etc., for making molds and ornaments), with wheat flour and a little sugar. This I distributed, on shallow plates and box boards, placed it in the corners of the kitchen and pantry, and left them to their glory in darkness. In the morning I found they had eaten quite freely. I fed them for three nights in succession. The plaster and flour, somehow, interferes with their intestinal canal, and gives them a costive habit, and spoils their appetite, I fancy. The short of the matter is, the roaches disappeared; whether they died outright, or left in disgust, I will not undertake to say. One thing I know, however, they are scarce and far between on my premises just now. The remedy is perfectly safe and simple. Try it.—J. S., of Pa.

CHEAP BATTERY.—There seems to be a great difference in the opinions of those that have given directions for constructing a cheap galvanic battery. I have made a great many experiments with, I guess, nearly all the forms of batteries, but I don't think that there is any cheaper, or one that will give as little trouble as Daniell's sulphate of copper battery. If the person that makes the inquiry will go to any telegraph office, he can see one and learn all he wants to know about it; and if he cannot get a porous cup, he can use a common flower crock, with the hole in the bottom stopped with melted beeswax. The connections should be made with copper wire, as any other kind is soon eaten off.—A. E. T., of Ohio.

PLATING BRITANNIA METAL.—J. F. (page 378) will succeed in plating Britannia and soft solder by first depositing a coat of copper on his soft metals, and then putting them in the cyanide solution.—D. G. P., of Ill.

REFINING GOLD.—J. E. H. can refine gold by dissolving it in aqua regia, and then pouring off the solution from the precipitate. Add to the solution a filtered solution of copperas as long as a precipitate is formed. Decant and wash thoroughly. Digest in dilute sulphuric acid, and wash again, and you have pure gold. Melt in a crucible lined with borax, under carbonate of potash.—D. G. P., of Ill.

TURNING CONE PULLEYS.—Finish on cone as desired, and then turn one pulley of the other (small) cone; take two pairs of callipers, and set them to the large pulley, on finished cone, and the small pulley (after it is turned to the desired size) on unfinished cone. Hook the jaws together, and mark their aggregate diameters on a rod with an awl or pencil. Now set one pair callipers to next smaller pulley on finished cone; hook them together as before, set the other pair to the mark, and turn the next pulley to the size of the latter.—G. L. B., of Pa.

SPEEDING PULLEYS.—Multiply the diameter of the pulley in inches by the speed that it runs, and divide by the pulley driven, and so on down. Or, if a given speed be required, multiply as above, and divide by the speed required, and the answer will be the size to give the pulley.—G. L. B., of Pa.

CISTERN.—The best answer to the question of E. E. H. is that nothing but pure water should ever be put into a cistern; and then, if properly constructed, it will remain "pure and fit to drink." If a cistern be merely an open vessel, especially of wood, and the accumulation of dirt on the roof is allowed to pass in with the water, no known substance thrown into the water will really "purify" it. This is a case where "an ounce of prevention is worth many pounds of cure."—A. B., of Mass.

CHIMNEY.—Every chimney will emit a "sooty odor," when in use, depending upon the character of the fuel: but it is aggravated if the chimney be foul. The most efficacious mode of cleaning out a flue, is to burn it out, which is always a safe operation if the chimney be properly constructed. Sweeping will help it, but is not as effective as burning, and beside costs something, while a flue can be burned out in a few minutes by putting an old newspaper or two into the bottom and applying a match.—A. B., of Mass.

PREVENTING RUST.—For the benefit of G. R., query No. 5, June 24, I would suggest a solution of carbonate of soda to prevent the rusting of polished metals. The solution can be applied with a brush, or the metal can be submerged in it. The latter is much better. As a coating for iron or tin, that will effectually resist atmospheric action, and also acids, I would recommend Pierce's "stone surfacing composition."—L. P. B., of Pa.

FIXING LEAD PENCIL MARKS.—If J. H. R. will breathe on his paper for a moment, after he has written with a lead pencil, he will find his lines will stay much longer, and be much darker.—W. E. D., of N. Y.

POWER TO DRIVE SAW.—E. A. M. will find a thin saw will run easier than a thick one. The more teeth there are in the saw, the smoother it will cut, but variations in the number will not add to nor diminish the power required.—S. H.

BLACK COPYING INK—BEST EXTANT.—Take two gallons of rain water, and put into it ¼ pound of gum arabic, ¼ pound brown sugar, ¼ pound clean copperas, ¼ pound powdered nut galls. Mix, and shake occasionally for ten days, and strain. If needed sooner, let it steep in an iron kettle until the strength is obtained.—E. G. A., of Minn.

NOISY GEARS.—I had in charge three pair of bevel gears, 30 inches diameter, running 120 revolutions per minute. The driver had wooden teeth, and at a distance of 40 feet could not be heard. I lubricated with tallow and black lead, with a little oil added, to keep it soft, twice a week, and they ran very well.—T. S., of Pa.

N. & Co.—We do not believe exhaust steam, in passing through a pipe surrounded by shavings, would be likely to ignite the shavings.

W. F. W. asks why is the bearing of a shaft or saw arbor called a journal? Because when it rotates, it is supposed to travel or go on a journey, and take notes thereof—hence journal.

B. A. J., of Wis.—If thills are pivoted to a wagon below the line of draft, the horse lifts the load to some extent, and thus does not draw quite so hard; but, as what he does not draw he carries, his work is just as hard, if not harder than it would be if the thills were pivoted higher.

J. D. N., of Ca.—A person acquainted with arithmetic can, if ordinarily intelligent, and willing to apply himself closely to study, make very fair progress in algebra without an instructor.

R. H., of Vt.—Like all other perpetual motion devices we have seen, yours has the trifling difficulty that it cannot be got to work on its own account. The reason is given in another column, in an article entitled "Mechanical Power and Specific Work."

B. G. C., of Ala.—The unpleasant odor of gas stoves, arises from the permeability of the tubing, and partly from the products of combustion. The latter does not render the food cooked unwholesome, but the air is rendered more or less unfit for breathing, and of course deleterious to health, unless good ventilation is secured.

J. G., of ——, will find directions for building a cheap ice house on page 359, Vol. XXIII, of the SCIENTIFIC AMERICAN.

W. J. B., of Dakota.—The principal objection to the Belgian system of wire cable towing is the difficulty in dealing with the slack, and keeping the cable in the center of the canal in rounding curves.

T. H., of Mo.—If, as you say, you have been a reader of the SCIENTIFIC AMERICAN for six years, you ought to have learned from it by this time that there is no such substance as you inquire for. The old "sailor man" who tells you he can discover gold or silver, by attraction of divining rods or magnets, is either self-deluded or is trying to delude you.

G. V., of Conn.—Have received a large number of letters on the canal question, for publication, where the parties desired to put their inventions against a modest amount of capital. We have not room for yours.

A., of N. Y.—The information you seek will be partly found in Box's "Treatise on Heat." To find complete data, you will need to search through many different works relating to heat.

W. B. W., of N. Y.—The U. S. gold coins are alloyed with copper.

J. E. W., of N. Y.—Brass scraps are remelted and used. They sell readily as old brass. Leather scraps are also utilized by a process you will find in another column.

NEW BOOKS AND PUBLICATIONS.

HERMES MERCURIUS TRISMEGISTUS; his Divine Pymander Also, The Asiatic Mystery, The Smaragdine Table, and the Song of Brahm. Edited by Paschal Beverly Randolph. 8vo, pp. 144. Boston: Rosicrucian Publishing Company. 1871.

We are told in the preface of this book that "the Divine Pymander, or Poemander, as it is now more commonly rendered, meaning 'shepherd of men,' comes from Egypt. It is not a child's book, nor a sectarian work, but it is a divine revelation." Further on it says: "In this book, though so very old, is contained more true knowledge of God and Nature than in all the books in the world, I except only Sacred Writ." The Rosicrucians who publish the book, say of themselves: "We claim to stand in the door of the dawn, within the cryptic portals of the luminous worlds, and that the lamp that lights us is Love Supreme! Unlike others, we do not recognize God as the Light—for this can be seen and known—but as the *Unfathomable Shadow*, the unsearchable *Center*, the impenetrable *Mystery*, the unimaginable *Majesty—utterly* past discovery—and who, as we approach, ever recedes, luring us through illimitable ages and epochs, up the steep mountain of *Achievement*—the whole end of man's being—in which opinion we of course differ from all philosophies in Christendom." Then, to show what they mean by "achievement," they express the following very high opinion o three well known modern characters—"Men, for instance, like James G. Bennett, James Fisk, Jr., and B. F. Butler, beyond all cavil the three ablest men on this continent, in their respective spheres, and whose superiors in absolute individuality of character cannot, today, be found on earth; born *kings of will*, and intensity of purpose"—in fact, we suppose they represent the *trismegistus*, or thrice great Hermes of modern times. We have not room for more extracts, and can only say that philologists have pretty much come to the conclusion that no such person as Hermes ever existed, and that the twenty thousand books attributed to him are quite as apocryphal as the author himself. The presumption also is that the Rosicrucians never had more actual existence than the Pickwick Club.

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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.

OFFICE INDICATOR.—Lewis Burger, of Chicago, assignor of three fourths his right to W. S. Gobble, of Scottsville, Ill.—A novel combination of parts whereby the necessary routine information will be given to parties inspecting it when the office is closed or open, has a tablet for orders, a small receptacle for business cards, a letter box, a clock dial, whose hands can be set to indicate the hour at which the office is opened or closed, disks which display through appropriate apertures the day of week, month, and name of month respectively, etc.

MILKMEN'S SIGNALS.—Elisha Belcher Blake, of Tarrytown, N. Y.—This invention has for its object to furnish an improved house or receptacle for the pitcher or other vessel in which the milk is received from the milkman, to protect said vessel from dust, dogs, cats, rain, etc., and obviate the necessity, of watching for the milkman, and which shall be so constructed as to sound an alarm when the door is opened. If no other benefit should be derived from this invention than the suppression of the unearthly screech with which milkmen in New York and Brooklyn announce their arrival, the inventor must be hailed as a public benefactor.

APPARATUS FOR STEAMING AND FILTERING.—John Murdock, of South Carver, Mass.—The object of this invention is to provide convenient and simple means for performing various operations in and around the household, and it consists in a receptacle elevated on legs, with a funnel shaped bottom and flanged top, whereby it is adapted for steaming substances smoking meat, filtering water, etc. Upon this receptacle is placed a cask in steaming food for cattle or in smoking meats. Filtering material is placed in the funnel in cleansing water. One or more casks or vessels may be fitted to the stand, as seen in the drawing, and used as occasion may require. In filtering or leaching, the purified liquid or lye is discharged through a pipe at the bottom. Steam may be introduced through a pipe for cooking vegetables for feeding animals. A small stove may be connected with the funnel, in which sawdust or other combustible material may be slowly burned for smoking meat in a cask. All the operations referred to have to be performed on the farm, and great inconvenience has been experienced for the want of a suitable stand on which to support barrels or vessels for these purposes. By this stand the barrel is suitably elevated and supported and the processes named may be performed in a convenient manner.

EYE BALSAM.—William Klingbeil, of Champaign City, Ill., has invented an eye balsam, composed of various substances found in the U. S. Dispensatory, which, applied externally, in such proportions and at such intervals as will appear most adapted to the nature of each case, will, he claims, cure diseases and defects of the eye, especially those leading to or arising from short-sightedness.

GRATE BAR.—William Muir, Archibald, and Pierce Butler, Carbondale' Pa.—These grate bars have a broad base and narrow top, with concave sides and oval top, and a deep longitudinal groove in the bottom; they also have numerous transverse openings from the bottom up through the sides and part of the top, calculated to extend upwards considerably in the fuel to admit the air freely to fine fuel, such as culm, sawdust, spent tan bark, and the like.

WATER FILTER.—William Linton, Baltimore, Md.—This invention relates to a filter so constructed that a large central chamber is provided for the reception of asbestos, which constitutes the filtering material used, and in which a smaller chamber is formed at each end of the cylinder or case, the same being divided by a scroll or spiral partition, so that the water takes a spiral course on entering and leaving the filter. Suitable nozzles are also provided for reversing the current of water and thus cleansing the filter.

SOLDERING FURNACE.—Andrew J. Burke, Baltimore, Md.—This invention consists in an apparatus whereby the soldering of the parts of a can together is effected, without the use of the hot iron, by causing the cans to gradually advance along a heated plate till the solder becomes melted, and then shoving the cans aside upon a cooler plate, where they remain till the solder cools, and the parts are thereby joined together.

TENONING MACHINE.—This is a machine for trimming tenons of wood, whereby, it is claimed, much time is saved and the work is more accurately performed than it has hitherto been. It consists in a knife and adjustable guides in combination with a properly constructed frame. The machine is adapted to various kinds of tenons, but is especially useful in trimming spoke tenons. An adjustable guide supports the small end of the spoke while the sides of the tenon at the other end are being trimmed. In trimming the sides of the tenon the main guide is adjusted so as to give the tenons the desired thickness. In being trimmed, the spoke is held firmly in the required position by two guides, one of which slides out and in or to and from the bed, and is varied as to hight by means of an incline. For trimming the edges of the spoke tenon, a flap or apron is adjusted or inclined to correspond with the disk of the wheel, and the knife will cut the edge of the tenon so that it will fit the mortise in the hub and give the proper or desired dish to the wheel. The machine may be used in making wooden wedges, the flap in this case being adjusted to give the wedge the desired angle. Andrew C. McQuaid, of Wenona, Ill., is the inventor.

SEATS FOR STORES.—Socket plates are affixed to the under side of the counter, in which brackets are fitted, which support the seats in such a way that both brackets and seats may be turned under the counter when not in use. Daniel Christian, of Chagrin Falls, Ohio.

PROPELLING BOATS BY OARS.—The oar is made in two parts, and the other portions of the device are so constructed that the rower may sit with his face in the direction the boat is advancing, and at the same time feather his oars. The invention of Thomas G. Pringle, of New York city.

COAL SCUTTLE.—The invention of Edgar Eltinge, of Kingston, N. Y., has for its object the improvement of a shield or cover patented by him in 1866. It consists in a construction and combination of parts, designed to make the shield cheaper and more convenient.

ATTACHMENT FOR VACUUM CUPS.—This invention supplies an electro-magnetic or galvanic attachment for Dr. Hadley's vacuum cups and receivers, patented in 1867, by the use of which an electric, galvanic, or magnetic action is exerted upon the selected nerves, and conveyed to any part of the nervous system, at the same time that an influence is exerted upon the arteries, veins and lymphatics, when a vacuum is produced in said cups or receivers. William Amer, of Janesville, Wis., is the inventor.

SILK SWIFTS.—John N. Stearns, of New York city.—The heads of the swift are made of sheet metal, of circular or other suitable form. The central axle is made also of sheet metal, tubular, and soldered to the centers of the heads. The projecting gudgeons, by which the swift is hung in the supporting frame, are rivets driven through the plates, so that their heads abut against the inner faces of said plates. They are retained in place by solder, and the central tubular axle is applied after the rivets have been secured, and covers their heads. The silk holders or rounds are of wire, and their ends are fitted through apertures in the end plates, and soldered to outer faces; or they may be laid over the edges of the plates and then soldered to their outer faces. It is claimed that by making a metallic swift in the manner specified, lightness, durability and cheapness are secured.

WRENCHES AND PIPE TONGS.—James A. Morrison, of Brady's Bend, Pa., has invented a combined pipe tongs and wrench. The device consists of two handles, curved on one side of their pivot, and two curved serrated jaws pivoted thereto, in such a manner as to adapt them to hold tubes, etc., whether true cylinders or not. The rear parts or handles of the levers or arms are made straight, and their forward parts are curved, so as to point toward each other, and upon them are formed tenons, which enter recesses in the convex sides or backs of the curved jaws, to which they are detachably pivoted by short bolts and nuts, so that the said jaws may adjust themselves to objects of different sizes and shapes.

IMPROVEMENT IN CONSTRUCTION OF CARS.—The car is made mainly in tubular form and of sheet metal, except a supporting frame or platform. The latter is composed of two long parallel beams tied together by cross-bars, and the body consists of an outer shell of sheet metal plates bent over T ribs, and an inner shelf, similarly fitted to the inner sides of the said ribs. The ribs rest at the ends on the timbers, and are firmly attached to them, and spring over from one to the other in a true circle. The ribs are arranged as far apart as the width of the sheets which are joined thereto and secured by riveting or by any other means. A level floor stretches from side to side above the beams and rests thereon, and a curved plate is suspended between the beams below the floor to form an air passage for admitting air from the ends along under the floor, to rise up into the car through holes therein, and between the outer and inner shell. The inner shell is perforated for allowing air to enter between the two walls, above the contents, and to pass down and into the contents, when of grain or other like substance, through the perforations below the grain; or air may enter the spaces from below the bottom, the latter being supported above the beams and passages provided between it and the beams.—John E. Leeper, of Godfrey, Ill., is the inventor.

PLOW ATTACHMENT.—John T. Hovis, Clintonville, Pa.—This invention relates to the combination with a plow of a vertically reciprocating cutter bar, similar to those used in mowing machines, the office of which is to sever such lodged and prostrate grass stalks, stubble, etc., as may be in the line of the furrow, thus preventing the plow from clogging with such vegetable matter, and also enabling it to turn the same under, so that it may rot, and thereby fertilize the soil.

MAGAZINE FIREARMS.—John L. Kirk, of Mattoon, Ill.—This invention consists in the arrangement of certain devices to form one of the now numerous class of firearms which carry a magazine of ammunition in a cylinder, composed of a cluster of barrels or tubes, soldered or otherwise fastened together. The construction gives a very compact and apparently effective arm.

GRAIN CLEANER.—John H. Weaver, of Gap, Pa.—This is a new combination of familiar devices in a fanning mill, or grain cleaner, whereby the inventor claims increased efficiency in separating wheat and other grains from chaff and other foreign bodies, such as straw, sticks, seeds, etc.

ELECTRO-MAGNETIC MEDICAL APPARATUS.—This invention relates to several improvements in the arrangement of electric apparatus used for generating electrical currents, which are to be applied to invalid and sick persons, for healing diseases. It consists in an improved arrangement of the battery, binding terminals, and adjustable magnets, and in a novel general combination of parts, whereby a compact, safe, and portable apparatus is produced. Albert J. Steele, of Brooklyn, N.Y., is the inventor.

HARNESS BUCKLE.—Thomas Crakes, of Mishawaka, Ind.—This invention has for its object improvement in buckles, or fastenings, for various parts of harness for horses, etc., but more especially designed for coupling the hames. The end parts of the buckle are made with hooks, or eyes, upon the outer ends, to hook into eyes, or rings, attached to the straps or hames to be connected. The other parts of the buckle are constructed to give a convenient and secure fastening.

REVOLVING FIREARMS.—John L. Moss and Edward W. Johnson, of Columbus, Miss.—This invention has for its object to facilitate the loading and shell extracting process in revolving rifles and pistols; and consists, principally, in the use of a rotary breech plate, which is hung upon the base pin, so that it will revolve, but not slide thereon, while the cylinder can freely slide, being connected with the barrel by keys. The breech plate has grooved supports for the cartridge head, and will retain the shells when the cylinder is carried forward, extracting them from the latter.

HARVESTER DROPPER.—John N. Wallis and Theodore Wallis (assignors of one third of their right to Henry G. Wise), of Fleming, N. Y.—This invention has for its object to furnish an improved attachment for harvesters, which shall be so constructed as to drop the grain in compact gavels at the rear of the body of the machine, entirely out of the way of the machine on its next round, and which is at the same time simple in construction and convenient in operation. The dropper consists in a series of parallel bars, or slats, attached at their forward ends to a shaft, the journals of which work in bearings in the framework. The framework is extended back, with an inclination toward the rear of the body of the machine, and to its pivoted rollers, around which passes an endless apron. The endless apron is driven from the mechanism of the reaper, and is designed to receive the gavels from the dropper, transfer them to the rear of the body of the machine, and drop them. The grain is transferred from the dropper to the endless apron by a beater, which consists of a series of slightly curved fingers, attached to a shaft, the journals of which work in bearings in the frame work. The fingers of the beater pass up between the slats of the dropper, lift the grain from said dropper, and transfer it to the endless apron. The throw or movement of the beater may be regulated as desired. A foot lever, operated by the driver, serves to throw the apparatus into or out of gear. The harvester should be provided with a stop, to prevent the cut grain from falling upon the dropper while the grain upon said dropper is being transferred to the endless apron.

WATER WHEEL.—This invention has for its object to furnish an improved water wheel, which shall be so constructed as to overcome the lateral and centrifugal pressure that is wasted upon the rims and scrolls of most wheels, and thus produces no useful effect. Upon the interior surface of the outer sides of the buckets are formed curved flutes, shoulders, or offsets, the effect of which is to give the water a spiral direction, and distribute it equally over the discharge or reaction buckets, thus preventing the wheel from clogging, and relieving the scroll from the centrifugal and lateral pressure. George W. Leonard, of Middle Valley, Pa., is the inventor.

SIDE-HILL PLOW.—George W. Leonard, of Middle Valley, Pa., has invented a swivel, or side-hill plow, so constructed as to raise the top of the working mold board to prevent it from clogging, and to enable it to turn a better furrow. It consists in the combination, with the double mold board, of an adjustable plate. Each edge of the forward part of the double mold board serves alternately as a share and as a cutter, as the double mold board may be turned to turn the furrow to the right hand and to the left hand side of the plow. The division line between the two mold boards of a swivel or side-hill plow must necessarily be low, so that it does not properly turn the furrow sluice, and is liable to choke and clog. To remedy this, the inventor pivots a plate to the upper part of the double mold board. The lower part of the plate is so formed that when turned to either side it locks fast, and forms a continuation upward of the mold board of the other side, causing the plow to work much more effectively, turning a better furrow.

EXTENSION SHANK FOR BORING BITS.—William S. Pattin, of Portsmouth Ohio, has invented an improved means for locking a bit holder and bit, so that the latter will have no side play, but will tend to move constantly, without deviation, and in a perpendicular line, through the timber. If it be perceived to bind or work with unusual friction, a turn on a nut forces a sleeve upon the converging shank of the bit, and centers the latter in perfect alignment with the stock. An extension shank is fastened in the bit in the same way as ordinary bits. The end of the shank is provided with a fastening dog for securing the bit. The sleeve is square inside, and from the screw thread the extension shank is square to the end to fit the sleeve. When the sleeve is allowed to slide back on the extension shank, the fastening dog, being pivoted loosely to the shank, falls back, and allows the end of the bit to enter. When the sleeve is forced up by the nut, the dog is inclosed by the sleeve, and a hook enters the notch in the end of the bit shank, while the end of the sleeve incloses the shank of the bit and firmly holds it in place.

FURNACE FOR MELTING ORES AND METALS.—This invention relates to a new and important improvement in the process of melting iron in cupolas, or melting po s, which, it is claimed, has demonstrated its utility in actual use. It consists in allowing one or more currents of air to enter the cupola or pot above the tweers, during the process of melting, thus supplying an additional quantity of oxygen to the carbon in the cupola, thereby converting the carbonic oxide evolved into carbonic acid, greatly increasing the temperature in the furnace by producing a more perfect combustion, and consequently more perfectly liquefying the iron. One or more pipes are introduced into the cupola, at any point above the tweers, and either above or below the feed door. Each has a funnel attached to it, the lower end of which extends to near the floor, or as low as may be found desirable. The upward rush of the gases in the cupola, produced by the blast below, causes a strong draft of air through the pipe into the cupola, producing the results before stated. By this simple device it is claimed that the iron is rendered more fluid, its quality is improved, and certain castings, which have hitherto baffled the most skillful foundery men, are produced with the utmost ease, sound and perfect in all respects. W. S. Wood, of Newtown, N.Y., is the inventor.

SASH LOCK.—This is the invention of Robert R. Ball, of West Meriden, Conn. It is a simple, and at the same time effective, sash holder and lock.

WATER GATE.—William C. Hopwood, Fillmore, Ind.—This invention consists in the combination of a gate for water-course fences, with an iron rod stretched across the stream, either in one piece, or in as many different sections as may be necessary, said rod being properly fastened at its ends to the banks of the stream, and, at as many intermediate points as may be expedient, to posts or stones in the bed of the stream. The gate aforesaid is also combined with braces, which, when the water is low, rest on the bottom of the stream and keep the gate upright.

APPLICATIONS FOR EXTENSION OF PATENTS.

PUMP.—J. D. West, East Orange, N. J., has petitioned for an extension of the above patent. Day of hearing, September 13, 1871.

HORSE POWER.—George E. Burt, of Harvard, and Abram Wright and Geo. F. Wright, of Clinton, Mass., have petitioned for an extension of the above patent. Day of hearing, September 6, 1871.

ROCK CUTTING AND DRILLING MACHINE.—William Plumer, Boston, Mass., has petitioned for an extension of the above patent. Day of hearing, September 20, 1871.

HAND STAMP.—T. J. W. Robertson, Washington, D.C., has petitioned for an extension of the above patent. Day of hearing, September 6, 1871.

Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing

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116,252.—GUN LOCK.—J. Albright, Pleasant View, Mo.
116,253.—DIVIDING POWDERS.—G. P. Allen, Woodbury, Conn
116,254.—HORSE HAY RAKE.—F. Andrews, Galesburg, Ill.
116,255.—BOILER.—J. F. Antisdell, G. W. Cronk, J. H. Haviland Janesville, Wis.
116,256.—GAGE.—Wm. E. Babcock, East Pembroke, N. Y.
116,257.—FASTENER.—A. G. Batchelder, Lowell, Mass.
116,258.—PATTERN CUTTER.—J. Bean, Jr., Pent Water, Mich
116,259.—SECTIONAL BOILER.—B. F. Bee, Harwich, Mass.
116,260.—BOLTING FLOUR.—L. G. Binkly, Baughman, Ohio.
116,261.—SERVING RIGGING.—I. W. Bowden and J. D. Leach Penobscot, Me.
116,262.—CORN SHELLER.—O. A. Bryhn, W. T. Farre, Montreal, Canada.
116,263.—SCREW MACHINE.—A. Buckminster, Boston, Mass.
116,264.—TWEER.—John Cappon, Rochester, N. Y.
116,265.—BLOWER.—E. Carleton, Cape Elizabeth, Me.
116,266.—TEMPERING SPRINGS.—A. Cary, New York city.
116,267.—TEMPERING OVENS.—A. Cary, New York city.
116,268.—CURRY COMB.—Jules Chaumont, Woodhaven, N.Y
116,269.—SAW FRAME.—W. Clemson, Middletown, N. Y.
116,270.—BOLT MACHINE.—D. S. Coe, Pine Meadow, Conn.
116,271.—CHAIR.—N., C. O., and A. Collingnon, Closter, N. J.
116,272.—HEAD LIGHT.—A. Collins, J. Hardy, Galesburg, Ill.
116,273.—VALVE.—A. A. Common, Regent's Park, London, Eng.
116,274.—SEASONING WOOD.—S. Constant, Peekskill, and J. Smith, Brooklyn, N. Y.
116,275.—MECHANICAL FIRING.—S. Danks, Cincinnati, Ohio.
116,276.—PENCIL SHARPENER.—S. Darling, Providence, R. I.
116,277.—IRONING BOARD.—J. W. Davis, Reno, Nev.
116,278.—PULVERIZER.—G. P. De Yo, Groton township, Ohio
116,279.—DRYER.—E. Drevet, New York city.
116,280.—EGG CARRIER.—W. Duchemin, Charlottetown, P.E.I.
116,281.—CANAL BOAT.—W. T. Duvall, Georgetown, D. C.
116,282.—DREDGING MACHINE.—John Ebert, Chicago, Ill.
116,283.—STEAM GENERATOR.—N. T. Edson, New Orleans, La.
116,284.—VEHICLE.—Clark Elliott, Woodland, Cal.
116,285.—DYNAMOMETER.—James Emerson, Lowell, Mass.
116,286.—ATOMIZER.—James J. Essex, Newport, R. I.
116,287.—SAFE.—John Farrell, New York city.
116,288.—PUNCHING MACH.—D. A. Faulkner, Centreville, Cal.
116,289.—MOVABLE STANDARD.—W. D. Fink, Windsor, Ill.
116,290.—RING DRIVER.—A. Fisher, Whitinsville, Mass.
116,291.—FLESH FORK.—Paul Fisher, Brooklyn, N. Y.
116,292.—LAMP BURNER.—S. W. Fowler, Brooklyn, N. Y.
116,293.—STEAM ENGINE.—S. B. Freeman, Ashland, Ohio.
116,294.—HOT AIR REGISTER.—D'A. T. Gale, Fort Wayne, Ind
116,295.—LAWN MOWER.—H. R. Gard, Chicago, Ill.
116,296.—LIFTING JACK.—E. R. Gard, Chicago, Ill.
116,297.—SPADING MACHINE.—L. H. Gibbs, Brooklyn, N. Y.
116,298.—ROASTING COFFEE.—J. W. Gillies, New York city.
116,299.—TREATING COFFEE.—J. W. Gillies, New York city
116,300.—HAY ELEVATOR.—C. E. Gladding, Towanda, Pa.
116,301.—SPINDLE.—D. P. Glines, Manchester, N. H.
116,302.—SASH BALANCE.—Lewis Goodwin, Bangor, Me.
116,303.—SEWING MACHINE.—T. Green, Brooklyn, N. Y.
116,304.—STEREOTYPE MOLD.—Louis Guex, New York city
116,305.—SHIELD.—C. S. Hall, Rochester, N. Y.
116,306.—SHOW CASE.—G. A. Hearn, Jr., New York city.
116,307.—CLAMP.—E. Hedge, Liverpool, T. H. Fleming, Canton, Ill
116,308.—WAGON BED.—S. Heffley, J. D. Pettit, Rochester, Ind.
116,309.—WATER CONDUCTOR.—L. B. Hill, Albany, N. Y.
116,310.—MEDICAL COMPOUND.—M. Holst, Memphis, Tenn.
116,311.—SPRING HEAD.—G. Hopson, Bridgeport, Conn.
116,312.—STEAM ENGINE.—John Houpt, Springtown, Pa.
116,313.—SLEIGH PROPELLER.—C. H. Hudson, New York city.
116,314.—PLOW.—Edwin Jennings, Candor, N. Y.
116,315.—MOWING MACHINE.—S. Johnston, Brockport, N. Y.
116,316.—CALENDAR WATCH.—A. C. Ionais, Chaux-de-Fond, Switzerland.
116,317.—JOURNAL BEARING.—A. F. Jones, New York city.
116,318.—SAFETY POCKET.—Elias Jones, Grand River, Iowa.
116,319.—VENTILATOR.—N. Jones, Buffalo, N. Y.
116,320.—EARTH CLOSET.—W. A. Jordan, New Orleans, La.
116,321.—GAS REGULATOR.—P. Keller, New York city.
116,322.—RUBBER COMPOUND.—P. J. Kelly, New York city.
116,323.—PUNCHING MACHINE.—C. Keniston Somerville, Ms
116,324.—FURNACE.—F. Kesseler, San Francisco, Cal.
116,325.—HAND TRUCK.—T. F. Kiff, Fairbury, Ill.
116,326.—FAUCET.—John Knoche, Cincinnati, Ohio.
116,327.—SEED PLANTER.—Wm. Knowland and K. Collings, Henryville, Ind.
116,328.—FLAX BRAKE.—J. C. Kurtz, Wooster, Ohio.
116,329.—FENCE.—John A. Kysor, Leon, N. Y.
116,330.—PAN LIFTER.—W. H. S. Lawrence and C. I. Collamore, Bangor, Me.
116,331.—SHUTTLE.—G. H. Lenher, Elizabeth, N. J.
116,332.—GANG PLOW.—M. Likes, Mansfield, Ohio.
116,333.—DRYING MACHINE.—J. O. Luther and Peter Staab, Grafton, Wis.
116,334.—STOVE DOOR.—D. N. Martin, Lawrence, Mass.
116,335.—LITHOGRAPHIC PRESS.—C. C. Maurice, New York.
116,336.—PISTON PACKING.—J. McAlonan, New York city.
116,337.—HOT AIR REGISTER.—J. W. McGlashan, Montreal, C
116,338.—WASHER AND BLEACHER.—H. Monroe, Baldwinsville, N. Y.
116,339.—FURNACE.—H. Mooers, Chicago, Ill.
116,340.—STEAM ENGINE.—C. Moore, New York city.
116,341.—BRICK MACHINE.—A. Morand, Leeds, England.
116,342.—PARING MACHINE.—S. H. Morse, North Jay, Me.
116,343.—CURTAIN FIXTURE.—B. Moser, Waltham, Mass.
116,344.—REFRIGERATOR.—C. E. Munroe, Cambridge, Mass
116,345.—DIE.—W. Noble, Derby, Conn.
116,346.—SCRUBBING BRUSH.—P. O'Brian, New York city.

116,347.—BOTTLE STOPPER.—J. Park, Philadelphia, Pa.
116,348.—CHURN.—T. B. Parke, Downieville, Cal.
116,349.—GAS REGULATOR.—C. C. Place, Boston, Mass.
116,350.—FOLDING LOUNGE.—W. Prufrock, St. Louis, Mo.
116,351.—COPYING APPARATUS.—W. J. Purcell, New York city.
116,352.—STEAM ENGINE.—W. Race, Lockport, N. Y.
116,353.—PISTON HEAD.—J. Rees, Pittsburgh, Pa.
116,354.—BED BOTTOM.—G. W. Robinson, Galesburg, Ill.
116,355.—PLOW.—A. Roden, Mumford, Ala.
116,356.—THRASHING MACHINE.—C. E. Roper, Canton, Ohio.
116,357.—STEAM ENGINE.—C. F. Roth, Osceola, Iowa.
116,358.—GASELIER.—J. H. Seaman, Brooklyn, N. Y.
116,359.—GASELIER.—J. H. Seaman, Brooklyn, N. Y.
116,360.—GASELIER.—J. H. Seaman, Brooklyn, N. Y.
116,361.—COOLING BONE BLACK.—C. H. Senff, New York city.
116,362.—WATER METER.—J. C. Slaughter, New York city.
116,363.—FIREARM.—W. T. Snedden, Johnstown, Pa.
116,364.—FIREARM.—W. T. Snedden, Johnstown, Pa.
116,365.—HEATER.—G. B. Snider, New York city.
116,366.—TANK.—H. F. and G. S. Snyder, Williamsport, and A. Snyder, Freeport, Pa.
116,367.—DOWEL BRAD.—J. Sowle, Boston, Mass.
116,368.—PESSARY.—H. Spillman, New Orleans, La.
116,369.—SEAT.—D. I. Stagg, New York city.
116,370.—VALVE.—N. P. Stevens, Hopkinton, N. H.
116,371.—PIPE MACHINE.—J. W. Stockwell, Portland, Me.
116,372.—DIE.—H. Thompson, Concord, N. H.
116,373.—CIGAR BOX.—J. L. Thomson, Syracuse, N. Y.
116,374.—BASKET.—B. F. Tuthill, Chicago, Ill.
116,375.—PRESERVING FLOWERS.—P. T. Vining, Springfield, Mass.
116,376.—POWER PRESS.—T. B. Wait, Zena, Oregon.
116,377.—SAPPING LOGS.—E. Webber, Gardiner, Me.
116,378.—GUIDE PLATE.—A. W. Webstet, Ansonia, Conn.
116,379.—FASTENING.—W. C. Wendell, Philadelphia, Pa.
116,380.—PRESSER FOOT.—J. Wensley, Philadelphia, Pa.
116,381.—LAMP SUPPORT.—T. P. White, Bridgeport, Conn.
116,382.—BRUSH.—J. L. Whiting, Boston, Mass.
116,383.—POWER PRESS.—M. G. Wilder, West Meriden, Conn.
116,384.—IRON FOLDING CHAIR.—G. Wilson, Chicago, Ill.
116,385.—VAPOR BURNER.—G. H. Wilson, Mansfield, Ohio.
116,386.—LATCH NEEDLE.—S. Woodward, Manchester, N. H.
116,387.—PRUNING SHEARS.—F. L. Yancey, Batavia, N. Y.
116,388.—PLOW.—C. M. Young, Meadville, Pa.
116,389.—SAUSAGE.—J. H. Zumstein, New York city.
116,390.—DRESSING STONE.—W. Adams, Edinburgh, G. B.
116,391.—TWINE CUTTER.—J. Adt, New Haven, Conn.
116,392.—FURNITURE TIP.—J. F. Akerstein, Chicago, Ill.
116,393.—VESSEL FOR OIL.—G. W. Banker, New York city.
116,394.—STEAM ENGINE.—J. Banks, Port Blanchard, Pa.
116,395.—STEAM ENGINE.—J. Barnett, Fredericktown, Ohio.
116,396.—STOVE GRATE.—M. R. Barr, Erie, Pa.
116,397.—CAR COUPLING.—J. W. Barrett, Calhoun, Ga.
116,398.—BARREL HEAD.—J. B. Barsaloux, St. Louis, Mo.
116,399.—STREET LANTERN.—J. W. Bartlett, New York city.
116,400.—BOOT HEEL.—H. H. Bigelow, Worcester, Mass.
116,401.—SELF-WATERING VASE.—W. M. Bingham, Henry Bemis, Rochester, N. Y.
116,402.—CHANNELING MACHINE.—R. Blake, Fort Wayne, Ind.
116,403.—STEAM TRAP.—J. H. Blessing, Albany, N. Y.
116,404.—SPUR.—J. C. Bohn, Allegheny City, Pa.
116,405.—TURBINE.—J. G. Boyland, G. Buchanan, Crawfordsville, Ind.
116,406.—LITHOGRAPHIC PRESS.—E. S. Boynton, Brooklyn, N.Y.
116,407.—STEAM ENGINE.—H. W. Adams, Philadelphia, Pa.
116,408.—ORDNANCE.—B. Britten, Red Hill, England.
116,409.—COASTING WAGON.—A. Brown, Springfield, Vt.
116,410.—SOLDERER.—A. J. Burke, Baltimore, Maryland.
116,411.—HOOP SKIRT.—C. C. Carpenter, New York city.
116,412.—KNIFE AND FORK.—M. Chapman, Greenfield, Mass.
116,413.—FRICTION PAWL.—W. R. Close, Bangor, Me.
116,414.—SCREW PROPELLER.—J. Cochrane, Wall Township, N.J.
116,415.—SAFE.—T. Coltrane, Cedar Township, Iowa.
116,416.—LOCK.—A. W. Cram, St. Louis, Mo., W. B. Dunbar, Chicago, Ill.
116,417.—ROWING MACHINE.—W. B. Curtis, Chicago, Ill.
116,418.—REAMER.—J. K. Derby, Jamestown, N. Y.
116,419.—DINING TABLE.—J. H. and L. Drane, Eminence, Ky.
116,420.—PUNCHING MACHINE.—J. Duff, Peoria, Ill.
116,421.—SAW.—J. E. Emerson, Trenton, N. J.
116,422.—FIREARM.—S. Forehand, H. C. Wadsworth, Worcester, Mass.
116,423.—DISCHARGING NAPHTHA.—T. Forstall, N. Orleans, La.
116,424.—SEWING MACHINE.—F. H. Furniss, Waterloo, N. Y.
116,425.—CULTIVATOR.—W. C. Gaines, Salem, Va.
116,426.—STOVE.—R. Gass, Troy, N. Y.
116,427.—CHAIR.—A. Gebhard, J. Blodan, Indianapolis, Ind.
116,428.—PLOW.—S. J. Gillham, W. C. Taylor, and W. Stolle, Vandalia, Ill.
116,429.—DIAL.—E. T. Gilliland, Cincinnati, Ohio.
116,430.—DIAL.—E. T. Gilliland, Cincinnati, Ohio.
116,431.—COUPLING.—H. C. Gilliland, Wellsville, Mo.
116,432.—SCISSORS.—R. S. Gladwin, West Meriden, Conn.
116,433.—BOTTLE STOPPER.—C. Glover, New York city.
116,434.—STAMP CANCELLER.—J. Goldsborough, Phila., Pa.
116,435.—LOOM SHUTTLE.—E. H. Graham, Biddeford, Me.
116,436.—ENGINE.—W. A. Graham, Carlisle, Pa.
116,437.—LET-OFF.—F. W. Graichen, Providence, R. I.
116,438.—GRATE.—A. Greenaway, H. J. Needham, New Albany, Ind.
116,439.—SHOE TAP.—J. C. Hancock, Charlestown, and J. C. Richardson, and E. P. Richardson, Somerville, Mass.
116,440.—RINGING HOGS.—J. and G. Heesen, and H. Nyland, Tecumseh, Mich.
116,441.—FIRE ESCAPE.—W. Henley, Chicago, Ill.
116,442.—LUBRICATOR.—J. Hodge, Harrison, N. J.
116,443.—WATER WHEEL.—O. J. Hodge, North Adams, Mass.
116,444.—STOVE.—H. T. Holmes, W. H. Priest, Little Falls, N.Y.
116,445.—WATER GATE.—W. C. Hopwood, Fillmore, Ind.
116,446.—PLOW.—J. T. Hovis, Clintonville, Pa.
116,447.—TILE MACHINE.—J. B. Hughes, Terre Haute, Ind.
116,448.—TILE MACHINE.—J. B. Hughes, Terre Haute, Ind.
116,449.—CARRIAGE SEAT.—B. Hurlburt, Fort Wayne, Ind.
116,450.—GAS.—E. Jones, Boston, Mass.
116,451.—GALVANIC BATTERY.—J. Kidder, New York city.
116,452.—DOOR LOCK.—J. H. Kinsman, Salem, Mass.
116,453.—LIGHTNING ROD.—G. S. Knapp, Winona, Minn.
116,454.—PUMP.—L. J. Knowles, Worcester, Mass.
116,455.—DIE.—W. W. Knowles, Plantsville, Conn.
116,456.—DIE.—W. W. Knowles, L. S. While, Plantsville, Ct.
116,457.—SIFTING MACHINE.—B. N. Lampman, Rutland, Vt.
116,458.—SAW MILL.—F. Layaux, Monroe, La.
116,459.—FLOWER STAND.—C. T. Lee, Taunton, Mass.
116,460.—DETECTOR.—L. L. Lee, Milwaukee, Wis.
116,461.—STRETCHING SILK.—J. N. Leonard, Rockville, Conn.
116,462.—HAIR DYE.—J. S. Letord, Sedalia, Mo.
416,463.—FILTER.—W. Linton, Baltimore, Md.
116,464.—TREADLE.—A. D. Lufkin, Cleveland, Ohio.
116,465.—COLLAR CAP.—A. P. Mason, Franklinville, N. Y.
116,466.—FIREBOX.—W. L. May, Philadelphia, Pa.
116,467.—FOLDING MACHINE.—J. C. Mayall, Boston, Mass.
116,469.—HASP LOCK.—W. C. McGill, Cincinnati, Ohio.
116,470.—ROOFING FELT.—J. B. Melvin, Lowell, Mass.
116,471.—HARVESTER.—C. Miller, Lincoln, Pa.
116,472.—BODY LOOP.—R. R. Miller, Plantsville, Conn.
116,473.—PLIER.—G. W. Moore, Newark, N. J.
116,474.—CURE OF PILES.—L. L. Moore, R. B. S. Whayre, Calhoun, Ky.
116,475.—CAR AXLE.—Eliza D. Murfey, New York city.
116,476.—LAMP.—T. North, Cincinnati, Ohio.
116,477.—DESK.—H. B. Osborne, N. W. Hammon, Des Moines, I.
116,478.—BOLT CUTTER.—A. W. Owen, M. E. Lilley, E. Canton, Pa.
116,479.—FERRULE.—J. L. Parker, Worcester, Mass.
116,480.—TILE MACHINE.—Z. F. Parus, Baltimore, Md.
114,481.—SIZING COILS.—A. Pearson, Assonett, Mass.
116,482.—BRACKET.—N. B. Peck, Woonsocket, R. I.
116,483.—VENTILATOR.—A. L. Pennock, Philadelphia, Pa.
116,484.—BRICK MACHINE.—J. F. M. Pollock, Leeds, G. Britain.
116,485.—CYLINDER COCK.—J. Porteus, Cincinnati, Ohio.
116,486.—SHAFT PROTECTOR.—A. S. Porter, N. Bridgewater, Ms.
116,487.—CRANK.—E. Quinn, Brooklyn, N. Y.
116,488.—WASHING MACHINE.—H. Richardson, Lyndon, Ill.
116,489.—FUEL.—E. H. Richter, Taunton, Mass.
116,490.—BUCK SAW.—E. M. Madden, S. D. Roberts, Middletown, N. Y.
116,491.—BOOT BURNISHER.—J. G. Ross, Philadelphia, Pa.
116,492.—TRUNK.—E. A. G. Roulstone, Boston, Mass.
116,493.—CORN PLANTER.—A. Runstetler, Peoria, Ill.
116,494.—RAIL JOINT.—J. C. Rupp, Newark, Del.
116,495.—KNIFE SHARPENER.—J. J. Russ, Worcester, Mass.
116,496.—PLANING MACHINE.—J. J. Russ, Worcester, Mass.
116,497.—CLOTH.—A. Ruzé, Gaillon, France.
116,498.—WOVEN CLOTH.—A. Ruzé, Gaillon, France.
116,499.—SHUTTLE GUARD.—J. Rycroft, L. A. White, Millbury, Mass.
116,500.—COMB CLEANER.—A. Sahlstrom, Chicago, Ill.
116,501.—EGG DETECTOR.—A. Sahlstrom, P. Rohdin, Chicago, Ill.
116,502.—SEESAW.—Sarah E. Saul, Brooklyn, N. Y.
116,503.—MOLDING MACHINE.—C. Schilling, Pekin, Ill.
116,504.—SACCHARINE LIQUID.—A. Schreiber, New York city.
116,505.—WAGON BRAKE.—F. W. Schultz, Mt. Pleasant, Iowa.
116,506.—JEWELRY CASE.—Julius Smith, Philadelphia, Pa.
116,507.—HOOP SKIRT.—T. S. Sperry, Chicago, Ill.
116,508.—CAR STARTER.—J. F. Stokes, Philadelphia, Pa.
116,509.—AUGER BIT.—James Swan, Seymour, Conn.
116,510.—CRAVAT HOLDER.—J. N. Thomson, N. Attleboro', Ct.
116,511.—CHAIN HOOK.—J. R. Thorne, Waldoborough, Me.
116,512.—MOP HEAD.—Joshua Todd, Webster, N.Y.
116,513.—PROPELLER.—C. E. Tripler, New York city.
116,514.—BED LOUNGE.—B. F. Walton, Philadelphia, Pa.
116,515.—TREATING SEWAGE.—R. Weare, Newcastle-under Lyme, England.
116,516.—TABLE FOR INVALIDS.—T. N. Webb, Baltimore, Md.
116,517.—TOOL REST.—J. S., A. N., and O. Wheeler, Worcester, Ms.
116,518.—SADDLE TREE.—P. H. Wiedersum, New York city.
116,519.—SADDLE TREE.—P. H. Weidersum, New York city.
116,520.—SEWING MACHINE.—C. H. Willcox, New York city, C. Carleton, Brooklyn, N.Y.
116,521.—SEWING MACHINE.—C. H. Willcox, New York city, C. Carleton, Brooklyn, N.Y.
116,522.—SEWING MACHINE.—C. H. Willcox, New York city, C. Carleton, Brooklyn, N.Y.
116,523.—SEWING MACHINE.—C. H. Willcox, New York city, C. Carleton, Brooklyn, N.Y.
116,524.—EVAPORATING PAN.—J. B. Williams, Glastonbury, Ct.
116,525.—WASHING MACHINE.—G. L. Witsil, Beverly, N. J.
116,526.—GATE.—J. A. Wood, Crosswicks, N. J.
116,527.—HAND CAR.—M. E. Hastings, Salisbury, Md.
116,528.—VEHICLE.—W. H. Keppel, H. Huffsey, Tiffin, O.
116,529.—BED BOTTOM, ETC.—C. Rich, Poughkeepsie, N.Y.
116,530.—MEDICAL COMPOUND.—F. Baker, New York city.

REISSUES.

4,436.—Division A.—REFRIGERATOR.—E. D. Brainard, Albany, N.Y.—Patent No. 73,292, dated Jan. 14, 1868.
4,437.—Division B.—ICE CHAMBER, ETC.—E. D. Brainard, Albany, N.Y.—Patent No. 73,292, dated Jan. 14, 1868.
4,438.—STOVEPIPE THIMBLE.—C. A. Buttles, Milwaukee, Wis.—Patent No. 95,649, dated Oct. 12, 1869.
4,439.—BESSEMER STEEL.—H. Chisholm, Cleveland, Ohio.—Patent No. 114,109, dated April 25, 1871.
4,440.—LUBRICATOR.—H. Grogan, Flatbush, N. Y.—Patent No. 105,053, dated Aug. 2, 1870.
4,441.—GLASS.—E. Ingraham, Bristol, Conn.—Patent No. 109,626, dated Nov. 29, 1870.
4,442.—BRUSH.—R. King, Brooklyn, N.Y.—Patent No. 60,013, dated Nov. 27, 1866.
4,443.—FLUTING IRON.—M. H. Knapp, Fulton, N.Y.—Patent No. 105,953, dated Aug. 2, 1870.
4,444.—IMITATION BRAID, ETC.—H. Loewenberg, New York city.—Patent No. 106,068, dated Aug. 2, 1870.
4,445.—MEDICAL COMPOUND.—D. Slade, Chicago, Ill.—Patent No. 112,858, dated March 21, 1871.
4,446.—GRIST MILL AND COTTON SEED HULLER.—J. W. Smith, Columbus, Ga.—Patent No. 114,215, dated April 25, 1871.
4,447.—PRODUCING BULLETINS, ETC.—W. Smith, H. D. Rogers, Cincinnati, O.—Patent No. 105,380, dated July 12, 1870.
4,448.—PUNCHING PRESS.—M. G. Wilder, West Meriden, Conn.—Patent No. 65,143, dated May 28, 1867.
4,449.—SEWING MACHINE GUIDE.—Willcox & Gibbs Sewing Machine Co., New York city.—Patent No. 15,402, dated July 22, 1856; extended seven years.
4,450.—WRENCH.—A. G. Coes, Worcester, Mass.—Patent No. 27,090, dated Feb. 7, 1860.

DESIGNS.

5,041.—SWIVEL.—P. G. Beckley, Newark, N. J.
5,042.—BASIN FRONT.—Francis Boyd, Newburg, N.Y.
5,043.—SHOVEL.—P. W. Groom, Philadelphia, Pa.
5,044.—GARTER, ETC.—S. Houghton, Worcester, Mass.
5,045.—BLACK LEAD BLOCK.—W. C. James, Plymouth, Eng.
5,046.—TYPE.—Alexander Kay, Philadelphia, Pa.
5,047.—CARPET.—John Magee, New York city.
5,048.—BORING MACHINE.—C. E. McBeth, F. Bentel, F. Margedant, Hamilton, O.
5,049.—PISTON.—J. H. McGowan, Cincinnati, O.
5,050.—PHOTOGRAPHIC CARD FRAME.—M. J. Rice, Boston, Mass.
5,051.—CARRIAGE SPRING.—G. B. Robinson, Derby, Conn.
5,052.—BOBBIN SCORE.—John Salisbury, Scituate, R. I.
5,053.—BUCKLE.—Louis Schindler, St. Peter, Minn.
5,054.—BUCKLE AND RING.—F. A. Schultz, Mt. Pleasant, Iowa.
5,055.—JELLY GLASS AND CAP.—J. H. Smith, D. C. Ripley, Birmingham, A. Kwoczalla, Lawrenceville, Pa.
5,056.—TYPE.—Richard Smith, Philadelphia, Pa.
5,057.—ALTO-RELIEF.—Amos Van Wart, New York city.
5,058, 5,059.—FLOOR OIL CLOTH.—J. T. Webster, Yonkers, N.Y.
5,060.—SURCINGLE FASTENING.—M. Wessen, Springfield, Mass.
5,061 to 5,064.—CARPET PATTERN.—G. C. Wright, New York.

TRADE MARKS.

351.—CLOTHING.—O. S. Baldwin, New York city.
352.—MATCHES.—Bock, Genin & Co., New York city.
353.—WRITING PEN.—C. H. Clifton, Pittsburgh, Pa.
354.—LIGHTNING ROD.—S. J. Mitchell, St. Louis, Mo.
355.—WHISKY.—J. A. Monks & Sons, St. Louis, Mo.
356.—FIRE EXTINGUISHER.—Northwestern Fire Extinguisher Co., Chicago, Ill.
357.—MEDICINE.—E. R. Phillips & Co., Freetown, Mass.
358.—NEEDLE.—Robert J. Roberts, New York city.
359.—UNDER GARMENTS.—G. A. Whiting, Charlestown, Mass.

EXTENSIONS.

RAKE.—S. T. Lamb, New Albany, Ind.—Letters Patent No. 17,685, dated June 30, 1857.
IRON.—W. Kelly, Louisville, Ky.—Letters Patent No. 17,628, dated June 23, 1857; reissue No. 505, dated Nov. 3, 1857.
SAWING MACHINE.—J. Haw, Hanover Co., Va.—Letters Patent No. 17,626, dated June 23, 1857; additional improvement No. 244, dated July 26, 1859.

Practical Hints to Inventors.

MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, have devoted the past twenty-five years to the procuring of Letters Patent in this and foreign countries. More than 50,000 inventors have availed themselves of their services in procuring patents, and many millions of dollars have accrued to the patentees, whose specifications and claims have prepared. No discrimination against foreigners; subjects of all countries obtain patents on the same terms as citizens.

How Can I Obtain a Patent?

Is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them: they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows and correct:

Construct a neat model, not over a foot in any dimension—smaller, if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row, New York, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible, and send by mail. An answer as to the prospect of a patent will be received, usually, by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

Caveats.

Persons desiring to file a caveat can have the papers prepared in the shortest time, by sending a sketch and description of the invention. The Government fee for a caveat is $10. A pamphlet of advice regarding applications for patents and caveats is furnished gratis, on application by mail. Address MUNN & Co., 37 Park Row, New York.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention, if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

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A re-issue is granted to the original patentee, his heirs, or the assignees of the entire interest, when, by reason of an insufficient or defective specification, the original patent is invalid, provided the error has arisen from inadvertence, accident, or mistake, without any fraudulent or deceptive intention.

A patentee may, at his option, have in his reissue a separate patent for each distinct part of the invention comprehended in his original application, by paying the required fee in each case, and complying with the other requirements of the law, as in original applications. Address MUNN & Co. 37 Park Row, for full particulars.

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Any person or firm domiciled in the United States, or any firm or corporation residing in any foreign country where similar privileges are extended to citizens of the United States, may register their designs and obtain protection. This is very important to manufacturers in this country, and equally so to foreigners. For full particulars address MUNN & Co., 37 Park Row New York.

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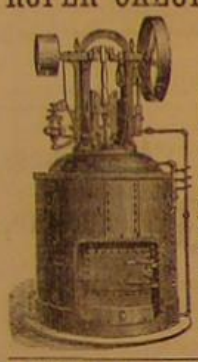
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By order of the Board of Directors.
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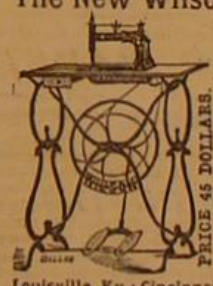
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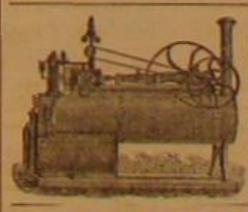


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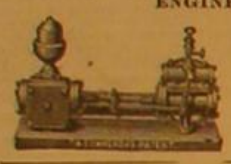
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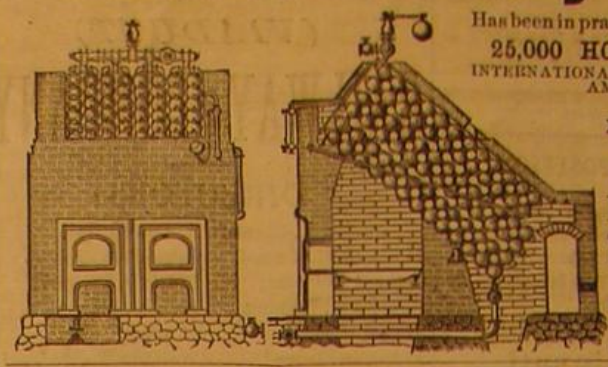
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Vol. XXV.—No. 3. [NEW SERIES.] NEW YORK, JULY 15, 1871. $3 per Annum. [IN ADVANCE.]

Improved Grain Hulling Machine.

This machine is claimed to do its work in a very superior manner, removing the exterior woody portion or bran of the grain, and leaving the nutritious portions, which are in some degree always wasted by the best milling in the ordinary way, so that the flour is enriched in quality upon subsequent grinding.

The attrition of the surfaces, by which the woody portions or hulls of the grain are removed, may be regulated with the utmost nicety; and the machine seems well adapted to the preparing of rice for market, as well as for the purpose already mentioned.

Its construction is very simple. Our engravings illustrate, first, the entire machine shown in perspective; second, a vertical section of a machine, with its internal or hulling cylinder made of stone, and the exterior of stone sections inclosed in a metallic case; and, lastly, a vertical section of a machine made wholly of metal. The principle of action is the same in both constructions. A hopper chute, A, Figs. 1 and 3, conveys the grain to the interior of the case, to be acted upon by the hulling cylinder, E, and the external grinding sections, F. The internal cylinder is grooved as shown, and the ribs thus formed enter between corresponding ribs formed in the exterior cylinder or shell.

It will be seen that raising or lowering the cylinder, E, will cause the upper surfaces of its ribs to approach or recede from the under surfaces of the ribs on the shell, by which the attrition upon the grain is regulated as required. This is accomplished by means of the adjusting lever, G, which supports the step of the cylinder, having a threaded rod pivoted to its outer end, upon which a nut turns, as shown.

The comminuted portions of the hulls are ejected through one or more screens, B, placed at suitable intervals over openings in the case and exterior grinding shell, the screens being boxed in so that the dust thus thrown out descends to the floor, upon which the machine rests, from which it is readily removed. The grain, when hulled escapes through the chute, C. Power is applied to the pulley, D, upon the vertical spindle of the cylinder, E.

The grooves on the internal cylinder extend outward and upward, so as to retain the grain and retard its passage through the machine.

By the method of hulling, introduced with this invention, the grain is treated with such a degree of nicety that only the particles not fit for flour—and none of the nutritious portions—will be removed Experiments made by the inventor lead him to assert that from grain hulled in his machine 80 pounds of flour can be obtained, where but 70 pounds could be produced from a like quantity hulled in the ordinary way. But apart from the increase in weight, there is a further advantage gained by superiority in kind, as all the matter not applicable to good flour is entirely removed. Higher priced flour, and more of it, are therefore the inducements offered by the inventor to the enterprising millers who wish to adopt his huller. For the use of persons desiring to test the merits of the invention, the inventor has forwarded a complete hulling machine from Europe, which is now in the New York Custom House. Responsible parties may obtain the right to remove the same to their mills and use it for a limited term, free of charge, if they will have it put up, repacked, and returned after use, at their expense.

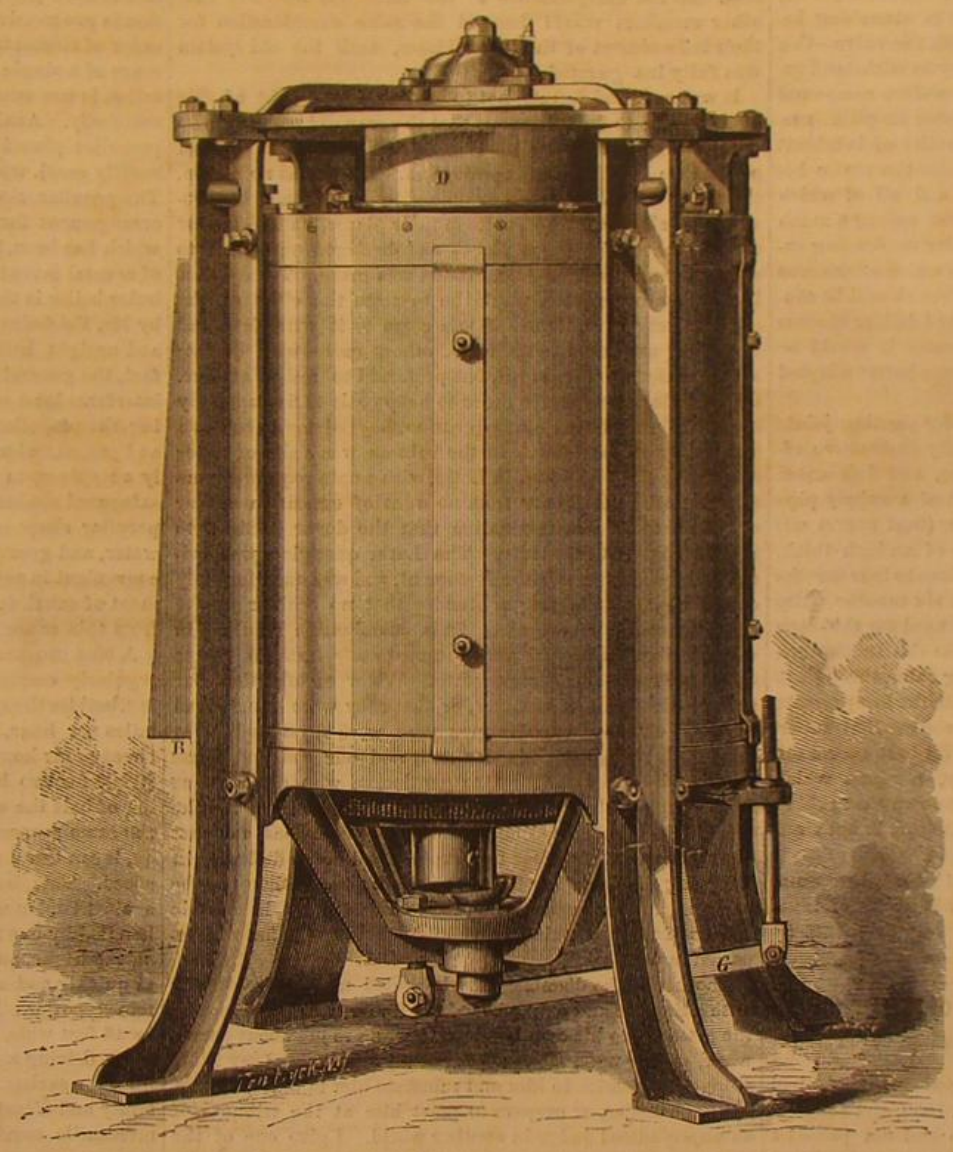


Fig. 2

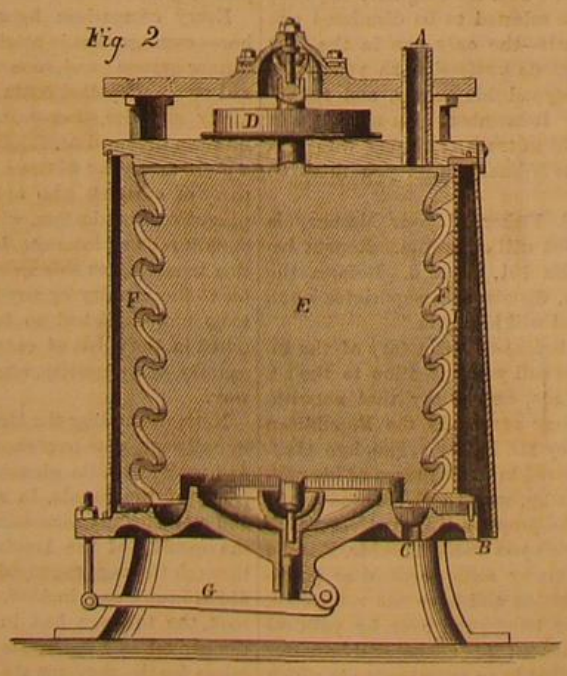
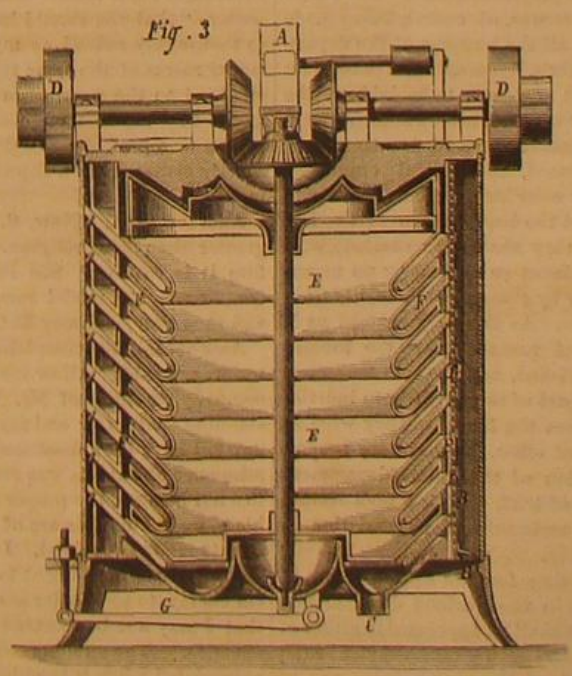


Fig. 3



HOFFMAN'S GRAIN HULLING MACHINE.

Patented through the Scientific American Patent Agency, April 18, 1871, by Michael Hoffman, of Munich, Germany. For further information address Louis Kölbl, Munich, or care Box 773, New York city.

Applications of Vulcanized Rubber.

The applications of vulcanized rubber are so numerous and so varied in their nature that we cannot perhaps do better than follow the selection of Mr. James Syme, Sen., in a paper read before the Institution of Engineers in Scotland, which is replete with practical information on the subject, but too long for the space at our disposal. In testing some specimens to ascertain the relation between breaking strain and price and density, Mr. Syme said he found the higher priced light qualities withstood less strain than the cheaper and denser, the utmost weight in direct strain borne on an area one quarter inch square being 85 lbs.; this was with rubber of 102¼ lbs. specific gravity to the cubic foot.

Probably one of the most important applications of vulcanized rubber is its use for the valves of marine engines. An opinion has been very general for some years that pure rubber valves of a floatable or nearly floatable quality were best for almost all purposes, but it is equally generally believed that good rubber is not readily to be obtained. Mr. Syme, however, thinks that there are other causes than the quality of the rubber influencing the duration of valves, such as a bad construction of grid seats and covers, employing them as bending valves under too great a pressure, or from the action of lubricants mixed with the water coming in contact with them. The conditions of service under which the rubber should probably last longest, are as circulating pump valves, where the hight to which the water has to be thrown requires but a low pressure, and the temperature ranges from 28° in cold, to 83° Fah. in tropical seas. The actual results obtained from two valves taken from the same steamer were clearly shown by Mr. Syme. Each was seven and five eighths inches diameter by five eighths of an inch thick; but one was white in color, and of a specific gravity of 100 5/16 lbs. to the cubic foot, of the quality known as "pure." The other was a "mixed" of a drab color, and had a specific gravity of 73½ lbs. to the cubic foot; while, however, the latter withstood 90 days' steaming, the former only worked 21. In both the rubber was in good condition, but was split outwards from the hole in the center. Mr. Syme considers that they were both too dense, and while thinking that the white specimen would be the best for cold water or hot water untainted with grease, he is persuaded that the size and curve of the valve guard had more to do with their early destruction than the quality of the rubber. In this case the guard was only four and five eighths inches diameter, leaving a projection of one inch and a half of rubber all round the cover; thus the rush of water acting on a leverage of one inch and a half to five eighths of an inch thick, turned up the edge of the valve into the form of a cup at each stroke, tending to tear and split the rubber. To obviate this destructive action Mr. Syme lays down a rule that circular valve covers should have a *minimum* diameter only two thicknesses of rubber less than that of the valve, and in foot valves or oblong suspended valves, only one thickness of rubber less. The mischief done by making the valve cover too small was further proved by an air pump valve which had been in action for 28,000 miles. The cover had a diameter three inches less than the rubber, which, originally three fourths of an inch thick, was worn away to one quarter of an inch at the thickest part.

It appears, however, that the air pump valves are the most unreliable in duration, presenting a puzzle which it is scarcely possible to explain. Mr. Syme exhibited specimens which had been employed in single cylinder condensing engines for periods ranging from a few months to twelve years. One of these, constructed of pure vulcanized rubber nine sixteenths of an inch thick, worked only nine months, and was found to be black and rotten, being more like strong size or glue than vulcanized rubber. It was worn on both sides, but in all probability would have lasted much longer if it had not been fixed at the center, and compelled to beat in one po-

sition. In extreme contrast to this was a valve which had been in work for twelve years. It had a specific gravity of 75⅝ lbs. to the cubic foot, and was probably seven eighths or one inch thick when new, the portions still sound retaining their original elasticity. This valve, however, was constructed of a mixed rubber, and Mr. Syme considers that rubber to which a metallic pigment is added, in addition to the usual quantity of sulphur for thorough vulcanization, is best adapted for the construction of air pump valves, the specific gravity being from 72 lbs to 77 lbs. per cubic foot. He thinks that pure vulcanized rubber is dissolved and worn away more rapidly when acting in oily water than the "mixed," which is protected by a pigment impermeable by oil or fluid grease. The general conclusions drawn from the examination of these specimens were that circular valves should be allowed to rotate, and that the angles of the apertures in the grid plate and the edges of bearing bars should be rounded off, as when these are left too sharp and the valve beats always in one position, the rubber is cut, and the oil getting in produces a viscid effect in each incision.

Speaking of oblong foot or discharge valves, Mr. Syme says they should be of a third quality mixed rubber from 92 lbs to 102 lbs. per cubic feet, and not above three quarters of an inch thick, because within certain limits the thicker they are, the shorter their life, from the fact that, being fixed along one side, when thrown back the difference in stretching between outer and inner curves tends to break the valve—this quality of rubber having too little elasticity to withstand extreme bending for any length of time. In modern compound engines the cause of the destruction of rubber air pump suction and discharge valves is the large quantity of lubricant —oil or grease—which permeates or saturates the steam before passing through the two cylinders, and all of which passes over the faces of the rubber valves among a much smaller proportion of water than in the older condensing engines. In order to prevent this destructive action as much as possible, Mr. Syme suggests that these valves should be constructed to work without bending—rising and falling as some feed pump valves do; by which arrangement it would be possible to employ a heavier rubber, and one better adapted to withstand the action of solvents.

Referring to the applications of rubber for packing joints in steam pipes, Mr. Syme showed the rapidly destructive effects of high pressure, high temperature, and lubricated steam on best red rubber. A flange joint of a supply pipe immediately under the injecting lubricator (best sperm oil) was packed with red rubber one sixteenth of an inch thick, the pressure in the pipe being 40 lbs. In three to four months it was eaten through to the bolt holes—in six months quite through. Joints of the same thickness, used for the high pressure cylinder covers, further away from the lubricators, stood from six to nine months before being eaten through to the bolt holes, while those in connection with the low pressure steam lasted two years and more. This shows that superheated, high pressure steam, permeated with best sperm oil, destroy vulcanized rubber very quickly, a result which might have been anticipated when it is known that rubber vulcanized at about 300° Fah. becomes quite soft in hot air at 460° Fah.

We shall probably return to this subject in a future number, and give illustrations of various applications of india rubber in mechanics, with some proposed improvements by Mr. Syme.—*English Mechanic.*

EXPERIENCES OF A BUREAU OFFICER.

[Extract from a speech of Hon. S. S. Fisher, late Commissioner of Patents.

In one of my earliest interviews with Secretary Cox he had called my attention to the act of March 2, 1853, and suggested that no one should be nominated who had not passed a rigid examination. Indeed, he proposed that we should go farther. A tremendous pressure was, of course, being made for the removal of clerks from all the bureaux of the department. There were some drunken, ignorant, and worthless men in all of them, but the ax was not to be laid at the root of all such trees. On the contrary, those whom we were most earnestly besought to remove were frequently among the most intelligent, experienced, and skilful employés. Their offence was not that they were incompetent, but usually that they had spoken against the impeachment of the late President. This view, which they shared in common with not a few members of the dominant party, was by no means to be overlooked or atoned for by reason of their admitted capacity or valuable experience. As it really seemed as if the outcry for the creation of vacancies for the hungry crowd must in some way be satisfied, and as there was good reason to believe that a large part of the hostility to individuals arose in great measure from the fact that they were in while their accusers were out of office, the Secretary proposed that a thorough examination of the entire department should be made under the act of 1853, and that men should be dismissed for incompetence rather than for a variation in the shade of their Republicanism.

The act of 1853, after providing for the appointment of four classes or grades of clerks in the various departments, proceeds as follows: "No clerk shall be appointed in either of the four classes until after he has been examined and found qualified by a board, to consist of three examiners, one of them to be chief of the bureau or office into which he is to be appointed, and the two others to be selected by the head of the department to which the said clerk will be assigned." Here is authority amply sufficient for the inauguration of a thorough civil service reform. It is obvious that the examination here referred to may be made as searching as desired; that every precaution may be adopted to insure its entire fairness; that such examinations may be either mere pass examinations, or may be made competitive, and that the President of the United States, as the executive head of the government, might if he chose, without further hesitation, issue a general order controlling all the departments, and establishing therein the principle of competitive examinations. There were circumstances which rendered the application of this statute to the Patent Office a matter of comparative ease. If I had been an applicant for the office of Commissioner, and had obtained it by reason of the active exertions and warm recommendation of Senators and congressmen, I should upon taking office have many debts to pay. It would have been hardly the fair thing to say to one of my Congressional friends that his candidate could not be received on his recommendation, but that he must first pass the ordeal of a stringent examination. He would have replied, "Why you were yourself appointed upon my recommendation. You have passed no such examination. If my indorsement was good enough to make the head of a bureau, it ought to be amply sufficient to guarantee the fitness of one of his subordinates." And then he would, perhaps, gently remind the reluctant officer that the influence that could make might also unmake, and that he must of course "provide for his friends." But it is obvious that if this gentleman's nominees were appointed without proper examination, that the independence of the office was lost, and that other members would demand the same consideration for their indorsement of their candidates, until the old system was fully inaugurated.

It was my good fortune not to have a single debt of this kind to pay; to feel conscious that the man did not live who could ask for office for himself or friend as the price of word or deed on behalf of my nomination. There was no reason, therefore, why a stringent examination should not be provided for all who wished to keep their places, as well as for all who longed for those places and besieged our doors to obtain them. Such an examination was made. To say that it caused a commotion would be to state the effect of the order in very faint terms. Some came to it with fear and trembling and even with tears, others came with curses; some refused to come at all, but preferred to resign at once. Of the latter, one man, in order to heap coals of fire upon my head, while tendering his resignation, begged me to accept a small copy of the Bible. In the volume was a slip of paper containing the beatitudes in Latin, with a note requesting me to take notice that it was from no want of education or fear of the result of an examination that the donor declined to submit himself to the rule. The Latin quotation was evidently copied from a Latin Testament, and was unfortunately copied wrong, containing a blunder that no scholar of the language could have made. This examination resulted in several dismissals, and these immediately brought to our doors the inevitable Congressmen. We were told that our examinations were a humbug, or that they were so arranged as to kill off the particular men who were dismissed. Our good faith was more than doubted, and our common sense was broadly questioned. One gentleman who appeared as the champion of the most worthless, reminded me that he was a member of the Committee on Appropriations, and that the former Commissioner had experienced much difficulty in obtaining the necessary funds to carry on the business of the bureau. As this argument failed to reverse the inexorable figures of the examining committee, he took his hat and departed in wrath.

Another of the dismissed, having plied me unsuccessfully with a Senator and a member of the House, proceeded to take the matter into his own hands, and wrote to me about once a week, calling upon me to repent of my sins, to read my Bible more, to do justice to him and reinstate him in office, to turn out his enemies, or prepare to meet him at the tribunal of an unprejudiced judge in another world. I give one of the shortest of these letters entire: "Is it not singular," says the writer, "that you should have selected to be dismissed one so thoroughly radical as myself—the only one in the four model rooms of the same religious profession as yourself—one kind to the poor, even beyond his means, and recommended by the best of men? Remember, I am writing to a person who professes to delight in truth, and one who will shortly stand before a supreme tribunal. Can you there be justified?"

Another says: "Now, S. S. Fisher, if your Masonry is greater than your religion, God will curse you. Repent before it is too late. See Psalm 101, verse 5. Reform the draftsman's and model rooms, dismiss the superintendents, and then pray, and may be God will hear you."

Another laid his complaint before the Secretary of the Interior, and said: "Allow me to call your attention to the accompanying letter of Mr. Wade, and to say that notwithstanding that letter and my long service in the Republican party, I have been dismissed by Mr. Fisher. The late Commissioner of Patents was removed in consequence of his politics not being of the proper stamp, and Mr. Fisher was put in his place because his are of the proper stamp, and yet Mr. F. selects me for dismissal. I wish you would have Mr. F., who doubtless has been urged to this by some personal or political enemy, to reconsider his action and have me reinstated, that I may not be taunted or triumphed over by political enemies." The sublime coolness of this appeal will be better appreciated when it is added that in an examination in which the highest mark was 100 and the lowest 1, this man received 14, and his utter inefficiency was notorious to every one who had dealings with the office. In the application of the system of pass examinations to applicants for admission to the bureau there were found to be many practical difficulties. In the first place the law was sixteen years old. It had been nominally observed in many of the departments, until at length it had notoriously become a mere form, was habitually disregarded, or totally ignored, and was found to be convenient only for the purpose of getting rid of some man who was sacrificed by an unfair application of it, or it was manipulated for the benefit of some favorite who was allowed to slip through its meshes. It was in bad repute. Instances were current, and were authentic, in which the examiners had been requested to make the proposed test a mere formality. Many who had been subjected to it were able to tell of trifling questions concerning routes of travel or the state of the weather, or the health of their families, or the welfare of their aged parents, which comprised the total examination as to their education or capacity.

THE APPLICATION OF STEAM TO CANALS.—NO. 5.

BY GEORGE EDWARD HARDING., ESQ., C.E.

We close the list by calling attention to the arrangement for applying steam power to canal boats, which has been recently designed and practically operated in the United States by Mr. Thomas Main, mechanical engineer, of New York, and presented in longitudinal section and plan on the diagram. It will be seen that it possesses all the happy features for obtaining propulsion by steam on narrow channels, for which many have striven, but none before fully accomplished; but, as has been justly remarked by a modern writer, "an invention is progressive in a regular series." There may be a long order of elementary principles developed without the occurrence of a single practical result, so far as any useful application is concerned, but the perfect machine will be found by somebody. Analyze the diagrams, and there will be found a propeller placed in the bow of the boat (its advantages are readily seen), working in a channel underneath the vessel. The peculiar sloping of the channel is the most convenient arrangement for overcoming any tendency to create a wash, which has been, in some form or under some name, the object of several inventions. The high pressure machinery and tubular boiler is the very locomotive engine so strongly urged by Mr. Fairbairn, only in this instance the inverted cylinder and upright boiler economize the space to the utmost. In fact, the general position of both the channel and the motor interferes least with the cargo bulk; and the water, after passing the propeller, is deflected in the line of least resistance, and passes under the entire length of the boat, to form scarcely a ripple upon the surface, while the channel sides are a safeguard against any lateral waves. It may be asked if the peculiar shape of this channel does not cause friction of the water, and great loss of power. This would certainly be inconvenient in any case of high speed, but in the slower movement of canal traffic we shall not find any appreciable loss from this cause.

A boat constructed on this principle has been for some time regularly employed upon the Erie Canal in America, carrying, besides the machinery, 200 tuns of cargo, at a rate of three miles per hour, including lockages, or seventy-two miles in twenty-four hours, consuming only a tun of coal, at $5, against $28·50 for two horses' towage for the same distance—a saving of half the wages of crew, and transporting the goods in the same proportion of time—and, additional to its own cargo, it can tow a similar loaded barge at very nearly the same speed. This boat can go through a lock in six minutes, against twelve minutes required for a horse boat, and is then handled by one man with ease. There is no injurious action on the banks, and the boat can leave the canal and proceed as quickly and safely on river navigation with her self-contained power. In twelve months, such a boat, 70 feet long by 16 feet wide, and 9 feet depth of hold, with an 8 inch cylinder, driving a 4½ feet propeller, can pay for her entire cost from the saving over horse boats, to say nothing of the certainty and dispatch which alone insures the confidence of the mercantile community, and is the foundation of extensive patronage.

Every comparison between the expense of steam *versus* horse carriage that is attainable, gives great economy to the former system; and, sooner or later, with her canals enlarged, and steam propelled boats giving a system of trackage indefinitely superior, cheaper, and more regular, than anything hitherto dreamed of, England's internal navigation will take a position worthy of those talents that conceived them. The party of croakers who are ever found in opposition to improved communication, will, with the present employés and certain railway interests, loudly cry out against any innovation trenching on this special province, and predict sad disaster to the country by any interference with the ancient customs now cherished so fondly; but if the step is not now taken in the spirit of enterprise, it will be forced upon the country as a necessity, after other nations shall have led the way.

Notwithstanding the immense amount of freight conveyed by railways, now burdened nearly to their utmost limits, we find trade, with its gigantic strides, tasking the carrying capacity of the canals, in spite of their many disadvantages, and ever steadily increasing in its demands. In 1835, before the opening of the London and Birmingham Railway, the through tunnage conveyed on the Grand Junction Canal was 310,475 tuns, and in 1845, after ten years opposition of this road, the tunnage had increased to 480,526 tuns; while, at the annual meeting of the canal proprietors, in 1860, the receipts for the previous six months had been the largest ever experienced.

America, at the present moment, is alive to the necessity of canal improvement. Nearly £4,000,000 have recently been recommended by the Canadian Canal Commissioners for the enlargement and construction of slack water navigations. And, within a few weeks, the Legislature of New York have introduced a bill offering a reward of $100,000 for the best plan of canal navigation, in the substitution of steam, or

other motive power, for animal labor; and England should not remain backward in the race, especially since to her canal system she owes so much of her present prosperity and greatness.

The cumbersome barge, with snail-like advance, feebly contrasts with the iron horse, thundering by with its speed and power. Yet, improved as they should and must be, canals will always continue to form an essential part of internal communication, to be missed quite as much as roads, railways, or even the telegraph itself.

In conclusion, the author expresses his sincere regret that this glance at the canal systems, and the mechanical methods which have been suggested as applicable to the propulsion of their boats, had not fallen into abler hands. Its compilation has been gathered from many sources and authorities, with but limited time spared from usual avocations. But, trusting that it may at least draw attention to a most important field in the economy of nations, such as it is, this paper is presented, in the hope of a favorable reception.

PHRENOLOGY AND SPIRITUALISM.—A LIVELY DISCUSSION.

At an ordinary fortnightly meeting of the Anthropological Institute, in London, the Secretary read a paper, written by the Rev. Canon Calloway, M.D., of Springvale, Natal, Western Africa, on "Dreams, Sympathy, Presentiment, and Divination, among the Natives of Natal." He began by saying that in all ages and in all parts of the world, certain strange phenomena have been seen, which by some have been ascribed to delusion, by others to imposture, by others to disembodied spirits, and by others again to the devil. The author argued that these phenomena probably had a natural source, and were probably due, in great part, to the mental condition of the observers; at the same time, he held it to be utterly unscientific to deny the existence of spirits, and the possibility of their playing any part in the affairs of man. He then proceeded to explain that certain changes in the state of the brain will cause men to see spectral illusions, and that a man who wakes very suddenly out of a dream, with the image of the person he saw in the dream still impressed upon his brain, sees that person at the moment of awakening, and believes, therefore, that he sees a spirit. Some spectral appearances he could not explain in this way, such, for instance, as the ghosts sometimes seen in haunted houses, by persons who slept therein, without knowing the house to be haunted.

In the course of his paper, he described the clairvoyant powers of some of the Zulus, and finally narrated how some of the natives went to consult a woman, in whose presence the spirits were said to talk with audible voices. A native Kraal among the Amadunga, on the Tukela, having had some quarrel with their people, settled with a relative among the Amahlongwa. After settling there, a young child of theirs was seized with convulsions; so some cousins of the child went a day and a half's journey to consult a woman who possessed spirits. The woman had never seen the inquirers before. The cousins sat on the floor of the hut, and the woman in the center, in broad daylight. Soon a voice, like that of a child, was heard near the roof of the hut, and this voice told the cousins that they had come to seek the advice of the spirits about a child suffering from convulsions; the voice also told them all kinds of things about their private family affairs, and told them what to do to cure the child. The natives then returned home, followed the instructions given, and the child recovered.

Dr. Calloway offered no explanation of this case, and he closed his paper by saying that, although these phenomena "cannot be ascribed to the direct agency of good or evil spirits alone, yet they may be intimations that not only can the soul of man look out upon the world around him, and become cognizant of it through the organs of sense, but that it can look in another direction, and, without the organs of sense, obtain a knowledge both of what is going on in the world beyond the sphere of the senses, and even look into futurity, and hold communion with the invisible world of spirits."

Mr. J. W. Jackson, F.A.S.L., of Glasgow, said that, in the first place, he did not think that the author had sufficiently explained his subject by the aid of phenomena, well known to men of science, for all the phenomena of dreams can be reproduced by means of phreno-mesmerism. He knew that subjects like these were much tabooed by the Anthropological Society, still they formed a part of the study of the science of man. When a man is in the mesmeric sleep, the operator has but to excite the organ which leads to dreamlife; if it be desired to show him somebody in distress, the operator has but to touch the organ of benevolence; if veneration be excited, he will perhaps fancy that he is in church; if the organ of philoprogenitiveness be touched, and the subject be a lady, she will perhaps fancy that she has an imaginary baby, and will begin to nurse it with the greatest care. Dreamlife is a reversal of the waking state. In the former, objects excite ideas; in the latter, ideas place objects before the consciousness. Community of sensation may also be produced by mesmerism; and what the operator feels and tastes, the patient will also feel and taste; this is the case sometimes when the operator does not touch the patient, but is on the opposite side of the room. Two minds may be united in the same way, and then thought-reading takes place. They might assert that these things did not take place; but they do occur, and every mesmerizer has his thoughts revealed to him, at one time or other, by his subjects. The paper just read was interesting, because of its bearing upon the state of the psychology of the savage; although the savage had a coarser physique than the European, he is more susceptible, perhaps, to psychological influences than the white man, because he lives nearer to nature; and all over the world, where men live closer to nature, they are more susceptible to mesmeric influences. There is no question that many of the phenomena now taking place among spiritualists throw much light upon what is taking place among the natives of Natal, and many of the things described in the paper now occur in our midst. He had seen heavy articles moved about in opposition to the law of gravitation, notwithstanding all that Professor Tyndall and others might say to the contrary; at the same time, he would not say that spirits moved them. These things are taking place around and about us. What is the value of the opinion of a man on this subject who has never seen these things? He had seen them, and knew them to occur. Many spiritualistic facts are mesmeric in their origin. He should like to hear a paper read before the society on the medicine men of North America; also, if some of our Indian officers would give a paper on mesmeric phenomena among the Hindoos, it would be interesting, for India is a great storehouse of extraordinary psychological phenomena. The great thing is for the writers of such memoirs to state what they know without fear. Dr. Calloway had not been afraid to speak the truth that was in him, and that was the great merit of his paper.

Mr. W. G. Dendy said that the spiritualists must not have the tether that evening. As regards Dr. Calloway's paper, what was true in it was not new, and what was new was not true. Dr. Calloway was egregiously wrong in writing it, and he ought to be ashamed of himself; Mr. Jackson, also, was a great man in stating things of which he was not ashamed. He wished that Sir John Lubbock had been present that evening to defend the savages, for many of the facts mentioned in the paper were mere humbug. He thought that Mr. Jackson was correct in much that he had said about dreams, but when he said he could excite a particular organ, he thought it was an entire mistake; it was the same great error that Gall and Spurzheim fell into. By mapping the skull, it was not possible to map the brain underneath it. Phrenologists place the organ of color in the forehead, whereas the nerves from the eye go a long way back into the center of the brain, so to have all that humbug stated at that meeting was too hard to bear. He thought that when their old friend, Dr. Donovan, ceased attending their meetings, that he and phrenology had gone out together. He very much regretted that such a farrago had been placed before them to discuss, and he rose to inveigh against the paper.

Major S. R. T. Owen said, that whether the brain could be mapped out or not he did not know, but almost all the experiments mentioned by Mr. Jackson he had personally tried, again and again; he knew them to be true, so took to himself all the blame awarded by Mr. Dendy.

Mr. Prideaux said that he had seen the phenomena of what is called phreno-mesmerism, and thought that they were produced by the belief of the operator; the operator believed that a certain part of the head was connected with certain organs, and because of this belief the phenomena were produced. Phrenology itself must be proved by facts, and not by opinions, and if Mr. Dendy would bring painters and color-blind people to him, whom he had never seen before, he would look at their heads, and would separate one class from the other.

Mr. Charlesworth said that the paper was all rubbish, and wholly unworthy of discussion. The society would have been much better employed in discussing phrenology and mesmerism than the facts in that paper.

The President said that the subject was one which well deserved investigation, and it was one which labored under an immense amount of prejudice. In some ages, great credulity was the rule, and in others, a great degree of skepticism; every pretence at a ghost was once believed in, and now, perhaps, we go too far in an opposite direction. He wished that some test could be applied to the phenomena, and he thought that the whole question was one which came within the province of the Anthropological Society. He thought there were certain cases of ghost seeing not readily explainable by any theory put forth that evening, such as those instances where people had died in foreign lands, say in India, and appeared to one or more friends at home at the moment of death. Those cases, he thought, could not be got over. The paper was valuable as showing how the opinions of savages agree with our own on such subjects. It was a fair subject for inquiry, and prejudice should be laid aside. Could not some scientific test be applied to these things? He rather thought with Mr. Jackson, and attributed more value to the paper than had been done by some of the other speakers, though he did not exactly see the connection of phrenology with the subject. He thought that the society should scientifically study the subject, try it by tests, and dismiss prejudice as much as possible.

Mr. Prideaux asked permission to speak a second time, and said that the phenomena were real. He had had some talk with the Bishop of Winchester about them, and the bishop expressed his opinion that the phenomena were governed by exact laws, like everything else in nature, only as yet we do not know the laws. One difficulty in the way of scientific investigation is the uncertainty and fugitive nature of the phenomena; the presence of persons adverse to their occurrence interferes very much with the effects produced. Their strange nature was no argument against them, for if eclipses only took place once in a century, the testimony as to their occurrence would be disbelieved. He was quite ready to take his share of obloquy in all matters connected with mesmerism and spiritualism, but with respect to the latter subject he was not satisfied as to the cause of the phenomena.

MEDICINE stains may be removed from silver spoons by rubbing them with a rag dipped in sulphuric acid, and washing it off with soap-suds.

Duration of Animal Life.

The duration of the life of any particular animal depends on its kind of structure, elementary and anatomically, as well as upon its place and mode of subsistence. Some have their lives extended to a century, whilst others live but a few hours. If we examine the longest lived, such as some reptiles, the whale, some kinds of birds, the elephant, and man, we will find the tissues of which they are composed, are so slowly changed, under the normal condition of their lives, the growth, absorption, and renewal of them being of such a character, that the induration which makes the decrepitude of age, is slow in taking place. The land tortoise, a reptile well known for longevity, is constructed of a gelatinous muscular fiber, with comparatively soft bones and shell. He lives on vegetable matter, moves about slowly, becomes fat, and is torpid during the cold weather. With few enemies to molest him when encased in his shell, those that pass from the egg state to this defence live year after year in lazy security, and answer the purpose of their creation. They do not harden and grow stiff by excessive labor as do man, the horse and the dog, and thus become prematurely old. Fish, particularly the larger kinds, attain great age. Whales are supposed to live a century. But little accuracy can be expected in computing the years these monsters roam through the different seas, but evidence from harpoons bearing ship marks, and dates, found imbedded in captured whales, is conclusive that the adult whale will live the greater part of a man's life without undergoing much change. The slow propagation of these monsters, the softness of their muscular fiber enveloped in fat, their food, all tend to that slow assimilation and expenditure of nutritious matter, which is most consistent with a long life.

The peculiar life element, nitrogen, plays an important part in the duration of animal existence. Where the food consists almost entirely of nitrogenous compounds, such as flesh, the greater amount of vitality imparted to such as live on this food, hurries them through their existence, other conditions being equal, in a shorter time than those which feed on a less stimulating nourishment. The tortoise and the whale are supported by vegetable, and other matter, that contains but little nitrogen compared with the food of carniverous animals. The whole lion tribe, whatever may be their magnitude and organization, soon show symptoms of age. The exertion necessary to procure food, strains every muscle to its greatest tension, and these muscles need constant supplies of highly animalized matter to restore their waste. This wearing away, and renewal, hardens the tissues that are thus constantly in a state of action until they become unfit to perform their perfect functions, and at a period, early, compared with the time it took to bring them to maturity, these carnivora fall into decay. An old, worn out lion is not unusual in the jungle. The buffalo, rhinoceros, and hippopotamus, less stimulated by their vegetable food, and less exercised in its procurement, live to a greater age.

Without bringing other examples in proof of the kind of food and exertion necessary to maintain life having an influence upon longevity, the laws that operate to this end, when duly considered, will show the harmony of the whole animal economy. The time appointed for the individuals of each race to live, seems adjusted to the accomplishment of their peculiar work. The ephemera, in the sunshine for a few hours, fulfil their function and die. Their larvæ are longer in coming to maturity, but one short season rounds the whole existence, from the embryo to the perfect insect, and during these stages, whether it has been created for devastation or to be devoured by some other, the wave of life has swelled and subsided. All that remains can rest until another season, when by the air and the sun it will be set in motion to repeat the same phenomena. Other beings, having purposes to accomplish that cannot be embraced in so short a period, have a slower organization.

It would be curious to trace the connexion between the elements of the air and influences of the sun in the life process, and to accurately determine how much nitrogen, one of the elements of the air, and the principal constituent of all the vital parts of animals and plants, has to do with the duration of organic existence. That kind of structure requiring altogether food of which this element constitutes the greatest part, such as the viscera and flesh of animals, should, with the vigor imparted to it by such aliment, live as long as that depending on the scanty supply of nitrogen obtained from vegetables, is not consistent with the idea that the decrepitude of old age is nothing more than the hardening of tissues by the amount of resistance they have had to overcome. The life force is most rapidly and most powerfully expended in the carnivora, and if they are such as by their habits require a daily supply to meet the exercise to which they are daily subjected, their lives must be shorter than those as continually, although not as powerfully called into action, that feed upon vegetables. In the latter, the life processes being slower, induration is later in causing decrepitude.—*James B. Coleman, M. D., in Beecher's Magazine.*

Curious Egg.

A correspondent informs us that, a few weeks since, at Westford, Mass., he saw a newly broken egg, having the usual quantity of white and a yolk, and, in addition, another (smaller) egg, an inch or more in diameter. The inner egg contained white only.

The hen who laid this egg is a mere tyro in science, and a little learning, in egg laying as in other things, is a dangerous thing. No doubt the hen's idea was, that by putting an exterior jacket on the inner egg, superheating might be achieved, and the egg would hatch itself. But she carelessly omitted to put the yolk in the inner shell. She must experiment further before she applies for a patent.

Experiments on the Strength of Cast Iron Girders.

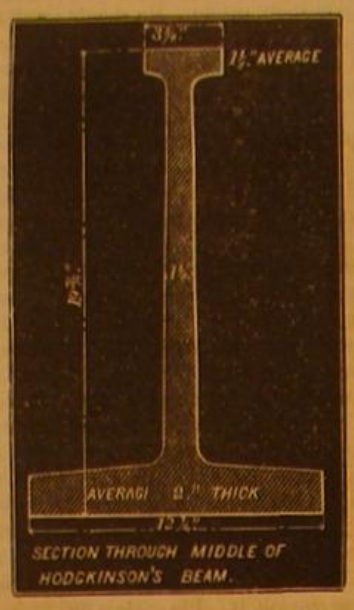
The New York Legislature passed a law, at its last session, requiring that every column girder and beam, having a span of eight feet and upwards, and intended to support a wall of stone or brick, or any floor, or part thereof, shall be tested previous to its use in any building, hereafter to be erected, in the city of New York. The margin of safe weight for large beams has hitherto been computed from standard results obtained from tests of smaller ones. To test the reliability of this method, an interesting series of experiments was recently made at the foundery of J. L. Jackson & Bro., Twenty-eighth street and Second avenue. The tests were made by means of a hydrostatic press. A number of prominent officials architects, and engineers, were present. The experiments were conducted by Mr. P. H. Jackson, a member of the above-named firm. The following is a synopsis of the resul's, as communicated by Mr. Jackson:

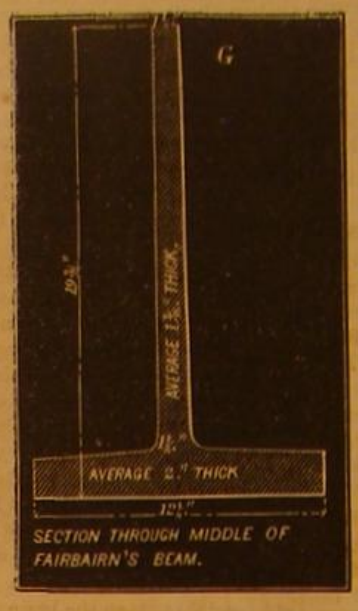
FIRST SERIES OF EXPERIMENTS, JUNE 23, 1871.

This was a Hodgkinson form of beam, whose areas of bottom and top flanges were in the ratio of 6½ to 1. It was made of such iron as is in common use for building purposes. Area of bottom flange, $12\frac{1}{4} \times 2 = 24{\cdot}5$; top flange, $3\frac{3}{8} \times 1\frac{1}{4} = 3{\cdot}8$; vertical rib, $16\frac{8}{8} \times 1\frac{1}{4} = 18{\cdot}4$; 4 fillets, 1; sectional area in middle, 47·7 inch.

Breaking weight in middle, computed by the Hodgkinson formula: $12{\cdot}25 \times 2 \times 19{\cdot}75 = 483{\cdot}875 \div 208 = 2{\cdot}326$. $2{\cdot}326 \times 514 = 1195{\cdot}564$ cwts. $= 59\frac{1}{20}$ gross tuns.

Experiments.	Tuns.	Deflection.	Pressure taken off, permanent set.
1	15	7-16 inches.	
2	20	9-16 "	2-32 inches.
3	25	21-32 "	2-32 " full.
4	30	3-4 "	
5	35	29-32 "	4-32 " full.
6	38	1 "	5-32 "
7	41	1 3-16 "	7-32 "
8	44	1 11-32 "	
9	47	1 1-2 "	
10	50 (broke)	1 5-8 "	





In accordance with Hodgkinson's formula, the safe weight should not exceed one third of breaking weight, or 20 tuns.

The test shows that the safe weight should not exceed $16\frac{2}{3}$ tuns, being 20 per cent excess of formula over test.

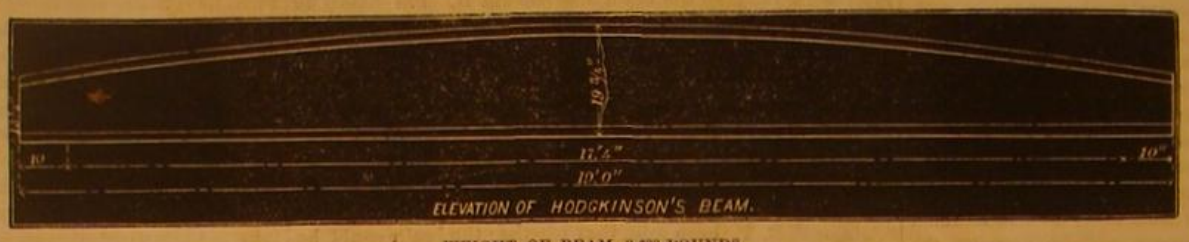
I do not believe, if the pressure had been taken off at $16\frac{2}{3}$ tuns, and allowed to remain off twenty minutes, before noting deflection, that there would have been any set whatever indicated, which would have shown that the elasticity was not impaired in the least at that weight.

You will observe that, at 20 tuns, when the weight was taken off, the gages showed $\frac{1}{16}$ in permanent set. But even this is questionable, to my mind, as a permanent set, since the beam would have conformed more to its original form, provided it had been left at a state of rest after the 20 tun test. I can only attribute the deficiency of strength in this beam to the following: In all founderies engaged in the manufacture of iron work for building, it is usual to melt soft iron, principally "Scotch pig," either at the first or last of the heat, usually at the first, for cornices, capitals, and all other light castings, which require to be soft in order to be filed, but do not require any extra strength. It may have been that some of this iron was in the Hodgkinson beam. Besides, when metals of various densities and formations of grain are mixed, the different particles in cooling have a tendency to adopt their former structure, and therefore if the metals are not properly mixed the strength of the casting will be considerably impaired by unequal contraction.

SECOND SERIES OF EXPERIMENTS, JUNE 23, 1871.

Same section as beam used in first experiment, but without compression flange, G.

This is a beam of the Fairbairn form of 1825, but somewhat greater in its ratio of resistance to extension and compression. In this beam the area of the bottom flange, subject to extension, is, to the area of the top of the vertical rib—one inch in depth, subject to compression—in the ratio of 21 to 1; while in Fairbairn's beams the ratio did not exceed 16 to 1. Bottom flange, $12\frac{1}{4} \times 2 = 24{\cdot}5$; vertical rib, $17\frac{4}{4} \times 1\frac{3}{16} = 21{\cdot}1$; two fillets, ·6; sectional area in middle, 46·2 inches.



WEIGHT OF BEAM, 2,680 POUNDS.

Taking the breaking weight as per section of Hodgkinson beam made with compression flange, it would be (see first experiment) 59¼ tuns. Then taking Hodgkinson's section of the greatest strength as unity, the ratio for Hodgkinson and Fairbairn will be as 1 to ·754, or 59¼ : F :: 1 : ·754. F—44 tuns.

Experiment.	Tuns.	Deflection.	Weight taken off, permanent deflection.
1	15	7-16 inches.	1-32 inches.
2	20	9-16 "	1-16 "
3	25	5-8 "	1-16 " full.
4	30	15-16 "	
5	35	1 1-8 "	5-32 " full.
6	38	1 7-32 "	7-32 "
7	41	1 5-16 "	1-4 "
8	44	1 1-2 "	
9	47	1 11-16 "	
10	49	1 25-32 "	

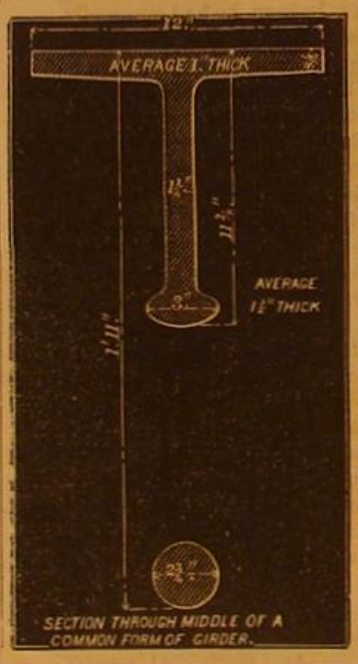
Broke at 49 tuns.

Excess of breaking weight, by test, over that of formula, providing the ratio of extension to compression did not exceed 16 to 1 (this was 21 to 1), equals 5 tuns, or 12 per cent.

At the place of fracture the bottom flange had a bright crystalline appearance, showing that the crystals had been subjected to a great tension; while at, or near, the top of the vertical web, subject to compression, the iron was of a dull blueish color, similar to the appearance of the outside of a pig of lead. Midway between these points the metal had the same appearance as a piece of the casting which I broke off at the end, and which had not been subject to strain.

On the day following the experiment I found the ends of beam at fracture rusted over, as it had rained during the night, or I would have sent you pieces from each of the three places, for your inspection.

This beam had the advantage over the Hodgkinson beam of lying undisturbed in the sand 20 hours longer. Consequently it cooled slowly, and contraction was more equalized, increasing its capability to resist strain. Besides it was cast

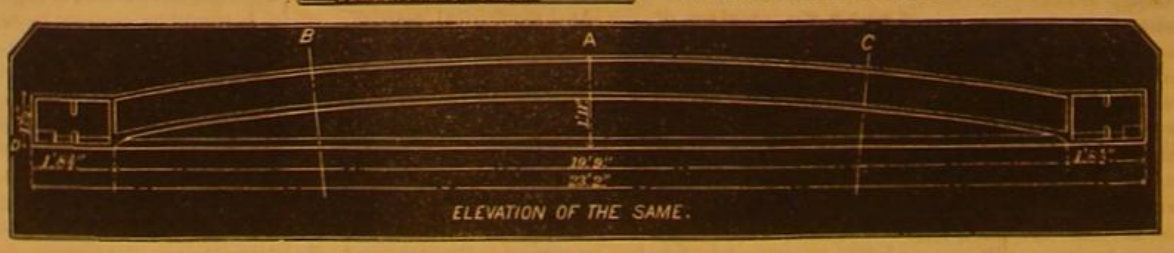


downwards. The top of the web, G, if exposed to the atmosphere equally with the rest of the beam, would cool and contract the quickest, by reason of its being the thinnest part of the casting; but, being cast in this position, it was the farthest point from where the atmosphere came in contact with the surface.

Lastly, being cast with the web downwards, all impurities would rise upward to the bottom flange subject to tension, while in the Hodgkinson beam, being cast on its side, the impurities would rise to the flanges uppermost.

THIRD SERIES OF EXPERIMENTS.

This is the usual section of almost all arch girders in common use in New York city, made to sustain four stories of 12 in. brick wall.



WEIGHT OF BEAM, 2,539 POUNDS.

Area of middle section: Top flange, $12 \times 1 = 12$; bottom flange, $3 \times 1\frac{1}{4} = 4{\cdot}5$; web, $8\frac{4}{4} \times 1\frac{1}{4} = 11{\cdot}1$; fillet, 1·0. Total, 28·6. 28·6 inches sectional area in middle—90 pounds per foot in length.

Breaking weight of this beam, if made straight, without the rod, agreeably to the formula of Hodgkinson: $3 \times 1\frac{1}{4} \times 11\frac{3}{4} = 51{\cdot}188 \div 237{\cdot}5 = 215 \times 510 = 110$ cwts., or $5\frac{1}{2}$ tuns.

Area of rod, 7·562 inches; it was shrunk in ¼ of an inch less in length than recess made for it in the casting.

Experiment.	Tuns.	Deflection. A.	B.	C.	Elongation of rod. D.	Permanent set, weight taken off. A.	B.	C.	D.
1	10	5-8 in.	1-4 in.	1-4 in.	1-8 in.				
2	15	5-8 "	11-32 "	7-16 "	3-16 "				
3	18	3-4 "	11-32 "	1-2 "	5-32 "	0	0	0	1-32
4	21	15-16 "	19-32 "	5-8 "	7-32 "				
5	24	1 5-32 "	3-4 "	25-32 "	1-4 "				
6	27	1 5-16 "	7-8 "	7-8 full.	9-32 "	1-8	1-16	1-8	1-32
7	30	1 13-32 "	15-16 "	31-32 in.	9-32 "	1-8	1-16	1-8	1-32
8	32	1 19-32 "	1 1-32 "	1 1-16 "	11-32 "				
9	34	1 3-4 "	1 5-32 "	1 3-32 "	13-32 "				

Broke at 34 tuns.

The bottom flange cracked through, and about half way up through the web. Elongation of rod, $\frac{1}{3}\frac{3}{2}$.

STAINS from acids can be removed by spirits of hartshorn diluted. Repeat if necessary. Rinse off with water.

A Second Street Tunnel under the Chicago River.

The first tunnel has been open to the public for a considerable time, and the second tunnel, the La Salle street, is now completed. The success of these works ought to be an example to the authorities of New York and Brooklyn. We presume that three or four first class tunnels might be laid between these two great cities, for less money and in much less time than the East River Suspension Bridge can be completed.

The Chicago *Times* thus describes the La Salle street tunnel: Entering the tunnel proper, there is seen above, a series of transverse arches resting on iron girders, three feet apart, the side walls being of stone. From the entrance, to the terminus of this section of the tunnel, is 396 feet; the portion covered with transverse arches being 60 feet. Next is a section of the tunnel which is covered with a regular arch of brick work, which, on account of its rough finish, has, in the dim light of the tunnel, the appearance of stone. On each side are noticed recesses in the walls, which are meant for refuge places for policemen in case of a runaway. Double gas jets are provided at intervals of 60 feet. At a distance of 40 feet from the river line is a ventilator, passing up through the arch, constructed of solid masonry, and 6 feet in diameter. Into this leads another ventilator from the pedestrian way. Passing along a well paved road, the single archway, which is 19½ feet in width, ends at a point two feet from the river line, where it diverges into two archways, each 11 feet wide, and separated by a central pier 2 feet 4 inches in width. This wall or pier is pierced, at intervals of 16 feet, with doorways, as is also the pier separating the eastern of the two carriage ways from the pedestrian way. This latter way is 10 feet in width, and is entered by stairways at South Water street and Kinzie street. This double driveway extends 300 feet, when in inverse order come the changes in the structure described at the south entrance to the tunnel. In the center of the tunnel, at the lowest point, is a well 6 feet in diameter, which enters into a main sewer 5 feet in width. This sewer drains the tunnel, carrying the water to the north end of the tunnel, where there is a pumping well, 36 feet from the dock line, from which the water is pumped when necessary. At the north end of the tunnel, at the same distance from the river line, is a second ventilator, or rather two, one for the carriage way and the other for the pedestrian way. At length, after a walk of 1,900 feet, the other end of the tunnel is reached. The air has been found to be pure, the ventilation good, the walls, except in a few places, dry, and the whole work bears the appearance of one well conceived and well carried out.

Drying Apparatus for Hose.

This invention has for its object to furnish simple, convenient, and effective means for drying hose quickly and thoroughly throughout their entire length, thus having the hose always in order, and not weakened and rotted in spots from being imperfectly dried. Shelves, slats, or racks support the hose in line while being dried. At each end of the shelves, slats, or racks, are partitions, having holes formed in them to receive the ends of the lengths of hose, which holes are of such a size as to fit air tight upon the ends of the lengths of hose. The partitions are made in two parts, the line of division running through the holes that receive the ends of the hose, and the outer or forward parts being detachable for convenience in putting in and taking out the hose. The rack may be arranged so that the lengths of hose may be horizontal, or inclined, or vertical, as may be desired or convenient. A closet is formed at one end of the rack, made air tight, and provided with an air tight door. In the bottom or lower part of the closet is an opening, with which may be connected a pipe leading to a hot air drum or other heater to introduce hot air into the closet, from which it can only escape by passing through the lengths of hose. Ernest Drevet, of New York city, is the inventor of this apparatus.

BURNING CHIMNEYS.—If it be desired to extinguish the fire in a chimney which has been lighted by a fire in the fireplace, shut all the doors of the apartment so as to prevent any current of air up the chimney, and throw a few handfuls of common salt upon the fire, which will immediately extinguish the same. The philosophy of this is that, in the process of burning the salt, muriatic acid gas is evolved, which is a prompt extinguisher of fire.

THE BEST REPEATER YET.—Among the numerous "repeaters" which are constantly being noticed in the telegraphic journals, we have seen nothing more worthy of mention than one which is working "out West" at the present time. It is a young lady operator, who can receive a message on one circuit and simultaneously send the same message on a second circuit with ease and rapidity. This repeater is said to be of unusual elegance and beauty, which we can readily believe, and an entire success in every respect, and good for a "house" instrument.—*The Telegrapher.*

[For the Scientific American.]

WOOD-BORING BEETLES---THE "GIRDLERS."

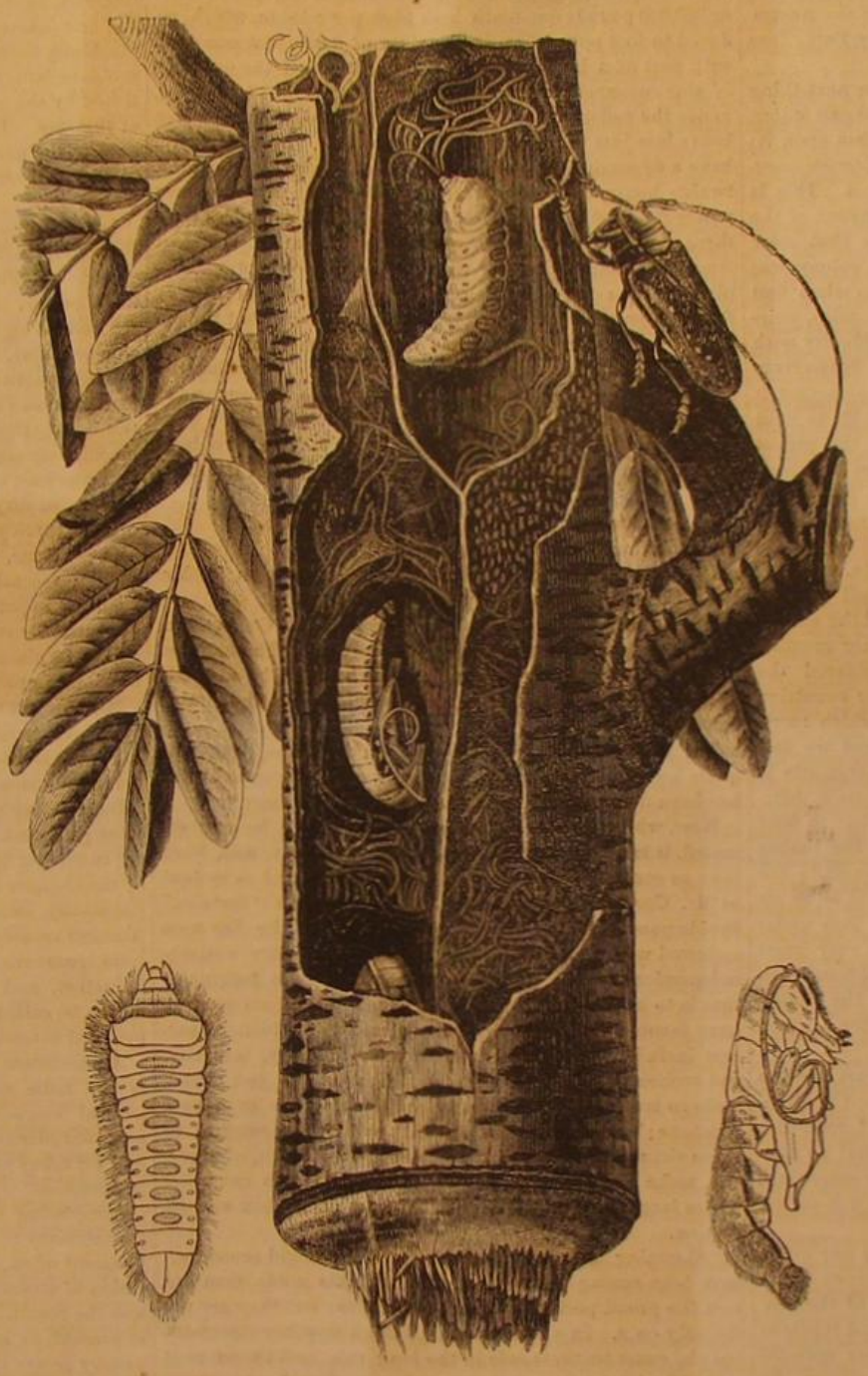
BY PROFESSOR E. C. H. DAY.

The insect figured in the accompanying beautiful engraving (from Blanchard), in the three stages of its life history, is one of the family of *Longicornia*, or "long-horned" beetles; a family also known among entomologists as the *Cerambycidæ*, from *Cerambyx*, one of the most typical of the genera it includes. As the former name denotes, the members of this, a most extensive group, are characterized by the length of their elegant antennæ. They are beetles, generally speaking, of neat form, with slender, often cylindrical, bodies, and moderately long legs. Many species attain to a considerable size, and many are brilliantly colored. They are, therefore, always acceptable additions to the cabinet of the coleopterist. On the other hand, the grubs of by no means a few of them are among the most mischievous of timber destroyers, and there is scarcely a tree that is not liable to suffer from the attacks of one species or another of this universally distributed family.

Sometimes these unsightly, whitish—often footless, maggot-like—larvæ, penetrate the tree while it still seems to be in the full vigor of its growth, boring through the trunk, or making their homes in the pith of such plants as the elder; others hasten the destruction of trees that are past their prime; while others, again, obtain an honest livelihood by removing decayed wood.

The latter, we suspect, was the original and normal occupation of the ancestors of the family, the less commendable practices of the others being probably the results of the necessities of the "long-horned" family, at times when its legitimate labor market was overstocked. For, as in these days of dense population, a man cannot always obtain his living in the trade of his forefathers, but must turn his hand to whatever pursuit offers the best chance, so, likewise, among insects, so great is the struggle for existence, so swiftly do foes multiply against every species, so constantly, though by imperceptible degrees, are all the conditions of existence changing around them, that, if the race is to continue, its habits and its instincts must be capable of corresponding modifications.

We thus find among insects, as among the inhabitants of large cities, instances of most singular and abnormalhabits, habits induced by the exigencies in the former of natural, as in the latter of civilized, associations. Yet, however singular and out of the ordinary course may be the instincts which dictate such habits, many naturalists of the present day, nevertheless, consider them, not as original endowments by creation of the creature possessing them, but as gradual developments from simpler instincts, under the influence of a tendency to variation, directed by the necessities of the race in its struggle for existence, during very prolonged periods of time. No voluntary effort on the part of the individual is invoked, as having produced, or even tended to produce, such changes. Creative wisdom, which implies continued preservation, implanted in every race the capability of undergoing such slow and insensible modifications as should correspond to the change of condition to which, in the course of time, it would be subjected. Wherever such correspondence fails in portions of a race, such portions die out; they are no longer required in that form in the scheme of the universe. In this sense, the most extraordinary of instincts, developed from a simpler one, is no less the work of the Almighty Designer than if it had been implanted at the moment of a specific act of creation. The doctrine, in fact, while in no degree lessening our sense of Almighty Power, hightens vastly our recognition of an all-pervading Foresight.



METAMORPHOSES OF THE WOOD-GIRDLING BEETLE.

The insect here figured presents us with a most remarkable instinctive habit. We give Professor Blanchard's history of the picture, in almost his own words: A M. Houllet, sojourning in the neighborhood of Rio Janeiro, heard every night the sound of branches falling from an acacia tree. These branches had been cut around, so that the centers alone were untouched, and they had broken off, consequently, by their own weight, or by a slight movement of the wind. "To whom was the mischief to be attributed? To the negroes of the house, undoubtedly, animated by a desire to cause their master a petty annoyance. But the traveller soon perceived that there was often a beetle (*Onciderus vomicosa*) upon the branch cut off; the coleopter, then, was the author of the mischief! A branch of the acacia was brought home; it contained living larvæ and pupæ of the Onciderus. It is the same branch, laid open and thus inhabited, that we here represent."

The reason of this extraordinary procedure appears to be, that, the eggs of the beetle being laid in a part of the tree in which vitality is very active, there is danger of the offspring, during its pupal or inactive condition, being built in too completely by the growing wood. Such may, or may not, be the true explanation; but, be it so or otherwise, it does certainly seem, at first sight, impossible to account, by any development theory, for such an incomprehensible instinct. Writing of an allied species (*O. cingulatus*), found in our own region, Professor Huldeman recognizes this difficulty: "In our walks through the forest, our attention was frequently drawn to the branches and main shoots of young hickory trees (*Carya alba*), which were girdled with a deep notch, in such a manner as to induce an observer to believe that the object in view was to kill the branch beyond the notch; and, extraordinary as it may appear, this is actually the fact, and the operator is an insect, whose instinct was implanted by the Almighty Power who created it, and under such circumstances that it could never have been acquired as a habit. The effect of the girdling is unknown to the insect, whose life is too short to foresee the necessities of its progeny during the succeeding season."

An error in the above argument consists in overlooking the fact that the instinct belongs to, or subserves the purposes of, the race, and not merely of the individual. The growth of such a peculiar habit must be the result of an accumulation of small changes of instinct, tending in one direction through a vast number of generations. But, if so, do we find instances of instincts less abnormal tending in the same direction? We believe we can indicate one, at least, among these same *Longicorns*. "The larva of the *Stenocorus putator*," says Packard, "nearly amputates the branches of black and white oaks. After becoming mature in the trunk, and just before undergoing its transformations, it gnaws off the branch which contains it, and which consequently falls to the ground." Here we have the very same instinct displayed by the grub, instead of by the perfect insect, and, though it is only a transference of the difficulty—for we are as puzzled as ever to demonstrate its origin in the grub—yet it, at least, shows that the habit of the *Onciderus* is not an isolated case; and we fully believe that, if due attention were given to all the variations of this instinct that are to be found among *Longicorns*, we might eventually trace many of the transitional steps from the habit of simply burrowing in the trunk to that of the grub severing the twig; and thence, to the still more abnormal one of the parent insect performing the operation.

But a worse part of the above argument is in the implied assumption, made too frequently elsewhere, that the Creator could not have developed an instinct; the only reason for this assumption being, that we do not easily see how He could have accomplished it! It is no consolation to the true naturalist to be told, "Well, after all, the view that the 'girdlers' were, from the first, created with this instinct is the simplest and most comprehensible one!" He is not in search of easily enunciated doctrines, but of the truth; he looks upon any misconception and misstatement regarding the causation of the phenomena of Nature, as tending to lessen the high opinion we should form of the wisdom of its Author; and, while he does not conceitedly hope to be able to fathom every detail of a scheme that is universal, he does try to comprehend as much as he may of the invariable laws that control it. To such an one, these "girdlers" are not merely passing wonders, but elements in the study of the great problem of life.

Curious Sleepers.

Sleep is nearly as great a puzzle as ever it was. Much has been discovered concerning the bodily peculiarities manifested during this portion of our existence; but all whose opinions are best worth listening to, admit that they are only on the threshold of the subject yet. Why, for instance, can some men maintain their bodily and mental vigor with so small an amount of sleep as falls to their share? Lord Brougham, and many other great statesmen and lawyers, are known to have been content with a marvelously small quantity of sleep. Frederick the Great is said to have allowed himself only five hours; John Hunter, five hours; General Elliot, the hero of Gibraltar, four hours; while Wellington, during the Peninsular War, had still less.

How, on the other hand, to account for the cormorant sleepers? De Moivre, the mathematician, could (though it is to be hoped he did not) sleep twenty hours out of the twenty-four. Quin, the actor, sometimes slept for twenty-four hours at a stretch. Doctor Reid, the metaphysician, could so manage, that one potent meal, followed by one long and sound sleep, would last him for two days. Old Parr slept away his later days almost entirely. In the middle of the last century a young Frenchwoman, at Toulouse, had, for half a year, fits of lengthened sleep, varying from three to thirteen days each. About the same time, a girl, at Newcastle-on-Tyne, slept fourteen weeks without waking; and the waking process occupied three days to complete. Doctor Blanchet, of Paris, mentions the case of a lady who slept for twenty days together when she was about eighteen years of age, fifty when she was about twenty, and had nearly a whole year's sleep from Easter Sunday, 1862, till March, 1863; during this long sleep (which physicians call hysteric coma) she was fed with milk and soup, one of her front teeth being extracted to obtain an opening into her mouth. Stow, in his "Chronicle," tells us that "The 27th of April, 1546, being Tuesdaie in Easter weeke, W. Foxley, potmaker for the Mint in the Tower of London, fell asleep, and so continued sleeping, and could not be waked with pricking, cramping, or otherwise, till the first day of the next term, which was full fourteen dayes and fifteen nights. The causes of his thus sleeping could not be knowne, tho' the same were diligentlie searched for by the king's physicians and other learned men; yea, the king himselfe examined ye said W. Foxley, who was in all points found at his waking to be as if he had slept but one night."

Another very notable instance was that of Samuel Chilton, of Timsbury, recorded in one of the volumes of the "Philosophical Transactions of the Royal Society." In the year 1694 he slept for a month, and no one could wake him. Later in the same year he had a four month's sleep, from April the 9th to August the 7th; he woke, dressed, went out into the fields (where he worked as a laborer), and found his companions reaping the corn which he had helped to sow the day before his long nap; it was not till that moment that he knew of his sleep having exceeded the usual duration of a few hours. He went to sleep again on the 17th of August, and did not wake till the 19th of November, notwithstanding the pungent applications of hellebore and sal ammoniac to his nostrils, and bleeding to the extent of fourteen ounces. He woke, asked for bread and cheese, but went off to sleep again before it could be brought to him, taking another spell of sleep, which lasted till the end of January. After this it is not recorded that he had any more of these strange relapses.

There are instances of sleep so intensely deep as to deprive the sleeper of all sense of pain. The records of the Bristol Infirmary present an extraordinary illustration of this. One cold night a tramp lay down near the warmth of a limekiln, and went to sleep. One foot must have been close to the fire hole of the kiln; for during the night the foot and ankle were so completely burned away, as to leave nothing but black cinder and calcined ash. He did not wake till the kiln man roused him next morning, nor did he know what had occurred until he looked down at his charred stump. He died in the infirmary a fortnight afterwards.

If we have an undue increase of noxious insects, it is not because new ones spring into being, but because of the increase of food on which they can feed. That the Colorado potato beetle is to some extent poisonous is inferred from the fact that the exposed parts of persons become very much swollen after standing in the smoke of fires into which these insects are thrown.

Correspondence.

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

Australian Timber---A Variety of Questions Asked

To the Editor of the Scientific American:

The lumber most used in this colony is that called Swan River mahogany, or, as the natives call it, Jarrah; this timber is most peculiar in almost every sense, and appears to be different from every other variety. It grows where you would think it almost impossible for anything to grow, namely, on the Darling range of hills, which range consists almost entirely of cemented gravel, commonly called ironstone. The higher the hill and the more stony the land, the larger and better the timber grows, the roots frequently raising up large masses of the above mentioned cemented gravel, several feet high, as the tree grows. The tree itself belongs to the *Eucalyptus* family, which predominates in all the Australian colonies, and is variously known as Stringy Bark, Iron Bark, Red White and Blue Gum, etc.

The timber of the Swan River mahogany is the next thing to everlasting; it is affected neither by fresh nor salt water, nor has any position on or in the ground any effect upon it; it is impervious to the white ant on land, and the *teredo navalis* in the sea, and no known insect will touch it. This is usually attributed to the peculiar geological formation of the land on which it grows. Houses and fences that were erected, and piles that were driven, when the colony was first settled, forty years ago, are as perfect now as when first put in position. It is largely used for jetties, piles, shipbuilding, railway sleepers, etc., but my great difficulty with it, and the point on which I am positive the SCIENTIFIC AMERICAN can give me good advice, is: How to prevent it from splitting? I believe it to be much more liable to split than most woods. It is generally agreed that the proper time to fell trees is in the winter, or when the tree is at rest. Now, in these Australian colonies, where there is, strictly speaking, no winter (frost and snow being unknown), all the trees are evergreens; the sap begins to flow and the tree to grow immediately after the rainy season sets in, which is about April or May. By June the tree is in full growth. September, October, and November are considered the spring, and December, January, and February the summer months, consequently March, April, and May are considered the autumn. Now, if we follow the practice of other countries, we should fell the timber in the wet season, which corresponds to the winter of most timber countries, but we find that the tree is growing then in full vigor, consequently it may reasonably be inferred that this is not the time to fell.

The information sought is what is the proper time to fell? and what is the best method of treatment after the timber is felled? Should the bark be left on, to exclude the effects of the hot sun and dry winds, or should it be removed to allow the sap to escape? To keep the logs under cover as they are cut is impracticable, except at very great expense. The questions are: Should the logs be covered with sawdust, earth, etc., at the ends, or not? Should the timber be cut up as soon as felled, or remain as felled for a given time?

In practice, we find that if any portion of the heart is left in the scantlings, they almost invariably split and rend in all directions, as if there were some substance in them, fermenting and causing them to burst. Another peculiarity is that no matter how long the lumber may have been in use or seasoning, if it be broken into, it is almost as full of sap and will shrink as much as when first felled.

The specific weight of the timber is 80 pounds per cubic foot; and consequently it sinks in water. It grows at an altitude of from 200 to 2,000 feet above the level of the sea. There is not more than half an inch of sap wood, and this is as durable as any part of the tree. The wood is most unequal in quality; some trees split ten times as much as others. So free is this timber at times that I have seen trees split from end to end, when they were felled, when full of sap. When a log is being broken down, or sawn down the center, I have seen it open at every stroke of the saw, as if the inside or heart wood were swelling or the outside wood contracting; so much so, that I have seen a log, when half sawn through, fly asunder. Professor Abel and others who have analyzed this wood attribute its peculiar properties to tannic acid.

Perth, Western Australia. WEST AUSTRALIAN.

Mechanical Equivalent for Zinc.

To the Editor of the Scientific American:

In your journal of the 24th of June, you assert that the "mechanical equivalent for twenty-two pounds of zinc, or the consumption of that quantity of zinc in such a manner that its total mechanical effect could be realized, would be a duty of two horse power maintained for nine hours." I am aware that it is the accepted formula of eminent scientists, and it is my purpose in this paper to prove that, as far as the researches of any public scientist are concerned, the world knows nothing about the mechanical equivalents of zinc, under combustion in a battery. Dr. Page, backed by eminent scientists, estimated three pounds of zinc to the horse power; Liebig, sixty four pounds.

Joule and Scoresby are capital experimentalists, and good orthodox authority, men who assert that the duty of electro-magnetic motors is as the quantity of zinc consumed in a given time. Well, they constructed such an engine, and found that one kind of battery consumed a third more zinc than another. A Daniell's battery uses seventy-five pounds, and a Grove's only fifty pounds, to do the same duty. Common sense might pertinently here enquire, if the different condition under which the zinc is consumed in the Grove battery gave it such an immense advantage over the Daniell, whether, in still other conditions, in some other battery, the quantity of zinc might not be still further reduced? The experiments of Joule and Scoresby, and also those of Jacobi and others, prove only that the work done is as the conditions under which the zinc is consumed, and not as to its quantity. This question of equivalents is, however, foreign to my purpose, and I will proceed to show, in a clear and unmistakable manner, that even three pounds of zinc is not requisite to the production of one horse power per day of twelve hours.

An electro-magnet, with limbs (one fifth of the area of the limb should be bored out) eight inches in length, and two inches diameter, bound with 1,100 feet of No. 14 wire, will lift fifty pounds at one tenth inch, under the action of four Bunsen eight inch cells. One hundred and twenty of these magnets, so arranged that their coils connect with a commutator making one revolution per second, will raise one hundred and twenty times fifty pounds one tenth inch high per minute, or 360,000 pounds one tenth inch high per minute, which, reduced to foot pounds, gives us a duty of 3,000, just one eleventh part of a horse power. Now, let us find the quantity of zinc consumed in the above duty. Four eight inch zincs, under the resistance of 1,100 feet No. 14 wire, will, in twelve hours lose just three ounces of their weight. We, therefore, have a dynamical value of one tenth of a horse power for a twelve hours, at a cost of three ounces of zinc, or one horse power for thirty-three ounces of zinc, three ounces less than three pounds. If it be alleged that such an arrangement of magnets is impractical for the continuation of motion, I reply that I am not now discussing the application of battery forces to purposes of motive power, but showing that the potential value of the battery has been extremely underrated.

In a future communication, I will as clearly show that the battery cost has had nothing to do with the non-success of electro-magnetic motors; that if the electric currents were generated absolutely costless, they never would have been more than a large toy. H. M. PAINE.

Peter Cooper's Success in Life.

To the Editor of the Scientific American:

I wish to say a word in relation to an expression in Mr. Peter Cooper's address and your comments.

No person not personally acquainted with Mr. Cooper, can, I think, regard him more highly than myself. The name of Peter Cooper can never be adorned or honored by any title or appendage. Of itself it stands alone, the most honorable name in the land.

But you say, "he shows how to earn a fortune," etc., and quote his words, that "whatever of wealth I have achieved has been due primarily to habits of patient industry."

Now, while the value of these virtues cannot be overestimated, it is a fact, nevertheless, that very many men have been as earnest, as industrious, as economical, and as patient as Mr. Cooper, but have not, like him, won a "fortune." Beside possessing and practising these virtues, he has been endowed with a keen business sagacity, a quality entirely independent of the former. He has also been fortunate; that is to say, circumstances over which he had no control, have favored him. The necessary elements of financial success include much more than "patient industry, integrity, and economy;" and it is the knowledge of this fact which leads so many to resort to questionable practices to make a "fortune;" seeing as they do, that while the practice of these virtues will get a man a "living," it will not, of necessity, make him "rich;" and also seeing numerous examples where large fortunes have been made by corruption and deception.

"Shunning intemperance, and practicing rigid economy," have been among the means by which this noble man has won the proud position which he occupies; but they are not the only ones. In a case like this, I think no other statement but the exact truth, is safe in the long run, and therefore it is that I wish to suggest that young men should understand that while the practice of these virtues will secure to them that which is more valuable than gold, it will not necessarily bring them the pecuniary success which has attended Mr. Cooper.

BETA.

How to Look at the Sun through a Telescope.

To the Editor of the Scientific American:

Take a good telescope, and cover the larger glass with a paper cover similar to the brass cover used to protect the glass. Pierce this paper cover with innumerable small needle holes, or with a ring of small holes. Unprotected, you cannot look at the sun, but with this protection, you will see the sun as a large white disk—sometimes a full disk, at others as a phase—accompanied by two sets of colored rings, which assume, during the different hours of the day, different combinations.

If you observe the sun at sunset, neither of those rings or disks appears, but the sun vibrates and follows a straight linear horizontal or vertical course.

Happening to look through the glass in the evening, at a stockade of posts some six inches apart, those posts appeared some six feet apart. If you puncture a straight line on paper with needle holes, and look at two posts of equal hight, using both your eyes, one post will appear much shorter than the other.

By using an opera glass, no rings appear; but the sun seems to move around a ring, if we provide both glasses with the pierced paper covers mentioned.

Why does the sun show different phases and rings at different hours, and why does it roll or drop at near sunset? Also, why does it, when looked at through the glass, set some five minutes sooner than when seen without the glass?

Missouri, Montana. A. H.

Paine's Perpetual Motion.

"Qui prouve trop ne prouve rien."

To the Editor of the Scientific American:

The object of this communication is to prove that if H. M. Paine's assertion (see his letter, page 404, No. 26, last volume) that the mechanical equivalent of the electricity, developed by the oxidation of 3 grains of zinc, is equivalent to 67,000,000 foot pounds, be correct, he has found perpetual motion, and even more than that, and that it is no use for him to deny this.

It is known to all electricians that we possess the means of developing electric currents by purely mechanical power; for instance, the old friction machine, the modern Holz induction machine, and the different kinds of magneto-electric apparatus first made by Pixis, Clarke, Ettinghausen, and since considerably improved by Siemens, Stoerer, and others. The latter kind have the advantage of giving currents of great quantity, even superseding batteries in telegraphing, while the first named give only intensity. The magneto-electric machines, therefore, give currents similar to those of the ordinary batteries of zinc and acids; this has been fully established by the practical results obtained by the large machines of this day. These results are of three kinds: First, in regard to the production of heat and light; second, in regard to chemical action; and third, in regard to electro-magnetic attraction.

1st. PRODUCTION OF HEAT AND LIGHT.—A beacon at South Foreland, England, is illuminated by means of a magneto-electric machine, rotated by a small steam engine of two horse power. It produces a light equal to that of fifty Bunsen cells, 6 by 4 in. plates, consuming each half an ounce of zinc per hour, with the necessary acids.

A few years ago, the Place du Carrousel and the Jardin des Tuileries in Paris, were illuminated at night with three electric lights (Dubosq's lamps) produced by a magneto-electric machine driven by a steam engine of four horse power. Its cost was half that of common street gas, while the equivalent battery, of fifty large Bunsen cups, consuming three pounds of zinc, three pounds of sulphuric, and two pounds of nitric acid per hour, would cost considerably more.

Quite recently a French government vessel, provided with such an apparatus, exhibited in our harbor an electric light, produced by steam power; it was placed at the bow of the vessel, in place of the ordinary lanterns, on which it was an immense improvement.

2d. PRODUCTION OF CHEMICAL ACTION.—Some years ago a company was formed in New York by a certain Mr. Shephard, to electroplate, by means of a magneto-electric machine driven by steam power. It was seen in operation at the fairs, and fine specimens of electroplating and electrotyping were produced. It was based on the fact that it is economical to replace the consumption of zinc in the battery, by that of the cheaper coal in the furnace; but the company was, financially, mismanaged, as is so often the case in companies, in total ignorance of certain peculiar laws of magneto-electric induction, and manipulated by persons who could by no means be called electricians, of which I satisfied myself by personal investigation.

A permanent success was attained at College Point, L. I., at the india rubber works of Mr. Poppenhusen, who had several magneto-electric machines, constructed after the patented plans of Mr. Beardslee, running by steam power; he had for many years a successful electroplating establishment in operation, or rather he rented out electric currents to an electroplating firm of New York city, in the same way as it is customary to rent out steam power. I visited this establishment often, and a great saving of expense, by the substitution of steam power for the consumption of zinc and acids, was the result. I believe that the process is no more in use at present, as an ordinary steam engine gives much more battery power than the largest electroplating establishment can make use of; perhaps also for reason of the difficulty of subdividing a powerful current properly between the different electroplating troughs, for which purpose different smaller zinc batteries are more easily adjusted.

3d. PRODUCTION OF MAGNETIC ATTRACTION.—In regard to the magnetic force of the thus produced electric currents, I can state that Mr. Beardslee occupied himself with manufacturing magnetic hammers, horseshoe magnets, magnetic toys, also magneto-electric rotary machines, and field telegraphs, in all of which it was necessary to obtain a strong magnetic power; and that all of this, he obtained in immense quantities from colossal soft iron systems, surrounded by coils, and solely charged by the currents produced in the magneto-electric machine by the power of the steam engine rotating the same. He saved in this way several hundred times the 3 grains of zinc Mr. Paine speaks of, while employing only about the hundredth part of the 67,000,000 foot pounds which Mr. Paine asserts that he can obtain from the 3 grains of zinc.

I have avoided theoretical reasonings for the simple reason that, according to Mr. Paine, the theory is all wrong; and I confined myself to purely practical results, to stubborn facts; and among those bearing especially on our subject, I selected only a few obtained in our city and neighborhood. They may be multiplied *ad infinitum*, and they all show that, independent of any theories, we may, by using mechanical power, develop electric currents equivalent, to all intents and purposes, to the currents developed by the consumption of zinc. These machines are coming more and more in use, one of the latest, that of Wilde, which was an improvement on Ladd's, obtained a prize at the Paris Exposition of 1867; while S. Marcus, in Vienna, now manufactures magneto-electric machines equal to a Bunsen cell consuming 500 grains of zinc per hour, and in which the current is developed by the power of a man only. A large magneto-electric machine

needs not even to be of the most improved kind in order to produce, by means of a single horse power, not only the same but much stronger currents than those which Mr. Paine asserts to be sufficient "to drive the largest ship afloat."

I propose, therefore, that Mr. Paine will use one thousand part of his 67,000,000 foot pounds obtained from the 3 grains of zinc, or 67,000 foot pounds (if used in one minute it is nearly two horse power), and employ this to run some large magneto-electric machine, producing thus a current equivalent to that obtained by the consumption of three pounds, or nearly 23,000 grains of zinc per hour, and therefore not only equal but much stronger than that originally obtained from merely 3 grains of zinc, which then may afterward be dispensed with; the stronger current thus obtained again acting on Paine's electric engine will cause it to run much faster than could be done with the 3 grains of zinc used at the starting; this faster motion again acting on the magneto-electric machine will, of course, cause a stronger current (the strength of the currents, as well known, increases in these machines with the velocity of rotation), this stronger current will again cause Paine's electro-motor to run faster, and so on, and so on; consequently he has not only obtained perpetual motion—no, "instead of this miserable small result," he will have obtained a motion possessing in itself the elements of a creative increase, so as finally to obtain "a velocity only limited by the strength of the frame of the" machine.

Mr. Paine says: "I am no tyro." The public is aware of this; but when he adds: "I am the peer of any authority you may quote," it gives a suspicion that after all he is not thoroughly acquainted with the investigations in electro-magnetism of Casselman, Bunsen, Joule, Wiedemann, and, above all, Dubb, the labors of all of whom are immense, and of much more special importance to the subject in question (electromagnetic motive power) than those of the authorities he quotes. Their investigations relate chiefly to the subject of the correlation of forces in general. Only Faraday stands among them as a great discoverer in electrical science. I ask: What is proved by the fact that Mr. Paine calls himself the peer of a man like Faraday? If it does prove anything at all, it surely does not prove his assertions. Drive your large ship, Mr. Paine, and leave it to others to call you "the peer of any man of science;" or, what is better still (as it would in a short time make you richer than Commodore Vanderbilt or A. T. Stewart), I advise you, if you are so sure of success, to manufacture small electro-magnetic engines, producing 67,000,000 foot pounds per day, at the expense of three grains of zinc; this would be equivalent to about 20 horse power, at an expense of two ounces of zinc per year, costing, with the acids, from two to three cents per year, in place of about $1,000 for coal, and more than $1,000 for labor, as is now the case; do this, Mr. Paine, such machines would sell, drive all steam engines out of the market, and your fortune is made, which is much better than fighting the old theory of the conservation of forces, or of bothering yourself and the public with blowing about what you are going to do.

I recommend to all others interested in this subject to study the labors of Casselman in regard to the unit of chemical intensity of the galvanic current, then the subsequent labor of Weber in regard to the unit of the absolute electro-magnetic effect as depending from the unit of chemical intensity, and the practical investigations of Dubb; when then applying all these to the laws of electro-dynamics, discovered long before by Ampère, the matter becomes settled. I came long ago to a final conviction in regard to the subject, after having studied it practically as well as theoretically, from the year 1837 (I had already, in 1839, an electromagnetic motor in operation, turning my lathe).

Mr. Paine says the gentlemen associated with him in this enterprise suppose that they are "fully competent to judge of the facts in the premises," and that they "are men that you nor I cannot mislead."

Well, in the recent Franco-German war, Napoleon III., his generals, and the French people at their back, were satisfied that they were fully competent to judge for themselves, that they could whip the Prussians, and would never have abandoned the idea without practical trial; and I believe that Mr. Paine and "the gentlemen associated with him" will have to go through the ordeal of a practical trial also, before their eyes can be opened to the truth. The only difference between them and the French is, that the latter had some chance of success, as the results of war depend, to a certain extent, on luck or good fortune, while for obtaining 67,000,000 foot pounds out of only 3 grains of zinc there is not a ghost of a chance.

The unfortunate thing in all this and similar cases is that the denial of an anticipated success does not pay, while the stubborn assertion of an ultimate triumph, may be made to pay, when a man is no tyro, and only knows how.

New York city. P. H. VANDER WEYDE, M.D.

Humboldt.

Alexander von Humboldt was the corypheus of physical science and a man of universal culture; a man also, of "society," and of courtly life. He kept up his intellectual work to the last, laboring mostly while the world around him slept. It was his most substantial life. He lived about ninety years, and crowded into them centuries of the life and work of ordinary men. On the 3d of May, 1859, the journals of Berlin announced that "Alexander von Humboldt has been confined to his bed the last twelve days; his strength has been gradually failing; his mind retains all its clearness." In three days more as the sunlight poured into his window, he exclaimed, "How grand those rays! they seem to beckon earth to heaven!" and died. For twenty years or more, the time in which men are usually said to be beyond the "allotted period of life," and during which they usually mentally decay from day to day, he was writing the greatest work of his life, the greatest of his generation, the "Cosmos." He laid down his pen, his task splendidly finished, but a short time before he laid himself down to die. The "Cosmos" kept him alive, mentally and physically.

Brain work is sanitary work. Nay, it is a necessary condition, more or less of it, of health in advanced life, a necessary preventive of cerebral decay. Not only moral purification, but growth in intelligence, in wisdom, is the divinely appointed result of human life as a probation; and nature deals out her penalties for the neglect of the latter, as well as for the neglect of the former.—*Abel Stevens, in Hearth and Home.*

Dream Workers.

Those cases in which the brain is hard at work during sleep, instead of being totally oblivious of everything, may be called either dreaming or somnambulism, according to the mode in which the activity displays itself. Many of them are full of interest. Some men have done really hard mental work while asleep. Condorcet finished a train of calculations in his sleep which had much puzzled him during the day. In 1856, a collegian noticed the peculiarities of a fellow student who was rather stupid than otherwise during his waking hours, but who got through some excellent work in geometry and algebra during sleep. Condillac and Franklin both worked correctly during some of their sleeping hours.

The work done partakes in many cases more of the nature of imaginative composition than of scientific calculation. Thus, a stanza of excellent verse is in print, which Sir John Herschel is said to have composed while asleep, and to have recollected when he awoke. Goethe often set down on paper during the day, thoughts and ideas which had presented themselves to him during sleep on the preceding night. A gentleman one night dreamed that he was playing an entirely new game of cards with three friends; when he awoke, the structure and rules of the new game, as created in the dream, came one by one into his memory; and he found them so ingenious that he afterwards frequently played the game. Coleridge is said to have composed his fragment of Kubla Khan during sleep. He had one evening been reading Purchas's Pilgrim; some of the romantic incidents struck his fancy; he went to sleep, and his busy brain composed Kubla Khan. When he awoke in the morning he wrote out what his mind had invented in sleep, until interrupted by a visitor, with whom he conversed for an hour on business matters; but alas! he could never again recall the thread of the story, and Kubla Khan remains a fragment. Doctor Good mentions the case of a gentleman who in his sleep composed an ode in six stanzas, and set it to music. Tartini, the celebrated Italian violinist, one night dreamed that the devil appeared to him, challenged him to a trial of skill on the fiddle and played a piece wonderful for its beauty and difficulty; when Tartini woke, he could not remember the exact notes, but he could reproduce the general character of the music, which he did, in a composition ever since known as the Devil's Sonata. Lord Thurlow, when a youth at college, found himself one evening unable to finish a piece of Latin composition which he had undertaken; he went to bed full of the the subject, fell asleep, finished his Latin in his sleep, remembered it next morning, and was complimented on the felicitous form which it presented.

Still more curious, however, are those instances in which the sleeper, after composing or speculating, gets up in a state of somnambulism, writes the words on paper, goes to bed and to sleep again, and knows nothing about it when he wakes. Such cases, the authenticity of which is beyond dispute, point to an activity of muscles as well as of brain, and to a correctness of movement which is marvellous when we consider that the eyes are generally closed under these circumstances.

Dr. W. B. Carpenter mentions the case of a somnambulist who sat down and wrote with the utmost regularity and uniformity. "Not only were the lines well written, and at the popular distances, but the i's were dotted and the t's crossed; and in one instance the writer went back half a line to make a correction, crossing off a word, and writing another above it, with as much caution as if he had been guided by vision." The young collegian, adverted to in a former paragraph, got out of bed in his sleep, lit a candle, sat down to a table, wrote his geometry and algebra, extinguished the light, and went to bed again; the lighting of the candle was a mere effect of habit, for his eyes were shut and he was really not awake. About the begining of the present century a banker at Amsterdam requested Professor van Swinden to solve for him a calculation of a peculiar and difficult kind. The professor tried it, failed, and submitted to ten of his pupils as a good mathematical exercise. One of them, after two or three days work at it, went to bed one night with his mind full of the subject, and fell asleep. On waking in the morning he was astonished to find on his table sheets of paper containing the full working out of the problem in his own handwriting; he had got up in the night and done it, in his sleep and in the dark. The first French Encyclopædia narrated the case of a young ecclesiastic at Bordeaux who was in the habit of getting out of bed in his sleep, going to a table, taking writing materials, and writing a sermon. He was often watched while doing this, and an opaque screen was cautiously placed between his eyes and the paper; but he wrote on just the same. One example of mental discrimination displayed by him was very remarkable, showing how strangely awake even the reasoning faculties may be during somnambulistic sleep. He wrote the three French words, "ce divin enfant;" then changed the "divin" into "adorable;" then recognized that "ce" would not suit before an adjective commencing with a vowel; and finally changed it into "cet." On another occasion the paper on which he was writing was taken away and another sheet substituted; but he immediately perceived the change. On a third occasion he was writing music, with words underneath. The words were in rather too large a character, insomuch that the respective syllables did not stand under their proper notes. He perceived the error, blotted out the part, and wrote it carefully again; and all this without real vision, such as we ordinarily understand by the term.

The Irrational House.

A house is as much a necessary of life as a loaf; yet this article of necessity has been lately raised to a fancy price by the trade conspiracies of the building operatives—not so much by their legitimate strikes for high wages as by their conspiring never to do for any amount of wages an honest day's work—and the fancy price thus created, strikes the householder first in the form of rent. But this excessive rent, although it is an outgoing, is taxed as income; its figure is made the basis of all the imperial and parochial exactions that crush the householder. One of these is singularly unfair; I mean "the inhabited house duty." What is this but the property tax rebaptized and levied over again, but from the wrong person? The property tax is a percentage on the rent, levied in good faith, from the person whom the rent enables to pay that percentage; but the inhabited house duty, is a similar percentage on the rent, levied, under the disguise of another name, from him whom the rent disables.

In London the householder constantly builds and improves the freehold: instantly parochial spies raise his rates. He has employed labor, and so far counterbalanced pauperism; at the end of his lease the house will bear a heavier burden; but these heartless extortioners cannot wait the end of the lease; they bleed the poor wretch directly for improving parochial property at his own expense. At the end of his lease the rent is raised by the landlord on account of these taxed improvements, and the tenant turned out with a heavier grievance than the Irish farmer; yet he does not tumble his landlord, nor even a brace of vestrymen. The improving tenant, while awaiting the punishment of virtue, spends twenty times as much money in pipes as the water companies do, yet he has to pay them for water a price so enormous that they ought to bring it into his cisterns, and indeed into his mouth, for the money.

He pays through the nose for gas.

He bleeds for the vices of the working classes; since in our wealthy cities nine tenths of the pauperism is simply waste and inebrity. He often pays temporary relief to an improvident workman, whose annual income exceeds his own, but who will never put by a shilling for a slack time.

In short, the respectable householder of moderate means is so ground down and oppressed that, to my knowledge, he is on the road to despondency and ripening for a revolution

Now, I can hold him out no hope of relief from existing taxation; but his intolerable burden can be lightened by other means; the simplest is to keep down his bill for repairs and decorations, which at present is made monstrous by original misconstruction.

The irrational house is an animal with its mouth always open.

This need not be. It arises from causes most of which are removable—namely, 1st, from unscientific construction; 2nd, plaster ceilings; the want of provision for partial wear; 4th, the abuse of paint; 5th, hidden work.

Under all these heads I have already given examples. I will add another under head 3. The dado or skirting board is to keep furniture from marking the wall; but it is laid down only one inch thick, whereas the top of a chair overlaps the bottom an inch and a half. This the builders do not or will not observe, so every year in London fifty thousand rooms are spoiled by the marks of chair backs on the walls, and the owners driven to the expense of painting or papering sixty square yards to clean a space that is less than a square foot, but fatal to the appearance of the room.

Under head 4 let me observe that God's woods are all very beautiful; that only fools are wiser than God Almighty; that varnish shows up the beauty of those woods, and adds a gloss; and that house paint hides their beauty. Paint holds dirt and does not wash well; varnish does. Paint can only be mixed by a workman. Varnish is sold fit to put on. Paint soon requires revival, and the old paint must be rubbed off at a great expense, and two new coats put on. Varnish stands good for years, and when it requires revival, little more is necessary than simple cleaning, and one fresh coat, which a servant or any body can lay on. 5. Hidden work is sure to be bad work, and so need repairs, especially in a roof, that sore tried part; and the repairs are the more expensive that the weak place has to be groped for.

I have now, I trust, said enough to awaken a few householders from the lethargy of despair, and to set them thinking a little, and organizing a defense against the extraordinary mixture of stupidity and low instinctive trade cunning of which they are the victims; for a gentleman's blunders hurt himself, but a tradesman's blunders always hurt his customer; and this is singularly true of builders' blunders; they all tend one way—to compel the house holder to be sending for the builder, to grope for his hidden work, or botch his bad work, or clean his unscientific windows, or whitewash his idiotic ceilings, or rub his nasty unguents off God's beautiful wood, and then put some more nasty odoriferous unguents on, or put cowls on his illcleaned chimneys; or, in short, to repair his countless blunders at the expense of his customer.

Independently of the murderous and constant expense, the bare entrance into a modest household of that loose, lazy, drunken, dishonest personage who has the impudence to call himself "the British workman," though he never did half a day's real work at a stretch in all his life, is a serious calamity to be averted by every lawful means.—*Charles Reade.*

Improved King Bolt for Carriages.

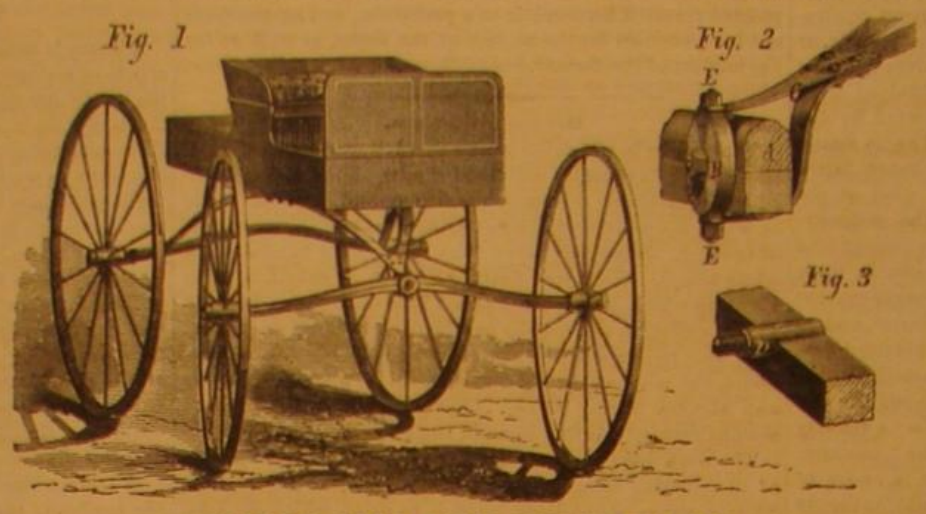
Our engraving shows an improved king bolt for carriages. By its use, the necessity for a fifth wheel, and many other attachments, is entirely obviated.

Fig. 1 is a perspective view of a buggy wagon with this improvement attached. Fig. 2 is a vertical cross section through the middle of the axle and the bolt; and Fig. 3 is a detail rear view of the middle of the axle.

In Fig. 2 the improvement is shown most distinctly. The body of the wagon rests upon two elliptic springs, placed lengthwise under the box, their front ends being brought together and joined, as shown at C, Fig. 2, forming what might be called a spring perch.

A bent piece is attached to the joined ends of the springs, and brought under the axle as shown. The bifurcations of the perch thus formed are pivoted to a plate, B, as shown at E. The plate B, is also pivoted to the axle, A, as shown in Figs. 2 and 3. This not only allows of the horizontal radial motion of the axle in turning or cramping the wagon, but also permits a vertical motion of the axle on the pivot, D.

This improvement was patented through through the Scientific American Patent Agency, March 29, 1870, by William Clark. Address, for further information, Clark Pivot King Bolt Co., Johnsville, N. Y.



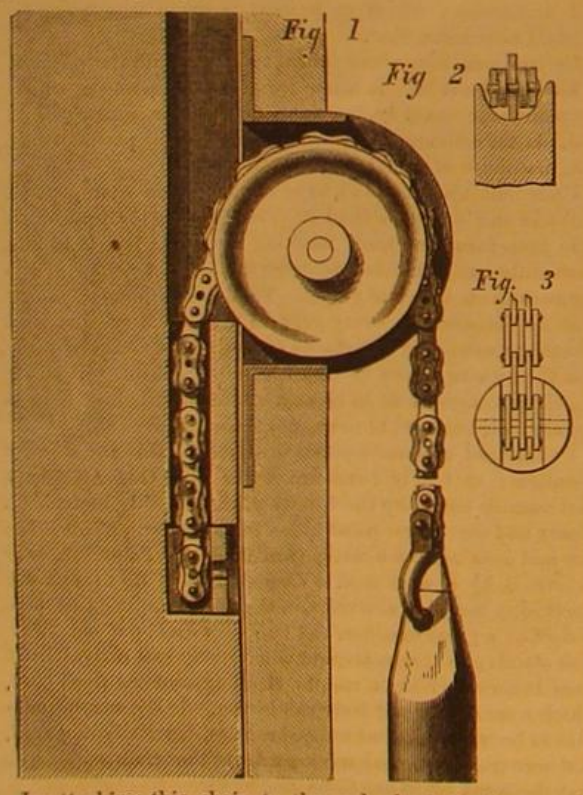
CLARK'S KING BOLT FOR CARRIAGES.

MAGRATH'S CHAIN FOR HANGING SASHES.

Every housekeeper knows the trouble attending the use of hemp cord for suspending weights of sashes. A chain, as a substitute for the ordinary cord, has recently been patented, which is designed to obviate the trouble arising from the constant breaking of the latter. The chain can be applied to any window, without change in any of the parts, it being so made as to run smoothly on the ordinary grooved pulley. For heavy windows it is specially applicable.

Fig. 1 is a view of a sash with chain and weight attached. The peculiar construction of the chain is shown in the detailed engravings, Figs. 2 and 3. As will be seen, every alternate link is composed of three blanks, punched from sheet metal. Each blank has a hole through the center, as well as at the extremities. The object of this is to enable the chain to be cut off at any required length, and be readily fastened, at one end to the sash and at the other end to the weight, by the insertion of a pin or rivet.

The triple blank links are connected by links made of two blanks, as shown. The middle blank of each triple link is made wider than the two outside ones, as shown in Fig. 3. This enables the link to adapt itself to the curvature of the groove in the pulley, as shown.



In attaching this chain to the sash, the latter is grooved or recessed along the edge, as shown in Fig. 1, so as to receive the chain. At the lower end of the groove is formed a vertical hole, which extends from the open groove down to a hole bored in the edge of the sash at right angles thereto. A metal plug or stop, of a size to fit the last named hole, is inserted therein. This stop is recessed on its face to receive the links, as shown in Fig. 2. The chain is secured to the stop by a rivet or pin, as shown in Fig. 1. The weight is attached to the end of the chain by a hook.

Patented, March 21, 1871, by Michael Magrath, whom address for further information, 74 Irving Place, N. Y.

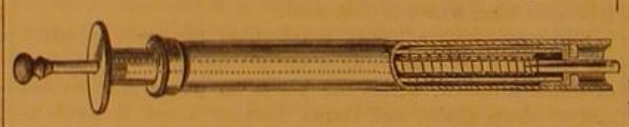
Steam Nut Crackers.

In the manufacture of palm oil, it has been very desirable to get rid of the shells which envelop the kernels in a speedy and effective manner. An English inventor proposes to do this by an apparatus of his devising, as follows:

The nuts are raised up to the second floor of the building by means of hoisting apparatus, and are fed into a hopper, which delivers them into a shake or spout, the bottom of which is perforated to allow parts of the husks or other foreign matters to escape. The spout delivers the nuts into the upper end of a revolving perforated cylinder, which is placed in a slanting position. The nuts in passing down this cylinder are agitated to remove portions of the husks and other foreign matters, which are carried off by the shoot. The nuts drop from the end of the cylinder into a hopper, which delivers them to the machinery by which they are broken. This machinery consists of a drum with blades or projections on its circumference. This drum revolves at a high velocity in a casing, and the shells are broken without breaking the kernels by the rapid action of the blades on the revolving drum striking the nuts. The broken shells and kernels discharged by the centrifugal force of the drum are delivered into the upper end of a perforated cylinder, which is also placed in a slanting position, so that in revolving it carries the shell and kernels to the lower end, whence they fall into a separating cistern. The small particles of shell and husk drop through the perforations of the cylinder into a discharge shoot. The cistern contains a solution of common salt and water, or any other solution the specific gravity of which is rather greater than that of water, in order that the kernels may float on the top of the solution, while the shells sink and drop on to an endless belt or creeper, which in traveling along conveys the broken shells towards and into the right hand end of the cistern, from whence they are discharged continuously by a spout. The outlet from the cistern is provided with a sliding valve, the position of which can be regulated by a lever. The lower part of the spout consists of open rods or a perforated plate, through which the solution escaping from the cistern with the broken shells is discharged on to the floor or into a suitable receptacle.

ARTIFICIAL LEECH.

This instrument is the invention of Frederick Wolff, of New York city. It consists of a lancet, or puncturing device, and a suction piston, the lancet acting independently of the



piston in making its puncture, and then both the lancet and piston being withdrawn, the body of the instrument is filled with blood. The instrument operates precisely on the general principle of first puncturing and then sucking, employed by the natural leech.

Disease and Carelessness.

There can be no doubt that carelessness is the origin of most diseases. Medical men also hold that foolish people who follow their own whims have hardly a chance of recovery when visited by serious disease. Nine tenths of the doctor's work would be done if people were only consistently prudent and cautious. Only it is so hard to be habitually cautious. On abundant occasions a man may be most elaborately prudent, and then, to his utter astonishment, he dangerously imperils his health by some startling impropriety. When he has used every imaginable pains, he is always amenable to the force of accident. There is another plausible theory, antagonistic to the one we have named, to the effect that every man has the seeds of some particular disease in his constitution, and some trifling accident will come, sooner or later, which will have for him the same effect as a match falling upon gunpowder.

Medical men explain this on theories of constitutional tendencies, or of some poison latent in the system. The fatal accident to one man is the merest accident for another. Two men while walking get well soaked by the rain. One man shakes off the water pretty much as a dog or a duck might do, and rather enjoys his shower bath than not. The other man is taken ill of inflammation of the lungs, and probably dies. The doctors cannot explain the different issues, and they would also be very much puzzled to give a satisfactory account of the phenomenon itself. They will, indeed, generally explain theories more or less plausible, and practice has been built upon theory, and theory has, no doubt, sacrificed a number of lives. Yet medicine must have its dogmatic system, and without it medicine becomes little better than empiricism.

COMMON salt is recommended for the extermination of ants.

Subterranean Electrical Disturbances.

A few minutes before and after the earthquakes of the 17th March last, says *Nature*, powerful positive electrical currents were rushing towards England through the two Anglo-American telegraph cables, which are broken near Trinity Bay, Newfoundland. Mr. C. F. Varley, C.E., who informed us of the fact, broaches the novel speculation that some earthquakes may be due to subterranean lightning. He imagines that as the hot center of the earth is approached, a layer of hot dried rock may be found which is an insulator, while the red hot mass lower down is a conductor. If this conjecture be true—and there is plausibility in it—then the world itself is an enormous Leyden jar, which only requires charging to a very moderate degree to be equal to the production of terrific explosive discharges.

The French Atlantic cable was disturbed at the same time, and so were many of the English land lines, but the only observations as to the direction of the current were made by means of the Anglo-American telegraph cables.

A number of Mr. Varley's charts about earth currents were published in the Government Blue Book of 1859-60, showing that the direction of these currents across England was in a very notable degree determined by the contour of the coast, and that the same auroral discharges would often produce currents at right angles to each other in direction, in different parts of Britain.

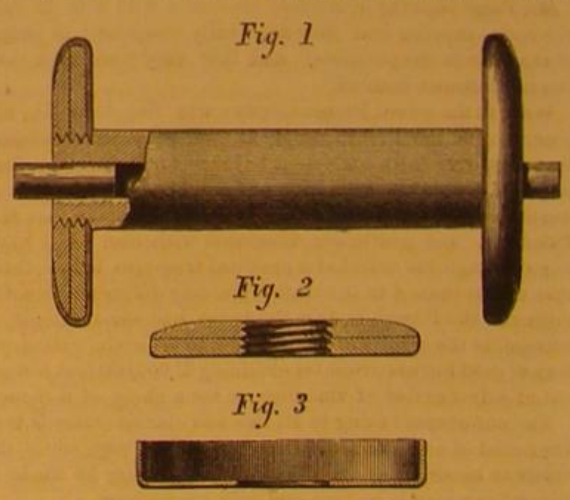
Necessary Rules for Sleep.

There is no fact more clearly established in the physiology of man than this, that the brain expends its energies and itself during the hours of wakefulness, and that these are recuperated during sleep. If the recuperation does not equal the expenditure, the brain withers—this is insanity. Thus it is that, in early English history, persons who were condemned to death by being prevented from sleeping, always died raving maniacs; thus it is also that those who are starved to death become insane, the brain is not nourished and they cannot sleep.

The practical inferences are three: 1st. Those who think most, who do the most brain work, require the most sleep. 2d. The time "saved" from necessary sleep is infallibly destructive to mind, body, and estate. 3d. Give yourself, your children, your servants, give all that are under you, the fullest amount of sleep they will take, by compelling them to go to bed at some regular, early hour, and to rise in the morning the moment they wake; and within a fortnight, Nature, with almost the regularity of the rising sun, will unloose the bonds of sleep the moment enough repose has been secured for the wants of the system. This is the only safe and efficient rule; and as to the question how much sleep any one requires, each must be a rule for himself—great Nature will never fail to write it out to the observer under the regulation just given.

METALLIC LINED SPOOL HEAD.

The object of this improvement is to overcome the difficulties experienced in the use of the ordinary wood spool heads, both for cotton yarn, and woolen roving on jack spools. The wood heads, after being used a short time, become rough on the edge, and this roughness catches and breaks the yarn, causing much unnecessary stopping of machinery. On jack



spools, much waste is made by the outside strands of the roving adhering to the surface of the head, and it is frequently the case that the strands next to the head have to be run off, and cannot be spun, making considerable waste which would be saved by the use of a smooth head, such as this improvement offers. It consists in covering the inner surface and outer edge of each head with sheet metal, which is firmly pressed on with dies, binding the two thicknesses of wood firmly together, preventing them from breaking and the edges from splintering, making a strong and durable spool, and giving at all times a perfectly smooth edge and surface for the yarn to run from, saving much of the breaking of the yarn, and enabling the machines to do more and better work. They have, we are informed, been in successful use nearly one year, by some of the first manufacturers in the country, and have given entire satisfaction. Patented May 10, 1870. All communications, either from manufacturers or spool makers, should be addressed to Stillman & Carmichel, Westerly, R. I.

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COLLEGE COMMENCEMENTS.

It is estimated that there are two hundred and twenty-five colleges, for males, in the United States, entitled to confer degrees, and that the total attendance upon them, of undergraduate students of arts, is, in round numbers, 14,000. This will allow one student to every 2,850 of the population; and as one quarter of the students leave every year, we have at the annual commencements the picture of 3,500 young men presenting themselves for the degree of Bachelor of Arts from all of our Colleges. This is a pretty large army of recruits to be admitted each year to the ranks of college alumni, and if classical education is what it is represented to be, the young men ought to exert a controlling influence over the affairs of the nation.

There is no doubt that college graduates are to be found in the highest positions of our land. The leading clergymen, physicians, lawyers, and statesmen are taken from the ranks of college alumni; and there appears to be something in the training which they have received that gives them an advantage over their competitors. There are, however, in our country, numerous instances of self-made men who, by extraordinary intensity and peculiar natural gifts, have surmounted the disadvantages of defective early training, and have risen to the highest eminence. These instances are rare and cannot be quoted as an argument against the advantages of college training.

Any reflecting man must observe that, of late years, a larger proportion of the so-called self-made men rise to prominent positions than formerly. A peculiar kind of talent is required to secure an ascendancy in politics. And our modern rulers cannot afford to waste time on the finer points of education if they expect to attain early success in the possession of office. We find college graduates pushed aside and intriguing men of inferior training accepted in their places. So many instances of this kind have occurred lately that it is said that the total number of students attending colleges in the United States is not relatively but absolutely less than it was thirty years ago; in other words, although the population of the country has largely increased, the attendance upon colleges has either remained stationary or has actually diminished. While at one time in our history there was one person in every thousand in college, we now find only one person in nearly three thousand. The average is said to be brought down by the great influx of foreigners, but it cannot be looked upon as an encouraging sign of the times. It is not safe for our colleges to shield themselves under cover of foreign emigration, but they would do well to consider whether the decrease in attendance may not be partly due to defects in their curriculum of instruction. Perhaps the fathers who supply the money do not feel that they get their money's worth. This is a practical age, and people are very much in the habit of sitting down and counting the cost of an education; and if the investment does not yield a good return, they certainly will not make it.

Somehow, college education has grown into disrepute, and college professors would do well to inquire why. It is none of our business to answer questions of this character. We have to deal with the applications of science to the arts, and the patent diplomas which we procure for our customers are written in plain English, and do not require an interpreter; but we have some knowledge of the wants of the country, and we publish every week a list of inquiries from all parts of the United States, going to show what people want to know. We would suggest to college authorities the propriety of reading these questions, and also of studying the great demands of the age, and, after the perusal, let them ask themselves, how many of these inquiries could be answered by a college graduate? This would be a fair test to make, and it may possibly afford an explanation of the falling off in the attendance upon colleges. Perhaps the colleges do not offer the kind of education that the times demand. It may be that a little less Latin and Greek, and more of the physical sciences, would be acceptable. That we are correct in our surmise is proved by the fact that a large number of schools of science have been organized all over the land, and the attendance upon them will soon far exceed that upon the old fashioned institutions. Schools must keep up with the progress of the age, as well as inventions, and as the inventor who brings out something that nobody wants, necessarily fails, so the college which teaches what was fashionable in the middle ages, but is now utterly superseded, must also go down for want of patronage.

"There is a screw loose somewhere," to adapt a phrase taken from out our profession, and it ought to be secured. When our colleges are able to provide an education that will enable men to make better mechanics as well as clergymen, better merchants as well as lawyers, better farmers as well as doctors, they will come nearer to answering public demand than they now do; and, instead of having an attendance of 14,000, in a population of 40,000,000, they would soon run up the number to more than a hundred thousand, and be able to scatter the seeds of learning over the whole extent of our great nation.

The Commencement season is the occasion for the gathering together of the faithful all over the land. Let the Alumni this year consider some of the points raised by us, and we doubt not that much good may be made to grow out of the discussion.

THE CAUSES OF DISEASE.

The uncertainty of medical men as to the real value of the greater number of remedies which have been recommended and tried in all ages, for the cure of disease, has been due to ignorance of the causes of the various ills to which the animal economy is liable. We think it may be safely asserted, that the discovery of the cause of any complaint has always been followed by an immediate improvement in its treatment. But even in this enlightened age, when the aids to scientific investigation have become so potent, it is surprising how little is known of those things which induce sickness.

Groping in the dark, we have made some unexplained discoveries of remedies which have proved efficacious. The *rationale* of the action of most of these is still a sealed book. In what way mineral poisons act to neutralize the effect of certain animal poisons—how it is that one drug acts as a sudorific, another as an expectorant, still another as a stimulant, cathartic, or emetic—yet passes our comprehension.

In surgery there still remain some unsolved enigmas, but it is in its province much less involved in perplexities than that of its sister department of medical science.

There is, doubtless, very much in pathology that must remain mysterious, till we more nearly approach to the greatest of all mysteries—life. Biology must make enormous advances before pathology can develop into anything like the proportions which the sciences of chemistry and physics have attained. No other field of investigation is so much beset with difficulties as this. Whichever way we turn and struggle to penetrate the mists that obscure our vision, we meet with the most discouraging obstacles. Were it not that all nature groaning in travail together makes an appeal that humanity cannot resist, the investigation would long ago have been abandoned as hopeless. But by dint of the most arduous toil, and through the actual martyrdom of many who have even braved death rather than be turned back, there have been gathered together a few precious crumbs of knowledge, and from these has been created a real, though very imperfect, science of pathology.

Among the most recent, as well as the most important, contributions to this science, are the results of investigations as to the extent and variety of atmospheric influences in the production of pathological conditions.

The microscope has been the chief instrument by which these investigations have been prosecuted. It reveals to us that what appears to the unaided human eye as a clear transparent medium, is really a mingled cloud of mixed gases, watery vapor, organic germs, the dust of nearly every known solid, and even living creatures.

Every breath we draw is loaded with materials that, introduced in sufficient quantity, would cause immediate and serious embarrassment to the vital functions.

So numerous and potent are these invisible enemies, animate and inanimate, that Dr. Sutton, Assistant Physician and Lecturer on Physiology in the London Hospital, takes the ground that inherited structures and *external* conditions are the true factors of disease.

Miasms, formerly supposed to be noxious exhalations or gases, unknown to chemists, and eluding their research, are now believed to be, for the most part, extremely minute germs, that find ingress to the circulation through the lungs, and there mature and breed, and multiply till their presence makes itself felt in chills and fevers. Though it is not proved by actual observation, that the infection of small-pox, measles, scarlet fever, etc., consists in similar germs, it is extremely probable that these diseases are so propagated.

Many skin diseases are now known to be the result of the establishment of insect colonies or vegetable plantations on the fruitful soil of the animal skin. Helmholz it was, we believe, who, affected with a hay-cold or incipient catarrh, examined the nasal discharge, and found it an ocean of vibriones. Diseases of the mouth, in children, have been traced to fungoid growths, the germs of which find a *nidus* in their food. In short, in our food and drink, as well as in the air we breathe, there lurk, unseen without the aid of the microscope, the seeds of numberless ills.

And yet not one doctor (the word means teacher, and every doctor of medicine should be a teacher as well as a healer), not one in fifty owns a microscope, or could use it skillfully if he had one.

Medical students are taught anatomy, physiology, surgery, obstetrics, *materia medica*, and the theory and practice of medicine—which includes pathology—but the latter, which owes its progress more to the microscope than to any other modern scientific appliance, is taught without the use of this instrument, with the manipulation of which every student of medicine should be as familiar as with that of the scalpel. Every medical school that has not a professorship of microscopy, is behind the age.

Another instrument which has been recently employed in the study of pathology is the spectroscope. An instrument, whose power, in dealing with the minutest traces of matter, has been so fully demonstrated, will doubtless be of service in detecting peculiar abnormal conditions of the tissues and the fluids.

PREJUDICES, ANCIENT AND MODERN.

We read in the writings of one of the most genial and accomplished of modern authors, that "the world is no fool's or sluggard's paradise, but a battlefield ordained from of old." And evidently true as this is generally, and more especially and significantly in a moral sense, it is singularly applicable to the world of science. From the days of Galileo to our own times, the discoverer and successful explorer, of the region of the dim unknown which surrounds our limited yet constantly extending Cosmos of ascertained knowledge, has had not only to fight with Nature, who sometimes struggles hard to keep her secrets, but, having won access to her mysteries, to combat the prejudices, and often the ignorance of his fellow men.

The unwillingness of men to adopt a new revelation of scientific fact is found, more or less, in all societies, and is co-existent with the mental emaciation which we find everywhere, and the existence of which we recently had occasion to deplore. It is, moreover, the most lamentable characteristic of an ordinary mind, paralyzed by being used in one direction only (which our correspondent, J. C. McElroy, last week somewhat euphemistically called "specialism"), that all truth that is an advance beyond the narrow sphere of average experience, is doubted, struggled against, and denied, not because it is false, but because it is new.

This atrophy of the mind is, we are glad to think, diminishing in extent and influence. In the prodigious activity of the present day, when each field of knowledge has its myriad explorers, when even the rapidity of modern experimental science does not prevent microscopic investigation of every detail, and the whole domain is thoroughly searched for new treasures of fact, the toilers after truth have little patience with the opposition of the ignorant. And the extended and liberal education of this age, which is the greatest of the advantages that society derives from the increase of wealth, has done much to secure, for all new discoveries, a fair hearing and a candid and impartial criticism. Altogether, we Americans have little to reproach ourselves with on this ground; indeed, we have among us some who run after the new, be it true or not; and who, in their zeal for discovery, forget that scientific knowledge must grow organically, and not be created out of nothing. But certainly no truth, however at variance with the preconceived ideas of half educated men, will fail to find hearers in this country, although some of them may merely tolerate it to await the issue, as Gamaliel did in a notable instance.

It is, then, a most hopeful sign of the improved intellectual condition of this age, that the unreasoning opposition of the average mind and the "specialist" is losing strength and pertinacity. The complete man, whether he be philosopher, artist, merchant, or mechanic, will never be a "specialist," in the narrow sense of that term. He will have sympathies with and interests in all honest pursuits, and consider nothing human, and certainly no human knowledge, as alien to him. The cultivation of the mind is the first duty of every man to whom the blessing of education has been given; and a fair index to a man's want of mental capacity and discipline is afforded by the number and strength of his prejudices. And the giant strides of science, during the past few years, are not more remarkable in their effect upon the material and intellectual well-being of the world, than in the moral advantages men have gained by the cultivation of a large hearted and catholic tolerance for all diversities of opinion. And this tolerance is reasonable, and will continue to increase. It would be strange, indeed, if men who have seen the lightning chained and taught to work, and fire made an obedient and docile helpmate to man, who have learned the history of the component parts of the sun, and have seen the astronomer sweeping the heavens "to charm her secret from the latest star," were all to continue to oppose, with blind and unyielding obstinacy, the introduction of a new process or a new truth. There are still many persons constitutionally unfit for appreciating or doing justice to the talents and the toil of their fellow men, but they are fast diminishing in number; and, under Providence, it is Science, majestic, beautiful, and benign, who shall deliver the world from them and from their yoke.

FIFTY feet of the bottom of the Wyoming canal, near Wilkesbarre, sank suddenly a few days since, draining the whole level.

ICE A NECESSITY.—HOW IT IS OBTAINED IN QUANTITY.

As a class, man is proverbially ungrateful. Those comforts which lighten his labors, day after day, he regards as matters of course, and gives not one single thought in gratitude for the enjoyment consequent upon them, nor one single reflection upon the care and labor expended in order that he may enjoy them. Little does he think, while sipping his ice water, after a day of toil under a sun high in heaven, and with the thermometer far up in the nineties, of the immense amount of labor expended a few months before in gathering and storing that substance which shall render his water palatable. Now that the hot season is once more upon us, it may not be inappropriate to give within the space of a short article, a description of the process of gathering the immense crop of ice which is necessary to supply the demands of sweltering humanity in our cities.

When we consider that seventy years ago ice in cities was deemed a rare luxury during the summer, and it was only within the power of the wealthy to pay the prices demanded, it must be conceded that the increase in its consumption and decrease in price have been wonderful, when, today, rich and poor alike demand it as one of the necessities rather than the luxuries of life. In the city of New York, seventy years ago, a few tuns satisfied the demand; for consumption during the present season, in this city alone, 1,000,000 tuns have been harvested, engaging the energies of six companies with an aggregate capital of $4,000,000; in its transportation and delivery, employing forty barges, five steamers, three hundred wagons, five hundred horses, and seven hundred men.

Many of the ice houses, in which the ice is stored until needed, are built of brick, with double, triple, or even quadruple walls, the spaces between the walls being filled with sawdust or some like substance. They are from 200 to 400 feet long and from 100 to 200 feet wide, and are sometimes three and four stories in hight. Airtight doors close each floor.

A proper time having arrived for the gathering of an ice crop, all is hurry and bustle. No time is to be lost, and here we fully comprehend the truth of the maxim that "time is money;" as the ice companies may be obliged to content themselves with but one crop of ice, everything depends upon the haste with which it is gathered, for should an unpropitious change take place in the weather, thousands of dollars' worth will be lost. All day long the men are as busy as bees, and, should the night be clear and the moon gracious, no respite is given, and the dawning of another day sees the work being carried hurriedly on. The ice field having been fenced in and the snow scraped off, the ice is planed to a depth of two or three inches to remove the porous ice coating from the solid mass beneath. A machine called a marker, drawn by horses, then cuts narrow grooves five feet apart over the whole length of the field; these are crossed by similar grooves, dividing the field into squares; these grooves are deepened and the squares made smaller by a harrow having three rows of teeth two feet apart. One row of blocks having been separated from the field by means of a hand saw, it is lifted upon the surface and hurried to the house. Rapidly a gang of men pry off the blocks with crow bars; the blocks are elevated upon an inclined plane, lowered into the house, and packed in sawdust, bran, shavings, or bark. As soon as one story is filled, the doors are closed, the next story is treated in the same manner, and so on, until the house is filled, when it is closed, not to be opened until the ice is needed. The ice is handled as little as possible, for like riches, with much handling it may take to itself wings and fly away.

SCIENTIFIC INTELLIGENCE.

EXPLOSIVE ACTION OF OZONE.

A number of mysterious explosions of various nitrogen compounds have attracted the notice of chemists, and some experiments have been instituted with a view to an explanation of the phenomena. It has been found that nearly all of the mixtures composed of nitrogenous substances and used as explosives, are decomposed with more or less violence by ozone. A powder in which picric acid was a constituent, caused great damage in the laboratory where it was made, in consequence of the action of ozone. At first the cause of the accident was inexplicable, but careful research traced it to the ozone in the atmosphere.

Nitro-glycerin is at once decomposed by ozone into nitric acid and other compounds. Gun cotton is also destroyed, sometimes with explosive force, and so on through the list of explosive compounds. An extension of these researches may eventually afford an explanation of the spontaneous decomposition of certain bodies, and may suggest precautions to be observed to prevent a recurrence of the accidents; and it has been suggested that a new test for ozone might be found in this way.

USE OF GLYCERIN IN TESTING FOR GRAPE SUGAR.

Glycerin possesses the property, in the presence of soda or potash, of dissolving a considerable quantity of hydrated oxide of copper. On this account, the alkalies do not give a precipitate from copper solutions to which glycerin has been added. Hence the copper solutions for testing for grape sugar can be advantageously prepared with a small proportion of glycerin, as they can be rapidly made, do not easily decompose, and withstand the action of diffused light. A standard solution can be prepared as follows: Dissolve 16 grammes pure sulphate of copper (blue vitriol) in 64 grammes of water, and gradually add 80 cubic centimeters caustic soda, specific gravity 1·34 (about 112 grammes), and then add, with constant agitation, 6 to 8 grammes pure glycerin, until the liquid is clear. It would be possible to prepare a solution, in this way, of a fixed value for the quantitative determination of grape sugar, and such a method could be applied to the analysis of cane sugar by converting the latter into grape sugar, previous to making the test.

DEATH OF PROFESSOR PAYEN.

Professor Anselme Payen died recently in Paris at the advanced age of seventy six, having been born January 17, 1795. After completing his studies, he was one of the first persons to appreciate the importance of the beet sugar manufacture to the prosperity of France, and early became a director of one of the largest sugar refineries. Afterwards he assisted in the foundation of several important chemical works, until he was called to the chair of applied chemistry at the *Conservatoire des Arts et Métiers* in Paris, where he devoted the remainder of his days to instruction by lecture and laboratory practice, and where he wrote his numerous papers on applied science, and prepared his learned work on the application of chemistry to the arts. He was long an authority in all matters of the application of science to the wants of man; and his own investigations were among the best contributions the French have made to this branch of knowledge. We remember him as an urbane, kind man, always ready to lend a helping hand to those who applied to him, an admirable specimen of a scientific teacher. He remained at his post during the recent siege of his native city, and took an active part in the food discussions at the meetings of the Academy. His health was not perceptibly impaired, but the strain appears to have been too much for his overworked brain, and he died suddenly of apoplexy. His death will be severely felt at the institution where he has so long and successfully labored, and the scientific world in general will regret to lose one of its most active and useful members.

NEW TESTS FOR PETROLEUM.

Good petroleum should possess the following characteristics:

1. The color should be white or light yellow with blue reflection; clear yellow indicates imperfect purification, or adulteration with inferior oil. 2. The odor should be faint and not disagreeable. 3. The specific gravity at 60° Fah. ought not to be below 0·795 nor above 0·804. 4. When mixed with an equal volume of sulphuric acid of the density of 1·53, the color ought not to become darker, but, on the contrary, lighter. A petroleum that satisfies all of these conditions and possesses the proper flashing point may be set down as a pure and safe article.

SILVERING GLASS.

The various methods invented by Liebig, Bothe, Böttger, and others for depositing silver upon glass have been considerably modified and improved by Krippendorf, in Switzerland, and we give below a condensed statement of the latest improvements introduced by him. The following are the labels required for the materials to be used in silvering glass:

1. Seignette salts; that is, tartrate of soda and potash.
2. Solution of seignette salts in the proportion of one gramme to fifty grammes of distilled water.
3. Caustic ammonia, fifty cubic centimeters.
4. Solution of nitrate of silver, 1·8.
5. A flask of 1,000 cubic centimeters capacity for the reducing liquid.
6. A second flask of same size for the silvering solution.

With the help of the above chemicals and flasks, the two normal solutions, viz.: (1) the reducing liquid; (2) the silvering liquid can be prepared in the flasks (5 and 6).

1. The normal reducing solution: 900 cubic centimeters (grammes) distilled water are mixed with ninety cubic centimeters seignette salts solution (2) and the mixture brought to boiling over a suitable fire. During the boiling of the liquid, by which considerable steam is evolved, twenty cubic centimeters of the nitrate of silver solution are added from No. 4, by which the whole liquid is blackened. The whole is allowed to boil for ten minutes until the so called oxytartrate of silver is formed, when the reducing liquid is ready for use. This normal liquid can be preserved any length of time; in fact, it seems to improve by age. It can be kept in flasks, and when required for use must be carefully filtered. Experience has shown that it is better to prepare the normal reducing liquid in a flask rather than in a capsule.

2. The normal silvering liquid: Nitrate of silver is dissolved in water, and ammonia gradually added until the brown precipitate is nearly all dissolved, then filtered, and diluted until there is one gramme of nitrate of silver in 100 cubic centimeters of the liquid. For those who are not chemists, it is as well to take 900 cubic centimeters distilled water, add eighty cubic centimeters of the silver solution from No. 4 (1·8) and afterwards 100 drops caustic ammonia from No. 3.

3. The silvering process: Equal volumes of the liquids (1) and (2) are carefully and separately filtered and afterwards poured together into a vessel of the proper size, and the well cleaned glass plate introduced. In about ten minutes a decomposition of the mixture begins to take place, indicated by a blackening of the surface, and pure metallic silver will be deposited upon the plate. The introduction of the plate and the cleaning of it take place precisely as in photographic operations, otherwise irregular lines and unequal deposits of silver result. Gentle heat and sunlight facilitate the operation, while cold and darkness retard it. Finally the plate is removed from the vessel, rinsed with pure water, and varnished or otherwise protected by a background. Good photographic varnish can be recommended for coating the film. For bath, after the operation, contains fifty to sixty per cent of the original silver, which can be reclaimed as chloride by the addition of hydrochloric acid. Hollow ware, reagent bottles, and test tubes are silvered by simply pouring in the solutions (1) and (2) in the same way as described above. The silvering the interior of large flasks, it is well to introduce a small quantity of the liquid at first, and to turn it rapidly around until the surface is covered with a thin deposit. Treated in this way, the operation becomes a very simple one, and may lead to the introduction of silver mirrors as substitutes for quicksilver glasses for very many purposes.

The New Railroad Depot at Forty-second Street and Fourth Avenue.

Among all our large commercial buildings, the railroad depots are those of which New Yorkers have least cause to be proud. Discomfort, shabbiness, and dirt, concentrated in ill-ventilated structures, have generally hitherto been all the accommodation to the public that our railroad kings have seen fit to give. But at last a building has been erected, where space for business, order and discipline in arrangement, ample ingress and egress, and substantial elegance of interior and exterior, are provided. This is the new Union depot, corner of Forty-second street and Fourth avenue, and it is intended to be the New York terminus of the New York Central and Hudson River, the New York and Harlem, and the New York and New Haven lines, which are all, directly or indirectly, under the control of Commodore Vanderbilt.

The building is nearly 800 feet in length by 240 in width, and is thus about four acres in floor area. The crown of the arched roof is over 100 feet from the ground; and the iron and glass of which the roof is built, and which is now the universal system of roof building for railroad purposes, insure to the depot plenty of light and an airy and pleasant appearance. Offices for the transaction of the business of the three roads, well built and decorated, are exterior to the depot itself, and face Forty-second and the adjacent streets; and waiting rooms, with restaurant adjoining, and toilet accommodation are also provided.

Telegraphic communication is made from the depot master's office to all the switches, and the centralization of all the switch arrangements will be found to prevent the numerous slight accidents which often occur in and about a railroad depot, accidents of which the public hears nothing, but which add greatly to the expenses of a railroad. To these well designed and costly arrangements, it will be necessary to add a well disciplined, courteous, and business like staff of clerks, porters, and attendants; and the traveling public will appreciate the convenience of the new terminus, and one of our railway presidents will have got rid, as far as he is concerned, of a lasting reproach to New York.

Munroe's Refrigerator.

In this refrigerator, a box or outer casing, made of wood and of any convenient or required form, size, and proportion, contains a porous vessel, either made in a single piece or in slabs or pieces of any material (preferably of kaolin), but of any mineral or other substance which possesses the required degree of porosity. The outer surface of this porous vessel or evaporating medium is corrugated, to present a more extended evaporating surface, or it may be made with double walls or projecting wings, or in any form for the same purpose. It has a channel or gutter around the top, either continuous or in sections, into which water or other liquid is placed. This liquid is absorbed by the porous vessel, so that the latter becomes saturated with the moisture. Any water or liquid which may drip from the vessel or evaporating medium is caught by a hopper shaped false bottom and conducted into a watertight drawer, whence it may be discharged at pleasure through a faucet. The vessel or absorbing and evaporating medium is supported above the drip bottom in any suitable and substantial manner, any device being employed which will not obstruct the current or currents of air from passing up or down entirely through the refrigerator. Between the casing and the evaporating medium is an open space on each side, which open space extends from the top entirely through, and in the top are orifices for the admission or discharge of air. In practice the air current is downward, and the more rapid the evaporation of the liquid or moisture, the stronger will be the current of air. The evaporating vessel is lined on the outside with zinc or other metal, but preferably with some mineral composition, cement, or plastic material, either waterproof in itself or used in combination with a waterproof coating on the vessel, so that moisture shall be entirely excluded from the preserving chamber. By this means the use of ice is dispensed with. The temperature in the preserving chamber is, the inventor claims, readily reduced to 40° in the hottest weather. In fact the temperature is more readily reduced in hot than in moderate weather, as the evaporation will then be more abundant. The improvement applies not only to refrigerators for family use, but to refrigerating compartments on board of vessels or on railroad cars for the transportation of meats, fruits, and vegetables. The motion of such vessels or cars will produce currents of air, which might be conducted to the absorbing and evaporating medium, and utilized in maintaining a low temperature in a preserving chamber. Lateral as well as vertical currents may be employed, and the air may be forced in contact with the evaporating medium by a blower or otherwise, as may be found most convenient, or as circumstances may dictate. This apparatus is the invention of Charles E. Munroe, of Cambridge, Mass.

GLUE KETTLES.—A few holes, bored in a glue kettle, in a horizontal line near the rim, will allow steam from the boiler to enter the kettle, and so prevent the glue from solidifying on the side. The holes need not be bored all round the kettle, as it is handy to be able to pour glue out of one side without wasting it.

What an Editor should Eat.

It is often said that editors are born, not made. This, says the *American Newspaper Reporter*, is doubtless true, as it is of many other occupations in life. Yet we have abundant evidence to show that men born with great capacity for certain occupations are frequently beaten in the race by men of much lower caliber. It is clear that to be born for a position is by no means all that is necessary to enable one to fill it satisfactorily.

In the editorial professio ⁿ many of the most noticeab'e failures have been the result of bad habits—mental, moral, or physical. Publishers will almost always prefer the even good sense and correct habits of average capacity to the fitful brilliancy of a born editor, whose habits are constantly stealing away his efficiency. To be a thorough editor, i owever, in all things, is a high ambition, and given first the mental capacity at birth, adding a thorough education and good habits, and everything worth having will be his. The question of food has assumed a large importance in the scientific world, and few things have so great a power over intellectual usefulness as what we eat and drink. An organism which is expected to be always clear, reliable, and ready, requires careful treatment to insure its usefulness. In all questions of stimulus an ambitious editor will always be a radical. No reliance can be placed in any stimulant whatever. It betrays when least expected to do so, and often destroys in a moment all that the labor of months, or even years, had accomplished. "I have never trusted," says Parton, "to a single sentence written under the influence of a stimulant." And it is well known that none of our journalists who have a reputation for long continued or arduous literary labor, ever depend upon stimulants in order to accomplish it.

After abstinence from stimulus, and a habit of perfect regularity in all things, the food question becomes of the highest importance. It is well known that certain kinds of food are peculiarly fitted for keeping the brain in a state of healthy activity. Many literary men here and in Europe permit themselves coffee, tea, and condiments in moderation, and for the rest confine themselves almost entirely to fish, fruit, vegetables, milk, and the various kinds of farinaceous food, Graham bread and oat meal taking the lead. These articles have, by repeated experiments, been found to be the best for brain workers. Some constitutions, however, seem to thrive best on a strictly vegetable diet.

Miles Grant, editor of the *World's Crisis*, has done a vast amount of intellectual labor; yet, after being eighteen years a vegetarian, he finds himself in the most perfect mental and physical health. The articles chosen are those preferred in the highest scientific circles, though, as we have indicated, few consider coffee and animal food, in strict moderation, injurious. The bread adopted by Mr. Grant, and which he says, with reason, will enable one to labor longer, and with less fatigue than any other one substance, is made with coarse Graham flour, mixed with water and baked in an oven. Oatmeal, in its various forms, is next on the list, and beans (boiled without meat) and baked apples are next in order. Two meals a day are found to be better than three, and they should be taken, Mr. Grant thinks, wholly without condiment, though equally high authority says that a sufficiency of condiment should be used to render the food palatable. A window in the sleeping room should be left open, feather beds avoided, and the hours kept as regularly as possible.

These seem simple directions, but Mr. Grant affirms that it is through these means that he has been enabled to fulfil his editing duties with comfort, and to preach, when necessary, fifteen sermons per week.

How to discover Sewage Contamination in Water.

Now that the warm summer months are approaching, the quality of the water used for drinking purposes becomes a matter of anxiety to the thoughtful householder. This is particularly the case in country districts, where the supply of water is obtained from wells, and may be affected by unsuspected sources of contamination. In the spring, therefore, every householder should call in the powers of the analyst, in order to demonstrate the purity or approaching foulness of his water supply; and this even though the water be clear, bright, and tasteless.

The reason an apparently pure sample of water should be analyzed is simply this: A water may contain so small an amount of sewage, that micro-chemistry will alone reveal its presence; and waters which contain such small quantities of sewage may remain innocuous through the winter, and only develop their ill effects on the approach of warm weather, and then suddenly.

The possibility of approaching danger having been indicated by the analyst, it may often be turned aside by a little attention to surface drainage, which is most commonly the source of contamination. Surely it is worth while to spend a guinea or two in order to prevent a pestilence whose cure may cost many times the sum.

The trouble involved in getting the matter into the right hands need not be great, as your chemist and druggist will almost certainly know of a suitable analyst, and will probably negotiate the matter. The samples for analysis should be collected in half gallon bottles, which have been properly cleaned and have well fitting glass stoppers; one such bottle will suffice for an ordinary analysis. Here again your chemist will help you, and provide a bottle ready for filling. In drawing the water, say from a well, the pump should be worked for a few minutes before filling the bottle, so that the sample sent may be unquestionably free from casual impurity.

It may interest general readers if we point out the chief features of the chemical evidence on which the analyst bases his judgment of a sample of water. We find, in the pages of a cotemporary, an account of the methods employed, from the pen of Mr. S. W. Rich. In the ordinary examination of a sample of water used for domestic purposes, two points have to be investigated: First, the freedom of the water from sewage contamination; secondly, the character of the water from a soap consuming point of view. The first point is determined by a series of micro-chemical processes, which indicate the presence of the elements of sewage in their characteristic form, and more particularly of "ammoniacal" and "albuminoid" organic matter. We may explain that these terms are applied to organic matter in a more or less advanced state of decomposition, from which ammonia is liberated, under specified conditions, and that the quantity of ammonia thus obtained commonly serves as a direct measure of the amount of sewage contamination. Collateral evidence has to be considered. The second point is determined by a direct estimation of hardness, and is interesting from an economico-domestic point of view. It is also customary to examine samples of water for lead, as this poisonous metal is frequently present where it is least suspected.

Druggist's Apparatus for Dividing Powders.

George P. Allen, of Woodbury, Conn., has invented an apparatus for proportioning and dividing powders, being intended to provide a simple and efficient means whereby druggists may quickly separate a mass of powder into any given number of equal quantities for doses, instead of the slow and inaccurate method of dividing with the spatula now employed. The invention consists of a board or plate of any kind or substance best suited for the purpose, having any required number of holes or pockets of uniform size and shape made through or in it, and each hole provided with a movable bottom or piston arranged for shifting quickly to vary the depth of the pocket, all the said bottoms or pistons being arranged so as to move equally in relation to the plate or holes therein. In using this instrument the mass of powder is placed on the table and scraped over the holes so as to fill as many as the number of divisions required. If it fails to fill as many holes as the said divisions require, the pistons are raised or the plate lowered, as the case may be, by which the powder in the filled pockets will be raised above the surface, so that some of it may be scraped into the holes not filled, which being done, and the requisite number of holes filled, the division is completed. The pistons are then raised to the level with the table and the powder raised up in separate piles, to be scraped away separately. The pistons are shifted downwards, and the operation of dividing the powders is carried on in like manner, if the pistons are too high at first.

Improved Show Case.

This show case is designed for showing and exposing for sale kid gloves, hosiery, laces, parasols, handkerchiefs, silks, ribbons, and any other merchandise that it may be designed to show in cases. It consists of one or more glass covered compartments so arranged that the back compartments are more fully presented to the view of the customer, enabling the merchant to exhibit a greater quantity and variety of goods in a given space without increasing the hight of the case. The cases may be used in a vertical position, or formed into an entire counter. If more than one case is used in a counter, the compartments are placed in an angular position. Where the cases are made as represented, eighteen sample dozen handkerchiefs, representing a stock of large amount, can be shown in a case three feet by two, thus bringing a great variety before the eye of the customer, while they are all at the same time under the eye of the seller, and, after the sale is made, can be put in order and re-arranged in a short space of time. With show cases of this description, where merchandise of the descriptions named is on sale, it is claimed that at least one third of the usual number of clerks now needed may be dispensed with. George A. Hearn, Jr., of New York city, is the inventor.

School Seat.

Mr. David I. Stagg, of New York city, has invented a new school seat, which is claimed to be a simple, strong, durable, neat, and convenient folding chair, so constructed as to allow the pupils to pass in and out freely and economize space. A pedestal is secured to the floor in the ordinary manner. To the upper end of the pedestal is secured a cross piece which equals in length the breadth of the chair, to the ends of which are securely attached end frames to which the back is attached, and to which the seat is pivoted. The end frames, back, and seat are constructed in the ordinary manner, except that the end frames do not extend below the top of the pedestal. This construction enables a folding school seat or chair to be attached to and supported by a single pedestal or column, so as to obtain, at the same time, the advantages of a folding seat and single column support.

Raising a Sunken Ironclad.

Efforts now making to raise the monitor *Weehawken*, sunk in Charleston harbor during the late civil war, reveal the facts that she lies due east and west on a bottom of mud, and there is about eight feet of water over her at low tide. In this position she is a dangerous obstruction in the channel. All her machinery has been taken up, and likewise the iron of her turret and deck. Her interior is all filled with mud and garbage, among which human bones are here and there visible. The diver is able to see about him when the water is clear. When the water is not clear he is compelled to go entirely by feeling, and in the muddy water, it is said, he sees better by night than by day, owing to the presence of innumerable phosphorescent animalculæ. Over two hundred tuns of iron and various metals have been raised from this ship.

Resignation of the Hon. Horace Capron.

We are to lose the valuable services of the Hon. Horace Capron, as Commissioner of Agriculture. The peculiar fitness of this gentleman for the office which he has so long and so worthily held, has been made familiar to our readers by quotations, from his elaborate reports, which have appeared from time to time in our journal.

Mr. Capron proceeds to Japan, on a mission undertaken at the solicitation of the Japanese Government, to introduce American systems of, and appliances for, agriculture, engineering, railroading, and industrial pursuits generally. The expedition will be aided by a corps of scientific men, and the best possible results from it may be looked for.

Mr. Capron's resignation takes effect on 1st next August.

EDITORIAL SUMMARY.

THE following illustration, says Professor Henry, of the vibratory movement of matter is attested by Professor Horsford, of the United States. The top of the high tower which constitutes the Bunker Hill monument inclines towards the west in the morning and the north at mid-day, and towards the east in the afternoon. These movements are due to the expanding influence of the sun as it warms, in succession, the different sides of the structure. A similar but more marked effect is produced on the dome of the capitol at Washington, as indicated by the apparent motion of the bob of a long plumb line fastened to the under side of the roof of the rotunda, and extending to the pavement beneath. This bob describes daily an ellipsoidal curve, of which the longer diameter is 4 inches or 5 inches in length. By molecular actions of this kind, Time, the slow but sure destroyer, levels to the ground the loftiest monuments of human pride.

IN a recent number of Poggendorff's *Annalen*, Dr. Wein hold states that the black absorption line of sodium can be easily obtained by a simple process. The usual method has been to interpose a flame, colored with chloride of sodium, between a strong light, such as the electric light, and the slit of a spectroscope. The source of light now proposed by M. Weinhold is an ordinary petroleum lamp; the light is allowed to pass through a slit directly on to a prism, and a spirit lamp flame, intensely colored with chloride of sodium, interposed between the prism and the eye, so as to cover the entire spectrum; the black absorption line will then be seen distinctly. If the flame colored with sodium be placed in front of the slit, the bright yellow line will be seen as usual. M. Weinhold has not been successful in using this method with an ordinary spectroscope fitted with telescopes, on account of various practical difficulties.

FORTIETH INDUSTRIAL EXHIBITION OF THE AMERICAN INSTITUTE.—The American Institute will hold its Fortieth Exhibition of National Industries during the coming autumn in the great structure known as the Empire Rink, covering the block between Second and Third Avenues, and Sixty-third and Sixty-fourth streets, opening, August 15th, for the reception of heavy machinery; Monday, August 28th, for reception of goods; Thursday, Sept. 7th, at 12 M., to the public, with an opening address; remaining open every secular day from 9 A. M. to 10 P. M., until and including Saturday, Nov. 4th, when it will close with an address and the proclamation of awards.

CRAMP in horses arises from irregular action of the motor nerves. Rubbing the affected parts with a wisp of hay for ten minutes would be beneficial; and should friction alone not remove the tendency to cramp, the parts affected should be rubbed occasionally with a solution of camphor and olive oil, in the proportion of one part of camphor to four of olive oil.

CEMENT FOR METAL AND GLASS.—The following cement will firmly attach any metallic substance to glass or porcelain: Mix two ounces of a thick solution of glue with one ounce of linseed oil varnish, or three fourths of an ounce of Venice turpentine; boil them together, stirring them until they mix as thoroughly as possible. The pieces cemented should be tied together for two or three days.

THE fifty per cent of silica in the straw and grain, respectively, show why it is that oats flourish luxuriantly on meadow land that has been broken up from grass. It also indicates that potash, for the reduction of the silicates, is absolutely essential as a constituent of the soil. Wood ashes, therefore, are very serviceable in the growth of the crop, as well as in the production of the finer grasses.

THE improved foot lathes made at Laconia, N. H., have obtained quite a notoriety. One was taken with Hall's Arctic Expedition which left this port lately. We learn that they are being sent in all directions—to California, Canada, Cuba, and Europe; many of them to noted places, such as the U. S. Military Academy, West Point, N. Y., Brown's University, Providence, R. I., etc.

AN exhibition illustrating the progress of all kinds of industrial pursuits is announced to be held at Moscow, Russia, next year, being the two hundredth anniversary of Peter the Great. The naval branch of the exhibition will have a most attractive curiosity, a boat built by the great Emperor, who "served his time" as a ship carpenter at Woolwich, England.

A SINGULAR accident happened to a lady in Portland, Me., not long ago. She went to call on a friend, and when she pulled the door bell, the wire broke, and she fell backward, striking her head on the steps. She was rendered insensible and very severely hurt.

The Electro-deposition of Tin.

The *English Mechanic* says: An improved process for coating articles, made of certain metals, with tin, by means of electricity, has been recently patented in England.

The inventor (Mr. J. E. Bingham) claims that he can coat and preserve iron, steel, brass, copper, nickel, lead, zinc, gold, platinum, and any of their alloys, or the alloys of manganese; and states that his improved method is specially applicable to the prevention of oxidization or tarnishing of silver surfaces exposed to atmospheric influences.

The inventor, in carrying out his improvements in the electro-deposition of tin, takes a given quantity of that metal, by preference in a pure state, although what is commercially known and sold as tin may be employed, which he dissolves in chlorhydric acid, and precipitates by means of a solution of crude potassic hydrate; the precipitated tin is then washed free from acid, after which a quantity of potassic hydrate and also of cyanide of potassium is added; the temperature is raised to a point just below that at which the solution boils; and when it has been thus heated, a quantity of solution of calcic hydrate is added.

In the solution thus obtained, sheets of tin and the articles to be coated with the same are suspended; the articles having been prepared in the usual manner. The tin and the articles to be coated are then connected with the battery in the usual manner, and the articles are retained a longer or shorter time in the solution according to the quantity or thickness of tin required to be deposited on their surface.

The quantity of ingredients may be varied, but the inventor uses with advantage a bath of the following composition: To ten gallons of water eight hundred and twenty-six grains of tin in solution, two and a half pounds of potassic hydrate, half a pound of cyanide of potassium, and one hundred grains of calcic hydrate are added. These proportions constantly vary according to the heat of the solution, the state of the electric current, and the quantity of metal dissolved and deposited. Thus a variation in the quantities of the several ingredients, will be caused, which can only be determined and altered by a practical operator, in accordance with the requirements of his solution.

In the event of the equilibrium of the solution not being maintained in so far as regards the heat, quantity of metal, electricity, or chemicals employed, the deposit obtained is liable to become rough, in which event the article should be taken out and brushed with wire brushes (as is usual in the manufacture of electro-plated articles) and again passed into the solution; and also in the case of large articles, the granular, soft, or surplus deposit must be removed by an ordinary brush, a cloth and sand, or by any other convenient method.

The solution may be made from several precipitates of tin, provided that potassic hydrate, cyanide of potassium, and calcic hydrate are added, and a similar result may be obtained by dissolving the tin into the solution by the aid of electricity.

The Broom (*Sarothamnus scoparius*) is extremely abundant in Madeira, but is supposed to have been originally introduced to the island. It is now sown extensively on the mountains for the purpose of being cut down for firing, or burnt on the spot every five to seven years to fertilize the ground. The twigs and more slender branches are also used commonly as withs for binding bundles of faggots, brushwood, fern, etc.; and numbers of country people, especially young girls and children, residing within reach of Funchal, gain a livelihood by bringing daily into the town bundles of broom for use in heating ovens, etc. The fine and delicate basket-work peculiar to Madeira is manufactured from the slender peeled twigs of this plant. Mr. Lowe speaks of a variety with pure white flowers, which occurs on this island.

A Long Stretch of Wire.—The American Compound Telegraph Wire Company have just completed, for the Pacific and Atlantic Telegraph Company, a wire for crossing the Mississippi river at St. Louis, which requires a stretch of about a mile and a half in one piece. This wire weighs 220 pounds to the mile, and by actual test the breaking strain is 1,240 pounds, which is very much more than sufficient to guarantee it against fracture after suspension, either from its own weight or by any other means.

Vagaries of Typography.—It is hardly necessary to notify our general readers that an egregious blunder was perpetrated in our last issue, by which the cut of "Baxter's Steam Engine" was inserted with the advertisement of the "Roper Caloric Engine," and *vice versâ*. The only apology we can make is to place each cut in its proper place in this present issue, and notify all our readers that "Baxter" is "Baxter," and "Roper" is "Roper."

Inventions Patented in England by Americans.

June 13 and 14, 1871.

[Compiled from the Commissioners of Patents' Journal.

Construction of Ships.—W. G. Warden, Philadelphia, Pa.

Gang Plow.—L. Chapman, Collinsville, Conn.

Governor for Steam Engine.—H. B. Weaver, Hartford, Conn.

Mold for Glass Blowing.—S. R. Bowie, New Bedford, Mass.

Foreign Patents.

The population of Great Britain is 31,000,000; of France, 37,000,000 Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, while business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address Munn & Co., 37 Park Row, New York. Circulars, with full information on foreign patents, furnished free.

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.

Scientific American.—Back Numbers, Volumes, and Sets, for sale at low prices. Theo. Tusch, 37 Park Row, New York.

Water Engines—Manufacturers will please send price lists and circulars to John Osborn, Engineer Fair Haven Water Co., New Haven, Ct.

Fine Engravings, more of them and better than ever before, will be given in every number of the present volume of the Railroad Gazette.

The "Union Water Meter Co.," Worcester, Mass., manufacture Steam-pressure Regulators, the best machine in use for reducing and regulating the pressure on paper machines, bleacheries, slashers, and all places where an even temperature is desired.

We pay more for Brass Turnings, Brass, Copper, Lead, Zinc, Pewter, than any other establishment. Consignments, large or small, wanted, from all parts of the country. DuPlaine & Reeves, Philadelphia.

Line, Shafting, Pulleys, and Hangers.
First class. Send for circulars and price lists. Greenleaf Machine Works, Indianapolis, Ind.

For Centrifugal Pumps, address Morris, Alvord & Co., 70 Canal street, Syracuse, N.Y.

Wanted.—The address of manufacturers of Wire Fences, Driven and Bored Well Machinery, etc. J. M. Ferguson, Summit, Miss.

Steel and Brass Letter Cutter. John C. Hilton, Chicago, Ill.

Magic Lanterns and Stereopticons, of every description. Send for Catalogue. W. Mitchell McAlister, 728 Chestnut st., Philadelphia.

Diamonds and Carbon turned and shaped for Philosophical and Mechanical purposes, also Glazier's Diamonds, manufactured and re-set by J. Dickinson, 64 Nassau st., New York.

Peck's Patent Drop Press. For circulars address the sole manufacturers, Milo, Peck & Co., New Haven, Ct.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

Boilers.—Allen's patent will prevent scale from forming, and not injure the iron. In 3 gallon cans, price $6. J. J. Allen, Philadelphia.

J. A. Whitman's Water Wheel Governor beats them all for bls. and price. Auburn, Me.

Electrical Instruments, Models, etc., made to order, and Gear Wheels and Pinions cut, by W. Hochhausen, 113 Nassau st., Room 10, N.Y.

Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth st., Brooklyn, manufacture Presses and Dies. Send for Catalogue.

Bright and industrious American, Scotch, English, German, or French boys, of 16 years or older, who desire to learn the machinist trade, in a first class establishment, will please address, for terms, P.O. Box 655, Hartford, Conn.

The Bucket-Plunger Steam Pump discharges at both strokes, with only two water valves. Valley Machine Co., Easthampton, Mass.

Lord's Boiler Powder is only 15 cts. per pound by the bbl., and guaranteed to remove any scale that forms in steam boilers. Our Circular, with terms and references, will satisfy all. Geo. W. Lord, 107 W. Girard ave., Philadelphia, Pa.

Improved mode of Graining Wood, pat. July 5, '70, by J. J. Calhoun, Cleveland, O. See illustrated S. A., Dec. 17, '70. Send stamp for circular.

Ford's Portable Tobacco Press for Planters. Will sell Virginia, Maryland, Missouri. Address Ford's Tobacco Warehouse, Evansville, Ind.

Air Cylinder Graining Machine.—A perfect tool for House Painters and Manufacturers of all kinds of Decorated Ware. Complete Machine for $50.00. Send stamp for Circular. The Heath & Smith Manufacturing Co., 41 Murray street New York.

For the most perfect Band Instruments in the world, send to Isaac Fiske, Worcester, Mass. Illustrated Catalogues free on application.

The Patent for the best Hydrant, or Fire Plug ever invented, for sale. For descriptions, terms, etc., address Lock Box 356, Lockport, N.Y.

Best Scales.—Fair Prices. Jones, Binghamton, N.Y.

Steam Watch Case Manufactory, J. C. Dueber, Cincinnati, Ohio. Every style of case on hand, and made to special order.

L. & J. W. Feuchtwanger, Chemists, 55 Cedar st., New York, manufacturers of Silicates of Soda and Potash, and Soluble Glass.

For Hydraulic Jacks, Punches, or Presses, write for circular to E. Lyon, 470 Grand st., New York.

Belting that is Belting.—Always send for the Best Philadelphia Oak-Tanned, to C. W. Arny, Manufacturer, 301 Cherry st., Phil'a.

Send your address to Howard & Co., No. 865 Broadway, New York, and by return mail you will receive their Descriptive Price List of Waltham Watches. All prices reduced since February 1st.

Ashcroft's Low Water Detector, $15; thousands in use; can be applied for less than $1. Names of corporations having thirty in use can be given. Send for circular. E. H. Ashcroft, Boston, Mass.

To Cotton Pressers, Storage Men, and Freighters.—35-horse Engine and Boiler, with two Hydraulic Cotton Presses, each capable of pressing 75 bales an hour. Machinery first class. Price extremely low. Wm. D. Andrews & Bro., 414 Water st. New York.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro, 414 Water st., N.Y.

Improved Foot Lathes, Hand Planers, etc. Many a reader of this paper has one of them. Selling in all parts of the country, Canada Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N.Y.

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

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Glynn's Anti-Incrustator for Steam Boilers—The only reliable preventive. No foaming, and does not attack metals of boilers. Price 25 cents per lb. C. D. Fredricks, 587 Broadway, 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.

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Answers to Correspondents.

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 must be by volume and page.

The Use of Aperients.—I am every year more dissatisfied with mankind; they want to know everything except what concerns them most. Just think of F. C. asking the question, in the Scientific American of June 24, "whether the habitual use of aperients is injurious." This is one of the wide roads to the grave. Let F. C., if he be one of those victims, gradually learn to do without aperients, and increase the quantity of his food, *sans increase of nourishment*, as much as he can. Volumes could be written in explanation, but I only lay down the principle. If F. C. keeps the principle always in view as long as he may live, he will thank the writer of this letter, before he is five years older.—J. M.

Belts.—It is asked by one of your querists, "Why a belt will run to the largest part of a pulley?" If a ribbon be drawn tighter on one edge than the other, it will bow out, or become crowning on the tight edge, more particularly at the point taken hold of. It is the same with a belt. The large part of the pulley draws the belt tighter than the small part, and consequently changes its direction, at the point of its entering on the pulley.—S. G. D., of Pa.

Dissolving Mica.—In the column of queries, page 347, Vol. XXIV., M. asks if he can dissolve mica. He can do what will perhaps answer his purpose equally well. Grind mica fine, and mix to a proper consistency, with a solution of gum arabic, in water. It is sometimes used in this form as a substitute for silver ink.—J. E. W., of N.H.

Cistern.—If E. E. H. will take the pains he will always have good cistern water. Let him construct the cistern so it will hold water to the top if necessary; cover it so no sweepings or washings can enter, and provide for good ventilation. If a pump be used, he should run the suction pipe no nearer the bottom than 18 inches. He must keep the gutters clear of leaves, otherwise he will have a filter of rotten leaves instead of charcoal. He should make the connection from the gutter to the cistern so it can be detached, and never allow the water to enter until the house roof and gutters are completely washed off by the rain. This rule I follow strictly, and clean out the cistern once a year. I always have good cistern water.—J. A. Mc., Ind.

Power to Drive Circular Saws.—If E. A. M. wishes to know which of the two circular saws takes the least power, I will say the thin saw always; but the same saw will not be suitable for all kinds of work. The saw with sixty teeth will answer well for some work, but the saw with thirty teeth would not. Practice will soon tell him which is best. —J. A. Mc., Ind.

Casing of Steam Pipe.—B. L. C., who wants information as to casing a steam pipe, ought to be surprised if he ever works anything but warm water into his engine. Such an elaborate device for condensing his steam as a pipe 180 feet long, uncovered with any non-conducting material, is seldom seen. He will find that a covering of felt, or of the numerous boiler cements now made, will produce an immediate and great effect. But he should at once, if possible, place his boiler and his engine in close proximity, and then use all possible means to prevent the radiation of heat. He will not, then, be forced to diminish the pressure in his cylinder by keeping his cylinder cocks open.—D. B., of N. Y.

To Restore Burnt Cast Steel.—In your paper of June 17, A. T. L. asks for a recipe to restore burnt cast steel. Take 1¼ pounds borax, ¾ pound sal ammonica, ¾ pound prussiate of potash, 1 ounce rosin. Pound the above fine, add a gill each of water and alcohol. Put in an iron kettle, and boil until it becomes a paste. Do not boil too long, or it will become hard on cooling.—F. A. K., of Pa.

Telescope.—In reply to E. T., I would say that the directions I gave were for a terrestrial telescope, which answers equally well for an astronomical one.

J. R., of N. J.—The pressure of steam in a boiler is exerted in all directions. The pressure of the water is transmitted in only one direction—downward. The pressure upward on the inner side of the top of the shell is that due to the expansive force of the steam. The pressure downward on the inner side of the bottom of the shell will be that due to the expansive force of the steam plus the weight of the water and the steam. The weight of the water and the steam is, however, received by the exterior supports upon which the boiler rests, so that practically there is on this account, very little if any more liability of the breaking of the shell at the bottom than at the top.

C. E. M.—The rule for finding the area of a circle, *i. e.*, multiplying the circumference by one fourth the diameter, depends for its approximation to exactness upon the exactness with which the circumference has been determined. As this is only attained approximately, of course the rule in question, although practically exact enough for all purposes, is theoretically imperfect. The problem of "squaring the circle" requires that the theoretically exact area shall be found.

A. E. S., of Mo.—In the oxychloride of zinc paint, the proportion of oxide of zinc used may be varied. It should, however, not be less than half the weight of the chloride. The object of the tartrate of potassa is to prevent too rapid drying. This may, therefore, be used in variable proportions. The amount of water and starch used depends upon the consistency required. Experience can be the only sure guide in these particulars. By a few preliminary experiments with small quantities you will probably be able to succeed.

S. —., of ——.—"Let well enough alone." If the iron pipe used does not rust, why should you wish a galvanized pipe? We have often expressed our disapproval of zinc coated iron pipes to convey water for culinary purposes. We believe them pernicious. We do not think burning an iron pipe in a wood fire would keep it from rusting in contact with water that would rust ordinary iron pipes.

A. G. X., of Ohio.—Glycerine and litharge stirred to a paste, hardens rapidly, and makes a suitable cement for iron upon iron, for two stone surfaces, and especially for fastening iron to stone. The cement is insoluble, and is not attacked by strong acids.

C. E. A., of R. I.—In your attempts to make a solution for electro-plating without a battery, you failed, probably through not using sufficient hyposulphite of soda. The recipe distinctly says, "a slight excess of the salt must be added."

C. B. P., of N. Y.—You can procure Haserick's "Secrets of Dyeing," of E. C. Haserick, Laconia, N.H.

Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1. -PRINTER'S COMPOSITION.—I should be glad if some of your readers would give me a recipe for a real good printer's roller composition, tough, serviceable, and one that will distribute all kinds of ink.—R. W.

2.—CLOTH DAMAGED BY MOLD.—Please inform me what will restore cloth affected by mold?—J. A.

3.—MILLSTONE PICKS.—Will some practical mechanic give me a recipe for tempering mill picks, for stones that are hard? Something that will not make the picks too hard, but will toughen the steel and keep a sharp edge.—F. A. K.

4.—GUN BARRELS.—I would like to know how laminated steel barrels and Damascus steel barrels are made, and which are the most durable for fowling pieces?—J. M.

5.—FISH CHANGING THEIR COLORS.—I wish to know the cause of the change of color in fish, as follows: I have an aquarium made of galvanized cast iron, in which the water is constantly changing. I have thirteen fish, gold, silver, bullheads, one shiner, and four roaches, or as some call them "pumpkin seeds" or "sun fish" or "kivers." Two of these roaches change from a very pale yellow to a very deep blue black three or four times a day, the change occupying from three to seven minutes. They remain of this deep blue black color for about thirty minutes, when they change back again to their natural color as quickly as they changed from it. While they are of this unusual color, the other two roach chase them about the tank, and have bitten their fins and tails till they are very ragged; but while of their natural color, they appear to live in great harmony. I have one and a half inches of sand on the bottom, and feed the fish once every two days with worms. Only these two particular fish change their color, although I got the four at the same time, from the same pond, some three or four months ago. They were caught with a hook, but have always been healthy. An explanation would oblige—S. M., Jr.

6.—VARNISH.—I need a pale, hard, glossy, quick drying varnish, for use on white and colored labels. Can any of your readers give me a recipe for such a varnish, which will dry in a few hours, and which will not turn yellow or dark by age?—B. F. B.

7.—A STEAM ENGINE PROBLEM.—Suppose the exhaust of a steam engine, after passing through a surface condenser, be connected directly with the boiler, below the water line, as feed water, would the engine work? It is the opinion of an eminent engineer that if everything were properly adjusted that it would.—J. C.

8.—LUBRICATING OIL.—Can any of your readers tell me which kind of oil is best for lubricating? The sugar centrifugals in our refinery, running at very high speed, appear to gum all oils used on them, especially where the spindle rests on the step of the centrifugal machine. We have tried all oils that we know of, but with little relief.—S. R.

9.—LESSENING THE STRENGTH OF PAPER.—Could one of your many thousand readers give me the much desired information, whether there is any acid, fluid, or other substance that I can put on paper to make it tear easily, and only tear where I put it? I do not want it to destroy the paper, but only to make it weaker where this fluid, acid, or whatever it may be, is put on.—C. C.

10.—PRIMING OF BOILER.—Will some intelligent reader of the SCIENTIFIC AMERICAN tell us why our boiler primes or foams so much? This occurs from once in four days to two or three times a day. We blow off once or twice a day. The water is taken by a well 22 feet deep, from a vein running through sand rock. Our boiler is 14 feet long, 40 inches diameter, with thirty-two 3¼ inch tubes, and a dome 14 inches by 2 feet high, and steam pipe 2¼ by 12 feet long. The cylinder is 10 by 30 inches, and the engine runs 90 to 100 revolutions per minute. Very good draft, and dome in center of boiler.—J. & I. T.

11.—MERCURY AS A PROPELLER.—I noticed in a recent issue of the SCIENTIFIC AMERICAN, in an article relating to the means used for the propulsion of canal boats, that mercury had been used as an agent to produce propulsion. I wish to ask some reader of your valuable paper in what way and manner it was employed.—F. S.

12.—WALNUT STAINS.—Can any reader of the SCIENTIFIC AMERICAN inform me if there is anything that will remove the stains of black walnut from the hands without making the skin rough or hard?—W. H. B.

13.—TWISTING OF ROPE FALL.—How can I take the twists out of a fall? I have a double block and a single block with a manilla rope three fourths of an inch in diameter. Is there any way to keep it from twisting?—C. A. B.

14.—WATERPROOFING FRESCO PAINTING.—How are water colors made waterproof by fresco painters?—P. E. S.

15.—SPECIFIC GRAVITY OF HYDROGEN.—I wish to know, from some of your readers, how many cubic feet of hydrogen gas would raise 140 pounds off the earth and balance it in the air.—S. F.

16.—SOLDERING COPPER.—I use, in soft soldering copper, muriate of zinc, which oxidizes the copper so that, when it is painted with oil paint, the paint does not dry in spots where the copper has been oxidized by the acid. What will neutralize this effect, or what kind of solution (or anything else) can be applied to the copper that the paint will dry over, and at the same time be durable?—F. E. H.

17.—MOISTURE IN THE AIR.—Can some one describe any economic method or methods whereby the moisture contained in the atmosphere may be extracted? Also, the percentage of moisture absorbed by such method from air saturated at the ordinary temperature, say 62° Fah.?—J. H.

18.—VICE BOX.—How can I fasten threads in a vice box?—B. B.

Recent American and Foreign Patents.

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

FENCE.—John A. Kysor, Leon, N. Y.—This invention has for its object to furnish an improved portable fence, simple, cheap, substantial, and reliable, and which may be easily and quickly taken down, moved to another place and again put up. It consists in the arrangement of legs or braces and hooks with the ends of panels, which are formed by attaching horizontal bars to cross bars. The adjacent ends of the panels overlap each other and are held in place at their top by inclined braces, and at their bottoms by hooks. The braces also serve as legs to support the panels away from the ground.

HAY ELEVATOR.—Charles E. Gladding, of Towanda, Pa.—This consists of a novel combination of a traveller, with a beam therefor, a pulley, and a tripping device. The arrangement is peculiar, yet, though difficult to describe in brief, not complicated. We judge it will be able to compete with other devices of similar character in market.

REAMER.—John K. Derby, of Jamestown, N.Y., assignor to Daniel A. Seymour and Elias B. Stillson, of same place, is the inventor of this implement. It is adjustable for different sized holes. The cutting device is novel, as, in fact, is the entire tool, no less than four different claims being allowed. We have no doubt this will be found a useful tool.

GANG PLOW.—This is a new combination of the elements of a gang plow which is simple, convenient, and effective. It consists of an arrangement of a frame, truck wheels, and various other parts, which, as they cannot well be described without engravings, need not be enumerated. The plow is one which will, we think, rank among the first class of its competitors. Michael Sikes, Mansfield, Ohio, is the inventor.

SEED PLANTER.—This is the invention of William Knowland and Kearnes Collings, of Henryville, Ind. It consists of a novel combination of mechanism for the planting of seeds in drills. The seeds are placed in a hopper, and conveyed by a number of conduits into furrows made by furrow openers. There are two plows for each conduit, respectively placed on the right and left, which throw up a ridge in which the seed is deposited. The seed conduit then opens a furrow in the crown of this ridge, and deposits the seed. A scraper follows, which closes the furrow. The whole is supported on wheels, which, through suitable mechanism, impart motion to the moving parts.

PORTABLE POWER PRESS.—In this invention the power is applied through a sweep to a vertical windlass, or capstan, the latter being provided with a sleeve, upon which the chains that draw the follower are wound. The sleeve is held from slipping on the shaft by a pin, which, when the bale is compressed, is withdrawn, and the sleeve then turns freely, so that the follower is readily placed in the proper position to receive a new bale. With the vertical windlass is also combined a crane for hoisting the bale out of the press. Thomas B. Walt, of Zena, Oregon, is the inventor.

WHIFFLETREE COUPLING.—Hyde Crocker, Jr., Montrose, Pa.—This invention consists of a strong cast metal plate, with a large central hole, the wall of which has an annular recess at the lower side, which plate is attached to one of the pieces to be coupled, and holds in said recess the flange of another plate, fitted into the large hole and attached to the other piece, the whole forming a cheap and simple coupling, which may be quickly bolted or riveted to the parts.

INSTRUMENT FOR RINGING HOGS, INSERTING RINGS IN LEATHER, ETC.—John Heesen, George Heesen, and Henry Nyland, Tecumseh, Mich.—This invention consists in the means for applying sheet metal rings to hogs' noses. Instead of sheet metal, wire may be used, with the ends sharpened; but the sheet metal, or flat ring, is preferred. When the piece is placed within the jaws of the instrument, the nose of the hog is caught between the jaws, and a single gripe forces the sharp ends or points of the metal through the skin, completing the ring and securely fastening it in the nose. It may be applied to inserting rings in leather or cloth. The inventors, therefore, claim it for all the purposes for which it may be adapted.

DUMPING CAR.—The object of this invention is to provide a railroad car with a jointed top or platform, which can be raised in the middle and lowered at the sides, to form inclined planes, from which its load will be spontaneously discharged. The labor of unloading sand and ballast from the cars is thus avoided, and the process carried out much more rapidly than by manual labor. The invention consists in making the car platform of two longitudinal sections, which are hinged together, so that they can be raised in the middle to discharge whatever has been placed upon them; and, also, in the use of new mechanism for raising or lowering the middle part of the platform by means of the rolling gear of the car. Jacob C. Wiswell, of Lennoxville, Canada, and Frederick A. Wiswell, of Beebe Plain, Vt., are the inventors.

PRESSER FEET FOR SEWING MACHINES.—James Wensley, of Philadelphia, Pa.—The object of this invention is to provide the presser foot of a sewing machine with a stitch guide, whereby, especially in leather, sewing or stitching can be done exactly parallel with seams. From the under side of the presser foot projects a feather, or rib, which is sufficiently thin to enter a seam, and thereby guide the fabric to let the stitching be parallel to the seam. The feather is secured to a spring, which is fastened to the shank of the presser foot by a screw or rivet, the feather projecting through an orifice in the presser foot. The spring can be set to regulate the depth of the feather. A point, or pin, projecting from the end of the presser foot, serves as an eye guide for the operator, it being in line with the feather and above the seam.

VAPOR BURNER.—George H. Wilson, of Mansfield, Ohio.—This invention consists in the arrangement of heating and conducting tubes for heating the oil and air, a flame regulator, and a disintegrator for the oil, whereby the inventor claims to have produced a burner superior to those hitherto used for burning the vapors of hydrocarbons. The disintegrator consists in a quantity of sand confined between two diaphragms of perforated substance, or gauze wire, which, besides serving to prevent the too rapid flow of vapor or oil, or the escape of the oil before vaporizing, also serves to facilitate the vaporizing of the particles.

COOKING STOVE.—Henry T. Holmes and Wallace H. Priest, of Little Falls, N.Y.—This invention consists in a new way of arranging the fire pot and air chamber of a cook stove with relation to each other. Two fire pots are used, and it is claimed that by the arrangement of these pots in the chamber, and the method of admitting the cold air thereto, much of the heat radiated by them may be saved; and that, by the employment of two fire pots, a considerable economy of fuel will result, when only one pot is to be heated; and the heat will be concentrated on the pot, instead of the cross bar, which is very soon ruined in the stoves of ordinary construction, being exposed to the most intense part of the fire, and the heat of which, passing through the plate, is lost, as far as the application of the vessels is concerned. The heating chamber, in which the fire pots are placed, is also of peculiar construction, and forms a part of the claim.

FLESH FORK.—This improvement consists in the mode of attaching the two outer tines to the shank of the fork. Three tines are used, the middle tine being an elongation of the shank of the handle. The two outer tines are made of a single piece, which passes through the shank, the ends being properly tapered and bent to correspond in form with the tine. As heretofore made, a round hole has been punched through the shank, and the piece forming the two outer tines is made to fit, being simply a piece of round iron or steel, of the required size, tapered and bent as before stated. The forks are made of iron or steel, or of both, and are tinned over to prevent oxidation. This thin coating of tin is all the fastening which the round iron has in the shank, or all that is depended upon to prevent the iron from turning in the hole. In lifting with the fork, the tendency is to loosen this connection, as the strain at times is great, and the result is that after using such forks, and while the outer tines drop down, by reason of the loosened shank connection, the fork becomes worthless. To remedy this, the inventor makes a square or other shaped hole through the shank, and makes the piece which forms the two outer tines to fit it. He also enlarges the shank around the hole to give additional strength where the strain is greatest. By this improved mode of manufacture the fork is claimed to be made strong and durable, and suited for army and navy as well as for household use.—Paul Fisher, of Brooklyn, N. Y., is the inventor.

RAILROAD CAR VENTILATOR.—This invention provides among other things for the adjustment of car windows, so that they may be partially swung open to allow the outflow of the heated air, and at the same time present an oblique position to the direction in which the train is advancing. Provision is made for admission of fresh air, from the advance of the train, and allowing the air exhausting from the car to pass out at the side windows, which, being arranged as described, are particularly favorable for use in this way, as the cinders cannot possibly enter the openings on account of being thrown off by the oblique windows. The oblique windows also facilitate the exhaust by creating a partial vacuum behind them and at the openings to be supplied by the air from the tube at the top of the car which admits the fresh air. The employment of three-bladed valves in openings in the upper part of the car also constitutes a part of the claim. Nathaniel Jones, of Buffalo, N. Y., is the inventor.

SHUTTLE FOR SEWING MACHINE.—George H. Lenher, of Elizabeth, N.J.—This invention is intended to supply an improved method of attaching bobbins to the shuttles of sewing machines, more particularly to a shuttle patented by the same inventor, Nov. 27, 1866. The attachment is now made by means of a screw-threaded stud-pin, which is fixed to the bottom of the recess that carries the bobbin. A nut is applied to the eye of the bobbin, so made that it will turn freely, but cannot escape therefrom so as to be lost and give trouble.

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116,533.—BLACKING.—R. W. Bailey, New York city.
116,534.—JACK.—H. Ballentine, Philadelphia, Pa.
116,535.—FEATHER RENOVATOR.—C. E. Barber, W. Dean Central Village, Conn.
116,536.—TRIMMING.—J. Bauer, Newark, N. J.
116,537.—DERRICK.—W. Q. Baxter, Maple Township, Pa.
116,538.—GAGE.—T. Beach, Freeport, Pa.
116,539.—SAWING MACHINE.—H. Bean, Fredonia, Ohio.
116,540.—BUGGY TOP.—B. L. Benson, Fairview, Ind.
116,541.—DIE.—G. W. Billings, Chicago, Ill.
116,542.—PITMAN ROD.—E. S. Blake, Pittsburgh, Pa.
116,543.—CARVING MACHINE.—M. T. Boult, Battle Creek, Mich.
116,544.—PADLOCK.—D. T. Brown, Plainfield, N. J.
116,545.—TOOL SUPPORTER.—I. F. Brown, New London, Ct.
116,546.—CLEANING FIBER.—J. Brown, Bay Ridge, N. Y.
116,547.—BOLT CUTTER.—J. R. Brown, Cambridgeport, Mass.
116,548.—CAPSTAN.—J. S. Brown, Schenectady, N. Y.
116,549.—GRAIN SEPARATOR.—J. D. Brunner, Doylestown, Pa
116,550.—REGISTER.—H. C. Buhoup, Pittsburgh, Pa.
116,551.—SPELTER.—J. E. Burrows, Newark, N. J.
116,552.—PLANTER.—S. J. Bye, Bluff Point, Ind.
116,553.—NAIL HAMMER.—H. Cheny, Little Falls, N. Y.
116,554.—WHEAT CLEANER.—E. Chipman, Baltimore, Md.
116,555.—WINDMILL.—E. Cleaver, North Wales, Pa.
116,556.—COTTON PLANTER.—J. P. Clopton, Terry, Tenn.
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116,558.—IRON SMELTING.—C. Cochrane, Upper Gornal, Eng.
116,559.—FIREARM.—F. G. Cochran, St. Louis, Mo.
116,560.—SWING.—G. W. Cole, Canton, Ill.
116,561.—POOL BALL RACK.—H. W. Collender, New York city.
116,562.—VOLTAIC PLASTER.—W. C. Collins, Bucksport, Me.
116,563.—CARBURETER.—M. P. Coons, Brooklyn, N. Y.
116,564.—SHOW CASE.—W. Cooper, Jr., Mexico, N. Y.
116,565.—TAMPING APPARATUS.—D. Corgan, Sugar Notch, Pa.
116,566.—COUPLING.—G. E. Darling, M. Heus, Marytown, Wis.
116,567.—ADDRESSING MACHINE.—G. A. Davison, Montana, Iowa.
116,568.—TOY ENGINE.—A. L. Dewey, Westfield, Mass.
116,569.—SAWMILL.—A. M. Dexter, Mattapoisett, Mass.
116,570.—BINDING ATTACHMENT.—G. E. Dolton, Monee, Ill.
116,571.—ROCKING CHAIR.—J. W. H. Doubler, Darlington, Wis.
116,572.—PUMPING ENGINE.—P. Doyle, New Comerstown, Ohio.
116,573.—VAPOR BURNER.—M. B. Dyott, Philadelphia, Pa.
116,574.—MOP HOLDER.—D. Edward, Montreal, Canada.
116,575.—ICE CREEPER.—E. S. Ellis, Trenton, N. J.
116,576.—WATER METER.—G. D. Emerson, Calumet, Mich.
116,577.—LEAF HOLDER.—A. Extein, J. C. Mills, Springfield, Mss.
116,578.—PREPARING FURS.—L. Falkenau, San Francisco, Cal.
116,579.—NICKEL PLATING.—M. G. Farmer, Salem, Mass.
116,580.—FUNNEL.—R. T. Fisher, G. F. Waldron, Boston, Mass.
116,581.—LOCK.—J. Fisler, G. Crompton, Jersey City, N. J.
116,582.—ENGINE.—R. N. and R. Francis, Girard, Pa.
116,583.—CANAL LOCK.—J. W. Gentry, and G. W. Barcus, Peytona, W. Va.
116,584.—FREEZER.—C. Gooch, Cincinnati, Ohio.
116,585.—CORSET.—C. A. Griswold, Willimantic, Conn.
116,586.—UMBRELLA.—G. G. Griswold, Brooklyn, N. Y.
116,587.—BRICK MACHINE.—F. L. Hall, Oneida, N. Y.
116,588.—HARVESTER.—W. H. Harman, Westminster, Md.
116,589.—SUPPORT.—D. Hartmann, Mansfield, Ohio.
116,590.—SEAT.—F. M. Hawkins, Indianapolis, Ind.
116,591.—CHUCK.—H. H. Heskett, Le Roy, Ill.
116,592.—WHEEL.—B. B. and J. R. Hill, Worcester, Mass.
116,593.—FIREARM.—F. W. Hood, Boston, Mass.
116,594.—NEEDLE.—O. L. Hopson, Waterbury, and H. P. Brooks, Wolcottville, Conn.
116,595.—CAR COUPLING.—H. R. Howe, Hartwick, N. Y.
116,596.—GOVERNOR.—R. K. Huntoon, Boston, Mass.
116,597.—STARCH.—C. B. Hutchins, Ann Arbor, Mich.
116,598.—FURNACE.—R. Jenkins, Newark, Ohio.
116,599.—SYRINGE.—W. J. Johnson, Newton, Mass.
116,600.—CORN POPPER.—W. J. Johnson, Newton, Mass.
116,601.—HARVESTER.—D. A. Kellogg, Valparaiso, Ind.
116,602.—SASH.—J. N. Kikendall, Jr., Virginia, Ill.
116,603.—CRUTCH.—S. Kreger, Philadelphia, Pa.
116,604.—DESULPHURIZING ORE.—G. T. Lewis, Phila., Pa.
116,605.—NOZZLE.—J. Lewis, Chicago, Ill.
116,606.—CLOTHES DRYER.—C. F. Linscott, Chicago, Ill.
116,607.—HOIST.—W. M. Lloyd, New York city.
116,608.—HEATER.—W. H. Lungren, Baltimore, Md.
116,609.—SHUTTLE.—J. Lyall, New York city.
116,610.—STEAM PLOW.—M. N. Lynn, New Albany, Ind.
116,611.—WATER GAGE.—M. N. Lynn, New Albany, Ind.
116,612.—DRILL.—R. Marks, A. C. Behne, Connersville, Ind.
116,613.—PULLEY BLOCK.—R. Marsden, Sheffield, England.
116,614.—WASHING MACHINE.—M. S. Marshall, Somerville, Ms.
116,615.—COTTON GIN.—R. W. Massey, Macon, Ga.
116,616.—GRIPER.—V. E. Mauger, New York city.
116,617.—MOVEMENT.—J. H. McCamey, Wytheville, Va.
116,618.—CLUTCH.—E. McDonald, Boston, N. H. Cole, Swampscott, Mass.
116,619.—VALVE.—Edward McSteen, Pittsburgh, Pa.
116,620.—HEATER.—N. Middleton, S. Morris, Philadelphia, Pa.
116,621.—DOOR FASTENER.—J. A. Morris, Greenbush, N. Y.
116,622.—HAY ELEVATOR.—W. T. Neil, Greensborough, Pa.
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116,628.—SASH HOLDER.—A.W. Pennington, Rochester, N.Y.
116,629.—CHAIR.—C.R.Peters,W. P.Taylor,San Francisco,Cal.
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116,637.—SHINGLE MACHINE.—C. Shelmidine, Summit, N.Y.
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116,640.—SHOT CARTRIDGE.—C. E. Sneider, Baltimore, Md.
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116,645.—SEWER TRAP.—S. Towle, New York city.
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116,652.—INSECT TRAP.—L. I. Way, Annawan, Ill.
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116,770.—FAN.—G. Stevens, J. W. Moyle, Cincinnati, Ohio.
116,771.—PHOTOGRAPHING APPARATUS.—John and Jacob Stock, New York city.
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116,775.—ORDNANCE.—J. P. Taylor, Elizabethton, Tenn.
116,776.—CULTIVATOR.—J. J. Thompson, Columbus, Ohio.
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116,778.—INK FOUNTAIN.—W. V. Wallace, New York city.
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116,780.—DINNER PAIL.—G. Wetzler, Peoria, Ill.
116,781.—COPYING PRESS.—A. Whitcomb, Worcester, Mass.
116,782.—CIGAR BOX.—T. A. Wiley, Lancaster, Pa.
116,783.—SEWING MACHINE.—C. H. Wilcox, New York, and C. Carlton, Brooklyn, N. Y.
116,784.—CHAIR.—G. Wilson, Chicago, Ill.
116,785.—SADDLETREE.—G. Woods, St. Catharine's, Canada.
116,786.—TOILET PASTE.—J. D. Young, San Francisco, Cal.
116,787.—BRIDGE TRUSS.—A. Fink, Louisville, Ky.
116,788.—FAN.—W. M. Bruton, Baltimore, Md.

REISSUES.

4,451.—Division A.—DECORTICATOR.—W. Ager, Washington, D.C.—Patent No. 92,556, dated July 13, 1869; reissue No. 3,788 dated January 11, 1870.
4,452.—Division B.—DECORTICATOR.—W. Ager, Washington, D.C.—Patent No. 92,556, dated July 13, 1869; reissue No. 3,789, dated January 11, 1870.
4,453.—CAPSTAN.—D. N. B. Coffin, Jr., Newtown Centre, Mass.—Patent No. 98,032, dated December 21, 1869.
4,454.—EDGE PLANE.—I. A. Dunham, North Bridgewater, Mass.—Patent No. 18,237, dated Sept. 22, 1857.
4,455.—DRAWERS.—H. G. Fisk, T. R. Clark, T. J. Flagg, New York city.—Patent No. 73,975, dated Feb. 4, 1868.
4,456.—ARTIFICIAL STONE.—G. A. Frear, Chicago, Ill.—Patent No. 73,965, dated Feb. 4, 1868.
4,457.—MANUFACTURE OF GAS.—F. King, Richmond, Va.—Patent No. 74,230, dated Feb. 11, 1868.
4,458.—PRESSING CIGARS.—A. Pearl, New York city.—Patent No. 108,290; dated Oct. 11, 1870.
4,459.—HOLDING BRISTLES.—C. D. Rogers, Utica, N.Y., M. P. Wilkins, Jersey City, N. J.—Patent No. 70,270, dated October 29, 1867.
4,460.—FRUIT JAR.—H. E. Shaffer, Rochester, N. Y.—Patent No. 96,490, dated Nov. 2, 1869.
4,461.—HOE.—E. Warren, Ceresco, Mich.—Patent No. 102,891, dated May 10, 1870.
4,462.—Division A.—PAINTING WIRE CLOTH.—C. H. Waters, Groton, Mass.—Patent No. 84,520, dated Dec. 1, 1868.
8,463.—Division B.—PAINTING WIRE CLOTH.—C. H. Waters, Groton, Mass.—Patent No. 84,520, dated Dec. 1, 1868.

DESIGNS.

5,065 to 5,067.—RUBBER OVERSHOE.—A.O.Bourn, Providence, R. I.
5,068.—ADVERTISING PRINT.—J. Brooks, Boston, Mass.
5,069.—ALARM LOCK.—J. M. Case, North Lansing, Mich.
5,070.—SHUTTER BAR.—L. Crooke, New York city.
5,071.—SPOON HANDLE.—W. B. Durgin, Concord, N. H.
5,072.—GAME BOARD.—W. Hearn, New York city.
5,073.—CARPET PATTERN.—O. Heinigke, New York city.
5,074 and 5,075.—FURNACE.—J. A. Lawson, Troy, N. Y.
5,076.—CARPET PATTERN.—L. G. Malkin, New York city.
5,077.—SPOON HANDLE.—E. C. Moore, Yonkers, N. Y.
5,078 to 5,085.—CARPET PATTERN.—E.J. Ney, New York city.
5,086.—BANNER PIN.—W. Riker, Newark, N. J.
5,087.—MUFF BOX.—R. M. Seldis, New York city.
5,088.—CARPET PATTERN.—John H. Smith, Enfield, Conn.
5,089 & 5,090.—GROUP OF STATUARY.—A.Van Wart, New York
5,091.—CHANDELIER.—T. Village, West Meriden, Conn.
5,092.—CHANDELIER ARM.—T. Village, West Meriden, Conn.
5,093.—SPOON HANDLE.—G. Wilkinson, Providence, R. I.
5,094 and 5,095.—RUBBER OVERSHOE.—I. F. Williams, Bristol, R. I.

TRADE-MARKS.

360.—STEAM PACKING.—W. M. Canfield, Philadelphia, Pa.
361.—SCREW WRENCH.—A. G. Coes & Co., Worcester, Mass.
362.—MEDICINE.—D. Dick, New York city.
363.—HOSIERY, ETC.—John P. Loring, Charlestown, Mass.
364.—GLYCERIN SOAP.—Mark & Rawolle, New York city.
365.—GIN.—L. Myers & Co., New York city.
366.—SHERRY WINE.—L. Myers & Co., New York city.
367.—MEDICINE.—Marie E. Perrin, Montreal, Canada.
368.—RAZOR STEEL.—R. J. Roberts, New York city.
369.—HAT.—Yates, Wharton & Co., Newark, N. J.

EXTENSIONS.

WHIFFLETREE HOOK.—Ann M. Cooley, Ceresco, Mich.—Letters Patent No. 17,668, dated June 30, 1857.
IRON TRUSS FRAME.—F. C. Lowthorp, Trenton, N. J.—Letters Patent No. 17,684, dated June 30, 1857.

APPLICATIONS FOR EXTENSION OF PATENTS.

GANG PLOWS.—George W. Hildreth, Lockport, N.Y., has petitioned for an extension of the above patent. Day of hearing, September 27, 1871.

MACHINE FOR CUTTING BUNGS.—Josiah Kirby, Cincinnati, Ohio, has petitioned for an extension of the above patent. Day of hearing, September 13, 1871.

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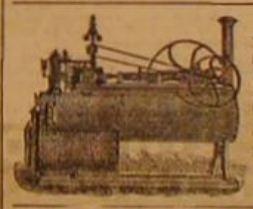
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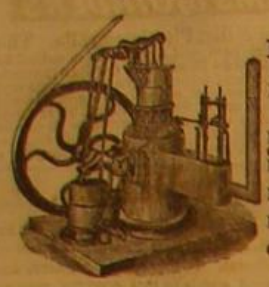
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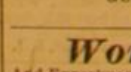
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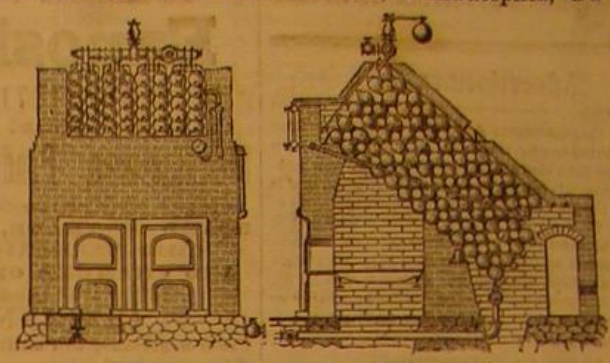
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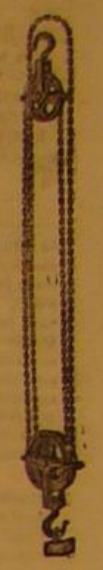
INTERNATIONAL MEDAL, LONDON, 1862.
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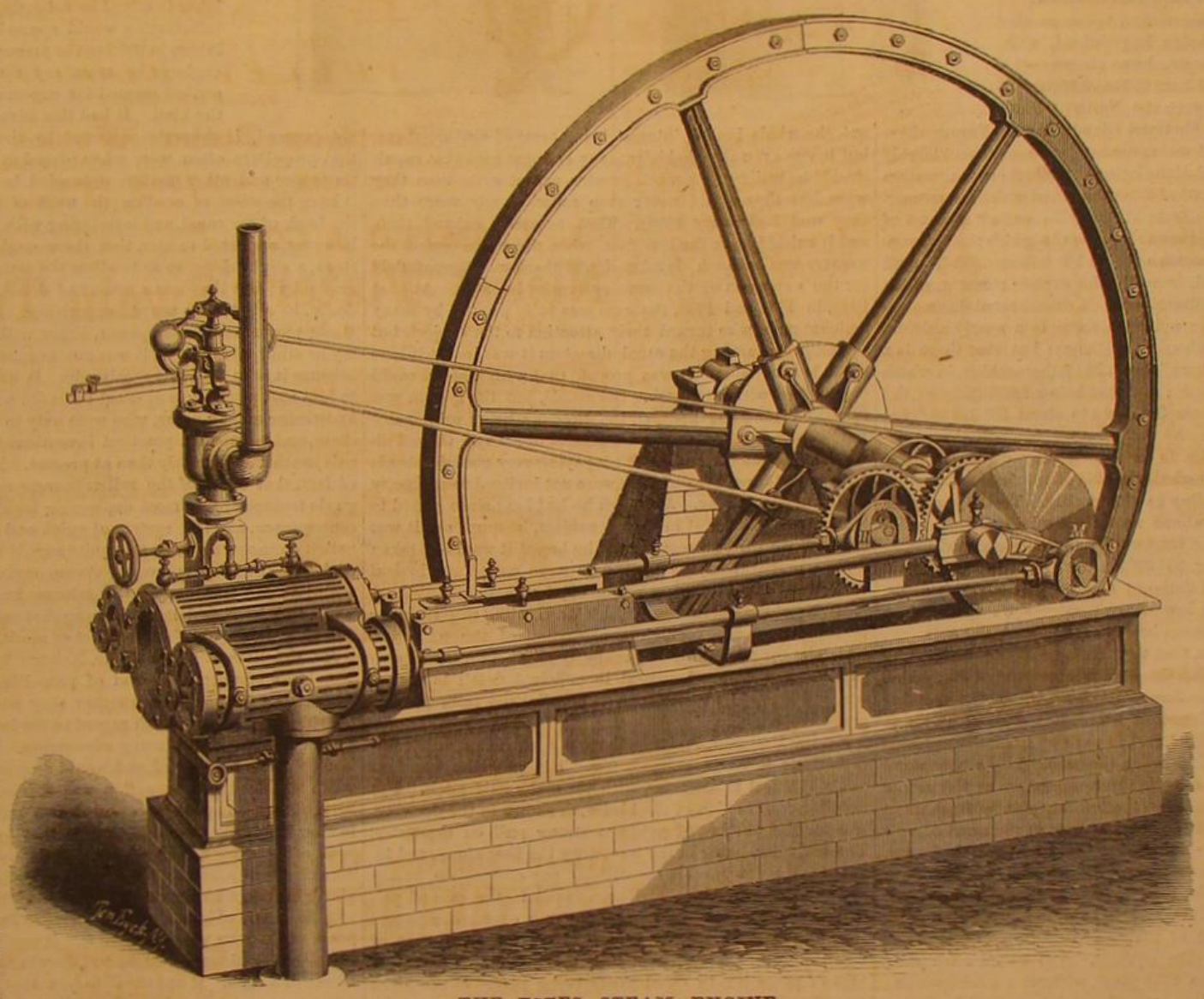
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXV.—No. 4. [NEW SERIES.] NEW YORK, JULY 22, 1871. $3 per Annum [IN ADVANCE.]

The Estes Steam Engine.

This is a Leavenworth (Kansas) engine. Our Eastern readers—manufacturers of engines especially, who for so long a time have supplied the Western market with steam motors—will look with curiosity at an engine built in the far West and which displays in its design and construction all the refinements of modern practice.

The engine is provided with variable cut-off, full stroke exhaust, and Tremain's balance valves. The piston is also furnished with Estes patent piston packing device, all of which are hereafter described. Economy of fuel, ere the railroads had made such inroads upon the timber supply of the country, was a consideration of little importance. The increasing cost of fuel from year to year, and the close competition in all kinds of manufacturing business, now render it imperative that every avenue of waste shall be closed. From being a question of secondary importance, economy of fuel is fast becoming one of primary interest in many parts of the country. It thus happens that the demand throughout the West for finer engines is annually becoming greater.

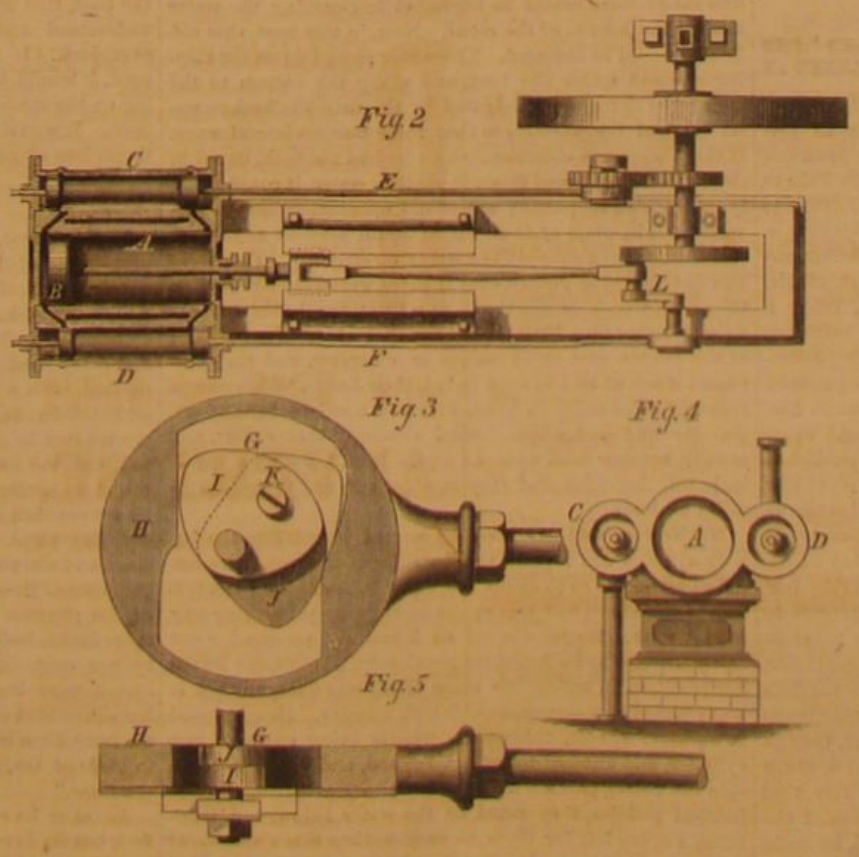


THE ESTES STEAM ENGINE.

It is claimed for the Estes engine that it meets this growing want, and that not only economy of fuel but economy in first cost and in current expenses for repairs, are also secured by the simple and strong construction of its working parts; and also that while its working will compare with any of the more expensive engines in market, it will not give trouble and annoyance by the necessity of frequent repairs.

A detailed description of the improvements combined in the engine will show the grounds upon which these claims are based.

Fig. 1 is a perspective view, from which our readers will gain a good idea of the general design as well as most of the details of the construction. Fig. 2 is a plan view, with sectional view of the cylinder and valve chambers, showing the induction and eduction ports and valves, etc. Figs. 3, 4, and 5 are respectively an elevation and a section of the cam, which operates the induction valve, a section of the cylinder and valve chambers and a section of the beam. Figs. 6 and 7 show the method of packing pistons employed, to which we shall call special attention in the proper place.



A, Fig. 2, is the cylinder, B the piston, C the steam chest or chamber, D the exhaust chamber. These chambers are cylinders attached to opposite sides of the cylinder, A, and of the same length as A. The induction ports are shown on the side of the cylinder next to the steam chamber, C, and the eduction ports on the other side communicating with the exhaust chamber, D. These ports are entirely distinct from each other.

Each chamber has a double piston valve, consisting of two heads connected by a rod, as shown, the heads working in suitable seats. The course of admission and exhaust will easily be traced in the section of the cylinders without further description. When the steam spaces between the heads of the valves are filled with steam, the latter transmits its pressure equally to the heads in opposite directions, and thus accurately balances the valves. Openings are made in the seats which allow the steam to pass under and lessen the friction of the valves.

The induction valve is worked by the rod, E, and the exhaust valve by the rod, F. The former is connected with the adjustable steel-pointed cam, G, Figs. 1, 3, and 5, which cam revolves in the yoke, H, Fig. 1, to which the valve rod, E, is attached. The cam, G, is attached to the end of a small shaft sustained by a bracket, which shaft is turned by a pinion meshing into a gear wheel, with an equal number of teeth, on the main shaft, so that the cam revolves once for every revolution of the shaft.

The cam, G, is formed in two parts, I and J. By means of the screw, K, the position of I may be varied on the part J, so as to cut off the steam at any desired point of the stroke.

The exhaust valve is moved by a crank, L, Figs. 1 and 2, on the end of the wrist of the pitman, by means of the cam, M, Fig. 1, working in the yoke, N.

The inventor does not confine himself to the use of cams exclusively for moving either of the valves; eccentrics may be used if desired.

The exhaust is kept open during the entire stroke, thus obviating all back pressure upon the piston. The cam and yoke, working the exhaust valve, make one full stroke backward and another forward during each revolution of the main shaft. Its movement being short is quickly made, and it then moves loosely in the yoke until the piston has made the full stroke, so that no back action takes place, no matter at what point the steam is cut off.

Figs. 6 and 7 are respectively a perspective view and a section of a piston packed by the Estes system. A are the packing rings, which are of the ordinary kind. Within these rings is placed a parted ring, B, with a wedge-shaped section as shown in Fig. 7. Within the ring, B, is another parted ring, C, also with a wedge-shaped section, the lower edge being cut off somewhat as shown, and so placed that its inclined face acts upon the inclined face of the ring, B; D is the annular base of the ring, E the radial braces of the piston head, and G the follower. When the latter is forced toward the head by the screws, F, the ring, C, is forced inward, expanding the ring, B, and through it the packing rings, A.

The chests are cast with the cylinder in one piece. All joints are ground in. The valves being cylindrical, a much larger area of opening is produced in the same length of travel than can be obtained by any flat slide valve. The valves are so constructed that they clear themselves of any sediment that may work through from the boiler in consequence of foaming or surplus of water, the rings being surrounded by steam and working half over the seats at every stroke. Each engine is provided with extra starting valves on each end of the cylinder for the purpose of starting the engine off its center. The slides are completely boxed in to prevent dirt from getting on the wearing parts, and each slide is provided with four brass gibs which can be readily packed up to a gage

mark. The main wearing parts are provided with patent oilers. The fly wheel is made in segments, all the joints being planed to fit perfectly. Each bolt in the hub is turned and chased, and every hole reamed, leaving no possible room for play. A hollow wrought iron pitman is used instead of the usual solid rod.

We have thus attempted to place before our readers the peculiarities of this engine of the West. Its merits are spoken of in terms of high praise by parties now using it in extensive establishments.

The improvements described are covered by two patents obtained through the Scientific American Patent Agency by Philip Estes. The patents are dated respectively Feb. 28, 1871, and May 2, 1871.

For further information address Great Western Manufacturing Company, Leavenworth, Kansas.

The General Oceanic Circulation.

The temperature soundings, taken in the Lightning and Porcupine Expeditions, with trustworthy instruments, have shown:—(1.) That in the channel of from 600 to 700 fathoms depth which lies between the North of Scotland, the Orkney and Shetland Islands, and the Faroes, there is an upper stratum of which the temperature is considerably higher than the normal of the latitude; while there is a stratum occupying the lower half of this channel, of which the temperature ranges as low as from 32° to 29°·5; and a "stratum of intermixture" lying between these two, in which the temperature rapidly falls—as much as 15° in 100 fathoms. (2.) That off the coast of Portugal, beneath the surface stratum, which (like that of the Mediterranean) is superheated during the summer by direct solar radiation, there is a nearly uniform temperature down to about 800 fathoms; but that there is a "stratum of intermixture" about 200 fathoms thick, in which the thermometer sinks 9°; and that below 1,000 fathoms, the temperature ranges from 39° down to about 36°·5. (3.) That in the Mediterranean the temperature beneath the superheated surface stratum is uniform to any depth; being at 1,500 or 1,700 fathoms whatever it is at 100 fathoms, namely from 56° to 54°, according to the locality. To these may be added (4) the observations recently made by Commander Chimmo, with the like trustworthy thermometers, which, in lat. 3° 18½'S., and long. 95° 39' E., gave 35°·2 as the bottom temperature at 1,806 fathoms and 33°·6 at 2,306 fathoms. These seem to be the lowest temperatures yet observed in any part of the deep ocean basins outside the polar area.

It is clear, therefore, that very strong evidence now exists, that instead of a uniform deep sea temperature of 39°, which on the authority of Sir James Ross, by whom the doctrine was first promulgated, and of Sir J. Herschel, by whom it was accepted and fathered, had come to be generally accepted in this country at the time when the recent deep sea explorations commenced, not only is the temperature of the deeper parts of the Arctic basin below the freezing point of fresh water but the temperature of the deepest parts of the great oceanic basins, even under the equator, is not far above that point. And it seems impossible to account for the latter of these facts in any other mode, than by assuming that polar water is continually finding its way from the depths of the polar basins along the floor of the great oceanic areas, so as to reach or even to cross the equator. And as no such deep efflux could continue to take place without a corresponding in-draught to replace it, a general circulation must be assumed to take place between the polar and equatorial areas, as was long since predicted by Pouillet.—*Nature.*

DISCUSSION ON MR. HARDING'S PAPER, ENTITLED "THE APPLICATION OF STEAM TO CANALS," CONCLUDED IN OUR LAST ISSUE.—NO. 1.

Mr. Hyde Clarke said he might contribute a small personal portion to the history of the subject, having been one of the minor actors in this movement from about 1836 to 1840, when he was one of those who had the misfortune to be an inventor, although, happily, he had escaped figuring in the satirical list given in the paper, which was probably owing to his having escaped the hands of their friend, Mr. Newton, the patent agent. He recollected that, being a young man, he gave his own views without much reference to what other people had done, and some of his first publications on the subject, in the *Railway Magazine*, having attracted some attention, he was attacked by a leading man in Liverpool, who accused him of plagiarizing his ideas. Since that time, he had always been very careful how he published anything as original; but it always happened that when any subject of real importance was engaging the attention of the public, a number of persons were engaged upon it, and each thought himself the first, and was ready to treat any of his contemporaries who broached the same ideas as having borrowed them from him. His attention had been attracted to the subject from having seen the great advantage to traffic in the Netherlands, which had been developed for centuries, and in his early days it was a regular part of the tourist's scheme to make a journey by the canal boat. It was always recommended by the "Murray" of that day; and, though there were no Cook's tourists then, those who did venture abroad generally made a rule to carry out, at any rate, that portion of the programme. When so large a portion of the passenger traffic was carried in that way in Holland, he could not but contrast it with our own canal system, although at that time a certain number of passengers did avail themselves of that means of transit, even on the Grand Junction Canal. His branch of practice, then, as a railway and hydraulic engineer, led him to turn his attention upon the subject, and he was put in communication with some of the leading men in the canal interest, and the late Mr. Richard Walker, M. P. for Bury, took an active part in promoting his views. The difficulty, however, was to move the canal interest. At that time, they hardly believed that railways would be carried out, the whole landed interest being arrayed against them; but it was even then held by many eminent men that canals should be utilized to a much greater extent even than they were, but they would never stop railways, any more than they would ordinary roads. That necessity existed then, and it existed none the less now, when the commerce of the country was so much developed, and there was a great field for the extension of the same enterprise in India. At that time, in 1837 and 1838, the case was fully proved by many eminent men, who turned their attention to the subject, but the prejudice among the canal directors it was impossible to make head against. It was proved that a high speed could be obtained without injuring the canals, but the system was then in a transitional period, the directors being principally half superannuated, or the successors or sons of the old directors, and the companies either paying very good dividends or very bad ones, the directors were not inclined to make any outlay in such a way. Although he had long since ceased to take an active interest in such a subject, he must say it was one well worthy of attention, and he hoped it would be taken up in a practical way by those who were competent to deal with it and could influence public opinion.

Fig. 6

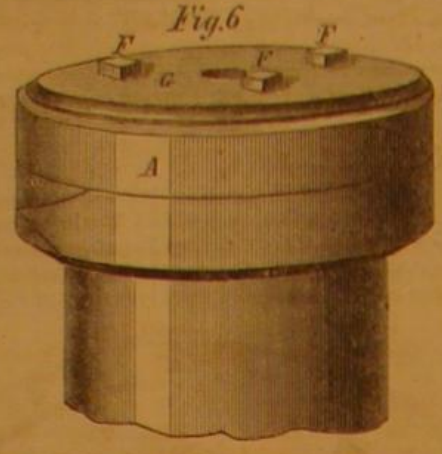
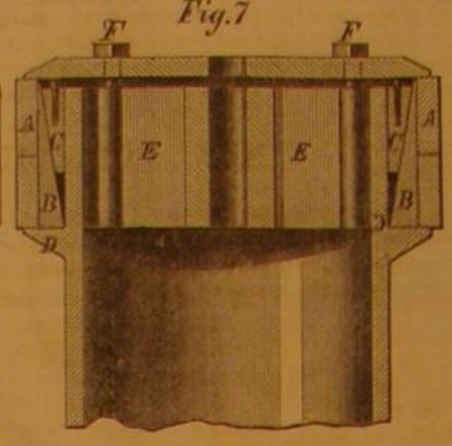


Fig. 7



Mr. Newton said, he should like Mr. Harding to give fuller information on the peculiar construction of the propeller, which he considered was so peculiarly eligible for canal navigation. It was not described in sufficient detail in the paper, and he hardly understood its peculiarities from the diagram.

Mr. Harding said, the propeller was constructed rather differently-to those in ordinary use. The propeller was four and a half feet in diameter, with six and a half pitch. The peculiar construction of the blades, as shown in the drawing, was for the purpose of getting a strong pull on the water. The propeller, being in the bow, drew the boat along, and insured the water reaching it without any obstruction, or any of the difficulties which had been found in the case of propellers at the stern. In fact, on looking over some papers read in the early season of 1867, before the Institution of Civil Engineers, it was mentioned that one great disadvantage of propellers in canal boats being placed at the stern was, that if the space between the boat and the bottom of the canal were not sufficient for a quick passage of water, a large amount of force would be expended in churning the water against the bottom of the canal. Now, in this boat, that difficulty would be obviated. The water passed down the sloping channel under the boat, and along the bottom to the stern; the force was dissipated by the time the broken water reached the surface, so that there was no lateral wave. If there were any objection, which he had not seen, urged to the water being forced down in shallow water, it could readily be obviated by putting across the opening, under the propeller, a thin plate of iron, which would prevent any downward action, and pass all the water directly aft. The water was distributed so evenly, that if there were a strong wind on the canal, which canted the boat a little, the bubbles could be seen rising up a little on the weather side. The cylinder of the engine was eight inches in diameter, and they consumed a tun of coal in each twenty-four hours, which gave a speed of three miles an hour, with two hundred tuns of cargo. He had seen a boat, loaded to almost that extent, and towing another boat with an equal load, keep up a speed, including lockages and stoppages, of two and three fourths miles an hour.

Mr. Newton said, Mr. Harding seemed to consider the important point was to place the propeller at the bow, in a channel so arranged as to cause the water to pass under the bottom of the vessel and rise at the stern, thus preventing any lateral wash. He recollected an invention, patented some few years ago by an American gentlemen, whose name he did not recollect, in which the same thing was done, though it was effected in a somewhat different manner. He employed two paddle wheels, the paddle wheels being enclosed in a cylinder, and allowed to project beyond, and were placed inside the vessel, parallel with the keel. By actuating the cylindrical paddles, they acted on the water below, and there being a space left for them to project, they threw the water back, just in the way Mr. Harding had explained, the effect being that the vessel was propelled along without causing any lateral wash. The invention was tried in the north of England, and was found successful; but, owing to the difficulty of moving canal companies, referred to by Mr. Hyde Clarke, and the inventor being obliged to return to America, the invention had not been practically carried out to any extent. With reference to the system of pulling vessels by hauling on ropes laid at the bottom of the canal, he knew of an instance in which it had been found to answer very well indeed. This was in Hungary, where it was carried out by Mr. Murray Jackson, who had a very ingenious way of overcoming the difficulty which had been previously found in this system, namely, that in order to get a sufficient adhesion to the rope, it was nipped so tightly that the rope was soon destroyed. He overcame that difficulty by passing it over several grooved pulleys, six, eight, or even a dozen, having the pressure wheel at top forced down by springs. By this means he got sufficient grip upon the rope, without in the slightest degree damaging it.

Mr. Olrick said, every one who knew the labor involved in collecting such a mass of information would appreciate Mr. Harding's labors in writing the present paper, and, as an engineer he must say that the system described seemed far superior to any thing of the kind. It had this advantage, that it was not exposed, if properly protected, to those disadvantages that propellers often were when placed at the stern, of getting ropes and other matters entangled in them, nor would it have the effect of sending the wash of the water against the bank of the canal, and interfering with the foot path. It, however, appeared to him, that there ought to be, near the stern, a slight slope, so as to allow the water to get up more gradually; but that was a matter of detail, which would, no doubt, be altered by simple experience. As for comparing steam power with horse power, either with regard to economy or other advantages, it was not necessary to say a word, because it is so well known already. It was quite a mystery to him that proprietors of canal boats did not make use of the knowledge of engineers, who were only too willing to serve them, and to produce practical inventions for navigating canals much more quickly than at present. It was an undoubted fact, that many of the railways were so overloaded with goods transport, that most deplorable accidents happened in consequence, and if a system of quick and cheap canal navigation were arranged, he was quite sure it would have a beneficial effect on the railways. As an engineer, he must congratulate Mr. Harding on the scheme he had brought forward, and he hoped it would reap that commercial success which, after all, was the great test of merit.

Mr. Hamilton Towle said, Mr. Newton had described, in a very brief manner, a system of propelling boats with two wheels, but did not state whether they were at the bottom, the side, or the top. With regard to the invention described by Mr. Harding, it had many advantages. When a boat was heavily laden it squatted, and would drop on the bottom; but when Mr. Harding's invention was applied to it, the water being drawn in at the bow and drawn under, instead of allowing it to drop, raised it up, so that by that system the boat could carry a larger load in the same canal than any other. About a fortnight ago, when at Ostend, he met the engineer in charge of the whole of the canals through Belgium, who described to him a system about to be tried, at the expense of the man who proposed it. It consisted of a traction engine going along the bank, and drawing the canal boat by means of a rope. It appeared to him that this plan would never answer, inasmuch as the pull of the rope would tend to bring the engine and the rope together. In the case of the boat, that might be avoided by steerage, but he did not understand what was to prevent the engine being pulled overboard. If ropes along the bottom of the canal were used, it would be very awkward when two boats were pulling on the same rope, and wanted to pass in opposite directions. It would be something like two trains meeting on a single line of rails.

Willow Leaf Tea.

Mr. Medhurst, the British Consul at Shanghai, says "the preparation of the willow leaf for mixture with tea is openly openly practiced in the villages on the Hong-keu side of the Soo-chow Creek, and it has become an industry which claims an important share of the attention of the villages of that and other localities. The banks of the numerous creeks are planted with willow trees, the young leaves of which are collected in April and May, very much in the way that the tea leaf is gathered. The produce is then collected in heaps on the hard threshing floors of the hamlets, and is allowed to undergo a mild fermentation in the sun. The leaves are then manipulated, similarly to those of the ordinary tea plant. They are sorted into kinds, according to sizes, and afterwards roasted in common tea ovens. The appearance of the stuff, after this treatment, is not unlike that of the genuine article, and it is carried to Shanghai, and there intermixed with pure tea, at a ratio of from ten to twenty per cent. The cultivation and preparation of willow leaves were begun in Shanghai about ten years ago, and have increased year by year. The poorer classes near Shanghai have for a long period consumed this leaf as an infusion in place of tea, the latter being too expensive for them to purchase."

As far as he can gather, its use is productive of no ill effect, but its flavor has not the slightest resemblance to any known tea. The cost of the article cannot exceed 2d. per pound, but when mixed with tea, and so sold to foreigners, it must represent a very large profit to the producers.

He thinks the interference of the authorities with regard

to this spurious manufacture, may shortly be necessary, for the purpose, if not of its actual prohibition (which may not be possible), at all events, of placing it under such control as that foreigners may be in a position to satisfy themselves as to the quantity produced, and the proportion used in mixing, so that the adulterated article may take its proper position in the tea market. From inquiries instituted through the superintendent of police, it transpires that there are at this moment about 400 piculs—say 53,000 pounds—of this willow leaf in the course of preparation at various drying houses in the foreign settlements at Shanghai. The probable amount made up last season is estimated at not less than 3,000 piculs, or 400,000 pounds. He is not aware that any analysis of the properties of the willow leaf has yet been made at Shanghai, but attention to the above facts will doubtless bring about an investigation of the kind, which is certainly demanded in the general interest, by the rapid expansion which is exhibiting itself in this feature of the tea trade.

EXPERIENCES OF A BUREAU OFFICER.

[Extract from a speech of Hon. S. S. Fisher, late Commissioner of Patents.

A gentleman called on me to solicit a place. I informed him that an examination would be necessary. He seemed in nowise disconcerted, but said he hoped it would be as easy as that which he had passed a few years before upon his appointment at the Treasury. He then proceeded to inform me that having applied for office there, he received a letter notifying him that, at a time to be thereafter designated, he might appear before a board of examiners, and, if found qualified, would receive his appointment.

A few days afterward, while awaiting the summons to the dreaded examination, he received another letter in these words:

SIR: Having been examined and found qualified, you are hereby appointed a second class clerk in the Treasury Department at a salary of $1,400.

I assured him that he would find our examination a very different affair. He accordingly sat down at a table in my room, and some simple questions were propounded. After studying on them for a time, he complained of headache, and asked permission to withdraw. The next morning he came again, and proposed to finish his examination. No objection was made, but new questions were substituted. As soon as he perceived that the interrogatories were not the same as those of the day before, he declined, with much dignity, to proceed, and abandoned the pursuit of the coveted position.

Another defect in the pass examination system was, that when it was merely a question of qualified or not qualified, it was impossible to satisfy the candidate or his friends that the test had been fairly applied, or that the result was to be accepted as a finality. Unsuccessful candidates were clamorous for a re-examination. Their Congressmen inspected the record and thought that the marks ought to be higher, and were always sure that no one else could have answered such questions any better than their *protegés*.

Great difficulty was experienced in giving the places to the best men, for every man who had technically passed the ordeal, although saved as by fire, was much offended if not appointed. Now as the number of candidates always exceeded the places to be filled, it seemed to be a pity to put men into the places who were just able to prove that they were not absolutely unfit, when it was nearly certain that a different system would disclose the fact that there were better men among the other applicants. In short, this method, while decreasing the number of applicants by a small percentage, left the greater number of candidates in the field, while the head of the department was still beset with all the weapons of influence, political services, fulsome flattery, and importunate persistence.

These considerations led me in June, 1869, having four vacancies in the corps of second assistant examiners, and having seventeen candidates for the places, to propose to the Secretary of the Interior to fill the positions by a competitive examination. He cordially approved of the plan, and the system of competitive examinations, thenceforth to be the rule of appointment in the Patent Office, was inaugurated. The candidates were summoned, and the announcement was made that, on a day named, a set of written questions would be propounded to them, which they would be expected to answer in writing. The answers were to be marked by impartial examiners, and the four whose marks were highest of the seventeen were to receive the appointment. Each man was seated at a separate table, and furnished with paper, pens, and ink. The questions were proposed in sets of ten each, and no one was allowed to leave the room until the set was answered. The candidates marked each sheet of paper by a private mark, letter, or word, and were not allowed to sign their names or otherwise to give any clue to their identity. They were instructed to write their real names and the private mark by which their exercises were signed upon a slip of paper, and to inclose it in a blank sealed envelope.

The answers were collected and laid before a committee, who were not acquainted with the candidates. Each question was read in turn, and then each answer was read and marked upon the margin—the lowest mark being 0, and the highest 100. When all the answers had been valued, the total marks of each candidate were added up and placed opposite the private mark by which alone he was thus far known. The highest four were designated for appointment, no one, not even the Commissioner, knowing who they were.

On the following day the candidates assembled in the Commissioner's room, and the averages were read in connection with the private marks only. Each man therefore knew his own marks without being able to say what were those of his competitors. The sealed envelopes were then opened in the presence of all, and the names of the successful parties were, for the first time, ascertained and publishhed.

If there is a more impartial mode of examination than this, I have also to be informed of it. At every examination that was held, the candidates uniformly bore testimony to the entire fairness of the whole proceeding.

Of course, all preliminary questions as to moral character, political soundness, physical stamina, and the like were settled before the candidate was permitted to take part at all, and attention was also paid to the fair distribution of places among the unrepresented sections of the country. There were those who at once suggested that such examinations excluded men of years and practical experience, and opened the door of public office only to school boys. Men who wanted office, and who were full of years and empty of knowledge, were swift to urge this objection to a system which excluded them from the public service. But the facts do not sustain this objection. Tables were prepared founded upon the results of this examination, and of another held in the following winter for the same grade of assistants, in which twenty-four candidates participated. These tables show the following results:

FIRST EXAMINATION.

Number, 1; age, 22; born in Ohio; high school education; practical experience, 3½ years machinist; army or navy none; office service, 1 month.

Number, 2; age, 20; born in Virginia; collegiate education; practical experience, 2 years engineer; army or navy, 3 years; office service, 21 months.

Number, 3; age, 20; born in Maine; collegiate education; practical experience, 2 years cabinet maker; army or navy, none; office service, 2 months.

Number, 4; age, 28; born in West Virginia; academy education; practical experience, 8 years printer; army or navy, 2½ years; office service, 2 years.

SECOND EXAMINATION.

Number, 1; age, 40; born in Vermont; collegiate education; practical experience, 5 years; army or navy, none; office service, none.

Number, 2; age, 40; born in England; common school education; practical experience, none; army or navy, 2½ years; office service, 2½ years.

Number, 3; age, 37; born in Pennsylvania; collegiate education; practical experience, none; army or navy, 1 year; office service, 2 months.

Number, 4; age, 33; born in Connecticut; collegiate education; practical experience, leather manufacturing; army or navy, none; office service, none.

It will thus be seen that the young and the old, the practical and the theoretical, those in and those out of the office, were fairly represented. Nearly every one of the present corps of second assistant examiners has been appointed after passing through one of these competitive examinations, and I do not hesitate to say that so intelligent and efficient a body of men have never before been seen in the Patent Office. The system was at once applied to the clerkships and higher grades of examiners with the happiest results; and I do not think it extravagant to say that, if the same plan were in all adopted the departments, and rigidly and impartially adhered to, the number of employés might safely be reduced one third.

Every bureau officer knows that he must carry on his rolls some superannuated, some imbecile, some drunken, and some ignorant clerks, and as his work must be done, he must have more able bodied and able minded clerks to make up the deficiency. To reduce the number while the system of appointment and retention remains as it is, would in nowise relieve the bureau from the proportion of drones to working bees which swells the total beyond the number needed if all were first class men. The Patent Office could not have been run with less clerks than it employed, such as they were, but if some of them had been changed off for better men a less number could have been employed. As it was, we managed to run the Office during the year 1869 with a reduction of fifteen from the number which Congress had actually appropriated for, but it was found necessary to keep this fact a profound secret, as we well knew that if it were known Congressmen would be upon us in shoals, demanding that the vacancies should be filled by their friends (since the places had been provided by law), whether we wanted the men or not. I say Congressmen; by this, of course, I mean some Congressmen. There are men in both Houses who are as pure and public spirited as can be desired; men who will never ask for offices, or who, when they do ask, so put their requests that they assist rather than hinder a faithful executive officer; men who are heartily in sympathy with all suggestions looking to reform in the civil service, and who always stand ready to adopt such legislation as may be needful for that purpose. I wish that I could name them all. If I speak of Davis, Garfield, Coburn, Jenckes, Hoar, and Stevenson in the House, and of Trumbull, Schurz, Morrill, of Vermont, Wilson, and Patterson in the Senate, it is not because they stand alone, or are even more worthy of mention than some others, but because my own personal experience made me grateful for their zeal in the cause and their encouragement for the labor on its behalf which I was endeavoring to perform.

The system of competitive examinations offers the only fair mode of making selection among many candidates, and the candidates are always many. It was found to be so efficient in our office that upon the examination of the Census Bureau it was so far adopted as to confine appointments within the limits of certain averages, selecting first from the highest. As may be supposed, this did not please politicians. The theory which they desire to establish is beautifully illustrated in the recent case in the Toledo district, where the removal of capable officers and the filling of their places with his own nominees was demanded as a perquisite of a member of Congress.

A gentleman called upon me and said he wanted a clerkship for a friend in his district. I replied, "I have already a man from your district."

"Who is he?"

"I don't know him. He is a young man, with a good war record, who has lately passed a competitive examination for a higher grade, having already occupied a lower position in the office, in which he has acquitted himself with great credit."

"Well, turn him out, he never did me any good."

"Why should I turn him out? He is faithful and able, a soldier, and a Republican."

"I tell you he never did me any good. I hope you mean to show us the usual courtesy of allowing us to select the nominees from our own districts."

In fact, I did not mean to do it, and in as polite language as I could command I told him so; and the result was that the Patent Office had no more determined foe on the floor of the House than this gentleman thenceforward became. I wish I were able to say that there were no more like him.

The Treatment of Mortar.

Much of the mortar used in buildings is unfit for the purpose, and much of that which is good is prepared by the workman mechanically, according to a given recipe, and not because he understands the reasons which make certain proportions of sand and lime endure better than others. The following practical lines by Mr. A. C. Smeaton, the author of a valuable work on building, not only afford instruction regarding the preparation of mortar, but give the reasons why it should be treated in the manner described:

"When mortar is to be used in a situation where it will dry quickly, it should be made with as little water as possible; but it is better that the mortar should dry gradually and slowly, as it then becomes more indurated. It is stated by some writers that mortar is injured by keeping, and under one condition, exposure to the air, it is; but if excluded from the air, it is rather benefited than injured. Pliny states that the Roman builders were prohibited by law from using a mortar that was less than three years old; and attributes the stability of all their large buildings to this circumstance. But when old mortar is used, it should be well beaten up before it is employed. The reader must not, however, suppose that these remarks justify the exposure of mortar to the air for a considerable time before it is used, a practice very common, but highly improper. The practice probably arose from the difficulty which workmen sometimes find in slaking the lime, in consequence of its being insufficiently burnt, or containing a large portion of argillaceous matter. But of all other things, it is important to use good lime, and to soak the bricks which are to be bedded before they are laid; for if the bricks are dry, they imbibe the moisture of the cement, and destroy its quality. There are two things which cause mortar and cements generally to crack—too small a quantity of sand, and too rapid exhalation of the water. There must always be a contraction; but it is least in those mortars which contain the greatest proportion of sand; for it is the moistened lime which contracts during the process of drying. All mortars may, for a time, be affected by atmospheric changes, and especially by alternate wetting and freezing, but this is most remarkable in those which are liable to crack. A mortar which sets without cracking will always stand afterward."

What the Microscope Reveals--With a Moral.

Lewenboeck tells us of an insect seen with the microscope, of which twenty-seven millions would only equal a mite.

Insects of various kinds may be seen in the cavities of a grain of sand.

Mold is a forest of beautiful trees, with the branches, leaves, and fruit.

Butterflies are fully feathered.

Hairs are hollow tubes.

The surface of our bodies is covered with scales like a fish; a single grain of sand would cover one hundred and fifty of these scales, and yet a scale covers five hundred pores. Through these narrow openings the sweat forces itself like water through a sieve.

The mites make five hundred steps a second.

Each drop of stagnant water contains a world of animated beings, swimming with as much liberty as whales in the sea.

Each leaf has a colony of insects grazing on it, like cows on a meadow.

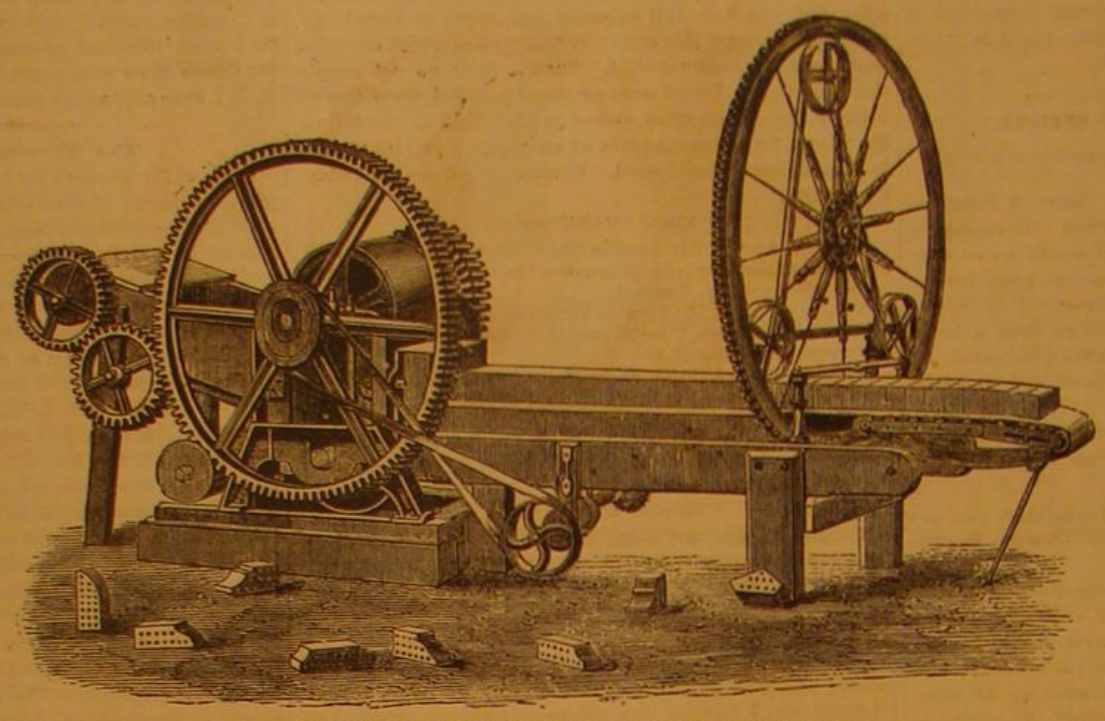
Moral.—Have some care as to the air you breathe, the food you eat, and the water you drink.—*Home and Health.*

Medical Microscopy.

It is difficult, says the *American Journal of Microscopy*, to imagine how any physician can practice with satisfaction to himself and for the good of his patients, without the aid of the microscope. In all the recent text books relating to pathological anatomy, diagnosis, and other departments of medicine, constant allusion is made to the developments of the microscope in throwing light on the essential nature of disease. We hold that the physician who ignores microscopic analysis and investigation is not fit to treat obscure and complicated disease. As an illustration of this a case came under the care of the writer—of a gentleman who for years had suffered intensely from dyspeptic symptoms accompanied by great mental depression—so peculiar as to deprive him of nearly all social enjoyment, or business energy. He had been treated by many physicians but got no relief. His urine had never been analyzed. Upon placing a portion of the sediment, prepared according to Dr. Bird's directions, under a moderate power, the specimen showed the presence of a large quantity of the crystals of oxalate of lime. The diagnosis was now clear enough, and the treatment plainly indicated. A complete recovery followed in a few weeks.

Self-acting Brick Machine.

Among the exhibits in the Pottery Machine Annexe, at the International Exhibition, in London, is a self-acting brick, architectural mold, and drain pipe machine, invented by Mr. J. D. Pinfold, of the Warwickshire works, Rugby. Its appearance and construction are at once striking and ingenious; it consists of a strong iron frame, one end of which carries the mixing apparatus or pug mill, which is nearly horizontal, and is seen to the left in our engraving. The clay is fed into this mixer, in which are two parallel shafts armed with a series of cutters, and revolving in opposite directions. On the shafts at intervals are fixed a set of scrapers, which clear the sides of the mill of the clay and keep it well under the control of the knives. The clay is thoroughly amalgamated by the action of the blades, and is, at the same time, carried forward to a pair of rollers, one above and one below, placed a quarter of an inch apart. A pair of cheeks, one at each side of the rollers, serve to guide the clay between the rollers. By an ingenious arrangement, the clay is lubricated while passing through the rollers, the water being conveyed to it through the cheeks, which communicate by a tubing with a small cistern overhead. From the rollers the clay is delivered into a compressing chamber, and thence to the mold, from whence it is seen in our engraving issuing in a continuous stream on to an endless traveling band carried over two rollers. The mold chamber is fitted with a lubricating apparatus, the water issuing from the sides and corners of the mold near its mouth in a very thin film. By this means the clay is lubricated as it leaves the machine, which gives it a smooth glossy surface.



PINFOLD'S SELF-ACTING BRICK MACHINE.

The stream of molded clay having reached the end of the traveling band, it passes under the operation of the cutting wheel. This part of the apparatus is carried by a triangular-shaped framing, at each of the angles of which is a friction pulley gearing into the inner rim of the cutting wheel, and serving to keep it in a proper position. The cutting wheel is driven by a pinion on a shaft under the machine and which gears into teeth formed on the periphery of the wheel itself. This wheel has a central bearing in a portion of the triangular framing, and it carries a number of wires arranged as spokes. There is, however, no weight brought on this central bearing, which merely holds the cutting wires in tension. As the stream of clay passes through this wheel, it is cut up into fine square bricks which are carried on a traveling delivery, to the end of the machine. If the cutting wheel were set at right angles to the direction of the clay the latter would be cut diagonally. The wheel, is, therefore, set at a slight angle to the stream of clay, and consequently a perfectly right-angled cut is made. The machine is 18 feet in length, 5 feet in width, and 6 feet in hight over all. It will be seen that it is self-acting throughout, and by adjusting the mold and using cone bars it will make perforated bricks, coping, cornices, etc. The bricks are sufficiently stiff to be removed at once from the machine and walled six or eight high.

On the Physical Sciences which form the Basis of Technology.

Putting aside all questions of beauty, morality, or philosophy, we are to consider where man can acquire the knowledge which will give his body the victory in the daily battle of life. The problem which he has to solve is a vast one; so vast, indeed, that instead of attempting to enumerate the items which make it up, I will say in one word, that his capital to begin with is one wise head and ten skilful fingers, and that with these he must build such a Crystal Palace as the world saw in 1851, and stock it with all its wondrous contents. To solve this problem he must fall back upon the sciences which reveal the properties of matter, and the modes of altering it.

The sciences in question are familiarly divided into natural history, on the one hand, and experimental physics, including chemistry, on the other. Natural history, on this view, is the science of all these objects, phenomena and laws, which physical nature spontaneously presents to our view; while experimental physics is the science of all the additional objects, phenomena and laws, which our interference with nature enables us to bring under our scrutiny.

Such a twofold division, however, is not sufficient for us. All the sciences observe and register the phenomena and laws which nature presents within the circle alloted to each; and are therefore portions of natural history, or naturalistic. All the sciences, also, but astronomy, experiment upon, or subject to trial, the objects presented by nature to each; and are therefore experimental. The difference, accordingly, between the majority of the sciences which are observational, and those which are experimental, is only one of degree. A distinction of a much deeper kind lies in the fact, that the experiments which the one characteristically makes, are simply more precise observations of what nature presents; while those which the other characteristically makes, imply the transformation or transmutation of natural objects, and the study thereafter of the results of such transformations.

In addition, however, there is a third class of experiments, neither simply observational nor transformational, but registrative and directive, in modes which I shall presently consider. And, further, biology, the science of plant life and animal life, must have a place to itself, from the peculiarity of the subject matter with which it deals.

I would arrange the physical sciences, accordingly, as related to Technology, in three groups.

I. Naturalistic, observational, and registrative sciences, of which the chief are astronomy and geology, including meteorology, hydrology, physical geography, mineralogy, as as well as descriptive botany and zoölogy.

II. Experimental, transformational, and directive sciences of which the chief are chemistry and mechanics, as well as heat, optics, electricity and magnetism.

III. Organic sciences: namely, functional or physiological botany, which treats of the plant life of non-sentiment organisms; and functional or physiological zoölogy, which treats of the animal life of sentient organisms.

This complex, nominally triple arrangement, is essentially twofold, in its relation to Technology. The industrialist must study one class of the physical sciences, or rather one side of all the physical science, to consider what gifts nature offers him with her liberal hand. He must study another class of these sciences, or rather another side of all physical science, to discover how to turn those gifts to account. There is always, on the one hand, something to be had for the taking, a raw material, a physical phenomenon, a physical force. There is always a necessity, on the other hand, for expenditure of skill to effect the transformation of the raw material, the registration of the phenomenon, the direction of the force.

KING'S "VALVELESS" ENGINE.

Among the exhibits at a recent *Conversazione* of the Institution of Civil Engineers, London, which we are enabled to



illustrate this week, is the valveless steam engine of which an engraving is annexed. This engine is one designed by Mr. H. J. H. King, of Glasgow, and its construction will be readily understood from the annexed section. The piston, it will be noticed, is made very deep, and has four ports formed in it, two on each side. Of the two upper ports, one communicates with the cylinder above the piston, while the other forms the mouth of a passage leading to the under side of the piston, as shown. In the same way, of the two lower ports, one leads to the lower end of the cylinder direct, while the other communicates with a passage leading to the upper side of the piston. The cylinder, also, has two ports formed in it opposite each other at the middle of its length, one of these being the inlet and the other the outlet port.

Supposing the piston to be at the bottom of its stroke, in the position shown in the section, the section will be as follows: The steam enters by the inlet pipe, 1, and passes down the passage cast in the piston, filling the cavity, 2, in the latter, and the clearance at the bottom of the cylinder. This admission of steam causes the piston to rise, when, with the proportions shown the steam will be cut off at about one eighth of the stroke, the steam then expanding until at about thirteen sixteenths of the stroke, the bottom port, 5, in the piston, begins to open to the outlet pipe, and the exhaust commences. A little later, at about seven eighths of the stroke, the lower piston port, 3, begins to open to the inlet pipe, and steam is thus admitted to the upper end of the cylinder, causing the piston to perform its downward stroke. The exhaust ports are made sufficiently large to reduce the steam pressure in the cylinder to very little above that of the atmosphere before they close, the remaining steam being then compressed, and assisting to fill the clearance spaces.

In making high-pressure engines on this plan, to run with a piston speed of 200 feet per minute, or upwards, Messrs. King & Co. make the width of the steam ports equal to about one eighth, and that of the exhaust ports equal to about three sixteenths of the stroke; but, owing to the variation of piston speed, at different parts of the stroke, produced by the crank motion, each steam port will be open for about 44 per cent, and each exhaust port for about 52 per cent of the time occupied by each revolution.

It may, says *Engineering*, whose description we have copied, at first sight, appear that an engine constructed on the plan above described must necessarily be a very wasteful steam user; but a little consideration will show that this need not be the case, particularly if the cylinder be steam jacketed. Its good performance will, however, depend greatly upon the capacity of the clearance spaces and the point of closure of the exhaust being properly adapted to each other, and to the pressure of steam with which the engine is to be worked. Speaking roughly, the most economical performance, as far as the consumption of steam is concerned, will be obtained when the ratio of compression is such that if no steam were to enter through the supply port, the steam enclosed in that cylinder would attain the boiler pressure at the termination of the stroke. In this case, the steam used per stroke would equal that required to fill a length of the cylinder equal to the width of the supply port, and the work done per stroke would be approximately the same as that which would be developed by the same quantity of steam used in a cylinder without clearance, and expanded the same number of times as in Messrs. King's engine. The principal effect of the early closure of the exhaust port, during the exhaust stroke which takes place in this engine, is to reduce the power which it is possible to develop in a cylinder of given size. The greater part of the power expended in compressing the steam during the exhaust stroke, is given out again during the steam stroke, the precise proportion between the power absorbed and that regained depending, as has been explained on former occasions, upon the relative ratios of compression and of expansion, during the exhaust and steam strokes.

It is stated that the non-condensing engines, constructed on the plans shown in our engraving, are found to compare favorably, as regards economy, with ordinary non-condensing engines having single slides cutting off at about five eighths or three fourths of the stroke, a class of engine of which so many are now made for various purposes; while they have the advantage, as compared with these engines, of having no slide valve, eccentric, valve spindle, or valve spindle stuffing box, and they are, moreover, capable of running in either direction. When applied to steam cranes, therefore, small pipes with cocks for admitting steam to either the top or bottom of the cylinder for starting, replace the ordinary link motion with a very considerable saving of cost.

It is also claimed that the arrangement will give better comparative results with condensing than with non-condensing engines. In large engines, means are provided for varying the amount of clearance at will, and the ports, instead of being cut completely through the cylinder, consist of a number of small holes, over which the piston rings pass easily.

To WASH FLANNEL.—Never rub soap upon it. Make a suds by dissolving the soap in warm water. Rinse in warm water; very cold or hot water will shrink flannel. Shake them out several minutes before hanging to dry. Blankets can be washed in the same way.

Care of Machinery---Safety of Workmen.

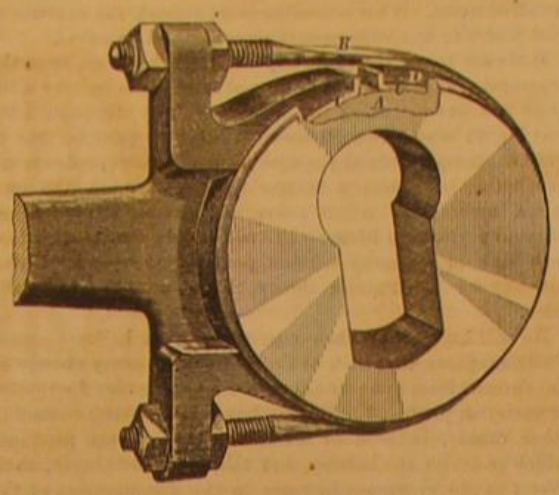
"Where is your engineer?" we inquired recently of some workmen as we stood by a thumping engine and a dirty boiler with two rusty gage cocks. "Oh! the boy you mean; he is playing around somewhere," was the answer. Leaving the youth to enjoy his frolic, we examined the machinery that had been consigned to his charge and watchful care. On finding that water issued from the top gage cock, we felt easier. We then looked for a steam gage, and lo! far back on the top of the boiler, we descried a dingy looking dial upon which with our best eye glasses, we failed to discern any indicatfng pointer or figures. We then explored for the safety valve, and found it safely covered with an accumulation of coal and sawdust, and out of the reach of both anxious inquirers and boys. But here comes the boy engineer. The fire doors are flung open, all the fuel that can be stowed away is thrown into the furnace, bang go the doors again, and he is off to finish his game. We subsequently learned that there were three rented workshops with machinery driven from this engine and boiler, and that the latter was second hand when it was put on the premises. A short distance from these works, we found another boy engineer in charge, and the machinery gradually wasting away from hard knocks, cold neglect and old age. "Why does not your landlord employ a competent and careful engineer who would keep his machinery in repair?" we again asked, and smilingly added, "You would feel safer if he did." "Oh, he says he cannot afford it," was the answer. Here, then, were second hand boilers, boy engineers, machinery out of repair—all tolerated on the plea of want of means. It is no wonder that the workmen in those buildings scold the boys, but despise the landlords who cause their lives to be put in jeopardy ten hours every day. These are not "fancy sketches," but the state of things as they actually exist in the instances described; and we too frequently find the same condition of things in all parts of the country. The condition of machinery in many of our manufactories is disgraceful, not to say dangerous. We write this from no hearsay; we know it from daily personal observation. Owners of machinery, in nine cases out of ten, pay high prices for their "power;" but when they have got their machinery in running order, they seldom employ a competent engineer, but get some raw hand or "smart boy" who thinks he can "fire and run an engine." They claim that neither their profits nor their business will allow them to pay high wages for running their machinery; but after a few accidents, for which they have to pay handsomely, they learn the economy of keeping their mechanism in repair, and employing reliable and competent persons to run their engines. We maintain that it is as much a duty of a manufacturer to examine or to have examined daily the state of his machinery, from boiler to journal, as it is to inspect and examine his wares. Are not lives as valuable as property? Is not the health of an employé of as much consequence as a bale of goods? And yet we see dirty and greasy floors in the engine room; the examination of the safety valve often requires the use of a lamp; pipes leak steam and water; bearings are without drip pans; belts are without guards, and occasionally send a patient to the hospital; steam pipes are rusty for want of paint; rooms are hot and poorly ventilated; the machinery is crowded; the passages are narrow; windows are unwashed; light is limited; grease and dirt are plentiful, and noise from unrepaired machinery adds to the general discomfort. We charge the whole of such neglect and carelessness on proprietors, because if they would employ intelligent and competent assistants who understood their business, and took a pride in the care and appearance of machinery, there would be a vast difference in the general neatness and good appearance of the works. In addition to this, a salutary influence would soon be observed in the health, conduct, and feelings of the employés. We could enlarge upon the advantages which would result from manufacturers enforcing thorough cleanliness, constant watchfulness, frequent examination, and immediate reports of all and everything that gets to be dangerous about their machinery, or that requires repair; but the good results accruing from such regulations are apparent to every mind. We close by simply remarking that, in instances where investigation, thorough and complete takes place, and where machinery receives the attention it demands, there we notice an amount of satisfaction and honorable pride on the part of both employer and employés.—*Technologist.*

The Poisonous Qualities of Chromate of Potash.

A professor of the University of Charkow recently fell a victim to poisoning by neutral chromate of potash. M. Neese complains that up to the present time the poisonous qualities of the chromates are not perfectly understood, and proposes as an antidote the acetate of lead. Neese himself acknowledges, however, that the antidote may produce worse results than the poison itself, and requests toxicologists to point out an effectual remedy. The ignorance in regard to the poisonous qualities of this substance is, however, not so great as M. Neese supposes, for already in 1853 Jaillard, in the *Gazette des Hôpitaux*, called attention to the danger in using it. The physician must be very careful in the employment of bichromate of potash; a dose of 0·25 gramme was sufficient to kill medium sized dogs in from two to six days. Jaillard himself took 0·12 gramme, and observed with small doses dangerous symptoms. Most of the organic substances, particularly the hydrates of carbon, such as sugar, alcohol, and the organic acids, decompose the chromic acid into oxide of chromium; this is particularly the case with tartaric acid, which Frederking has proposed as an antidote against poisoning with chromic acid. The decomposition of tartaric acid, unless it is very much diluted, takes place in about one and a half minutes, chromate of potash and carbonic acid being formed. It will still be necessary to try this antidote on living beings.—*Photographische Zeitung.*

FOWLER'S IMPROVED METHOD OF ADJUSTING ECCENTRICS.

The object of this improvement is to obviate rattle or jar in the working of eccentrics, wherever used on steam engines, rub rolls, comb drivers, or any other machinery; and also, whenever the parts wear loose, to enable the wear to be taken up by means of the screws and nuts at the end of the strap. The method of accomplishing this is shown in the accompanying engraving.



The eccentric strap, B, extends from two lugs formed on the connecting rod about the eccentric, A, as shown, the ends of the strap passing through the lugs and being threaded to receive the tightening nuts.

C is a wearing plate which underlies the eccentric strap on the half circumference opposite the eccentric rod.

Between the eccentric strap, B, and the wearing plate, C, may be placed a pad of leather or other suitable material, if desired, which adds to the delicacy of adjustment, and aids in accomplishing the ends sought.

Patented June 1, 1869. For machines or rights address Geo. Fowler, patentee, Philmont, N. Y.

NELSON'S REVERSIBLE WINDOW SASH.

Every housekeeper will appreciate the want supplied by this improvement, by means of which windows can be cleaned both inside and outside, in cold or warm weather, without

Fig. 1

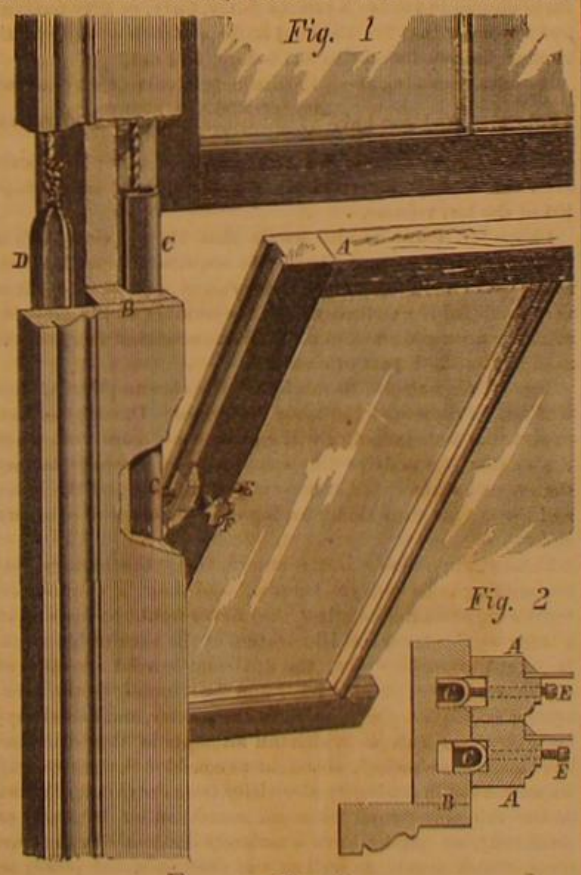
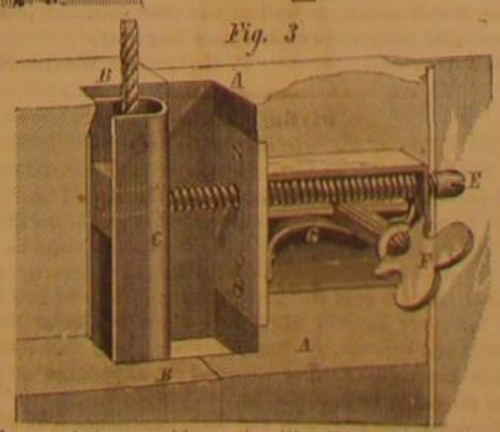


Fig. 2

Fig. 3



standing or sitting outside on the sill. For weeks during the winter, the ordinary window cannot be cleaned, because ice and snow cover the sill. Besides, it is tedious to have the water bucket inside, when the cloth needs a fresh supply, and the window must be raised to get in the room to rinse and replenish, proving an annoyance and source of constant slopping on carpet and wall paper.

In the arrangement illustrated, the sash can be turned completely over, washed from the inside of the room and turned back when done, so that no danger is incurred, and no draft created.

The frame, B, Fig. 1, and the sashes, A, are grooved to receive a guiding bar, C. This bar is of metal, rolled into gutter or U form, which makes it light and strong, and leaves a groove for the weight cord, which is fastened near the center by knotting, and slipping into a casting, shown in Fig. 2, as in ordinary wooden sashes. When the window is in customary position, the guide is partly in the sash, and partly in the frame, sliding up and down with the sash, and completely stopping any draft.

Fig. 2 exhibits a portion of the sash, part of the pivot casing being cut away. This shows the pivot, E, passing through the sash, and screwed into the guide, C. Inserting the key, F, which fits screw threads formed on E, the guide is thrown entirely out of the sash and into the frame by turning the key, leaving the window free to turn over. When turned over, the key is again inserted on the other side (the keyhole passing through the sash), the guide drawn back again, and the window is held steady, leaving both hands free to handle cloth and bucket. A spring, G, fits into the screw threads, and holds it wherever left, making it at all times perfectly secure. When the key is inserted, it throws the spring out of action, allowing the pivot to move back and forth. But one key is necessary for the whole house. The upper sash being fitted in the same manner, by throwing all the guides out at once the sashes readily pass each other, and no draft is created, and no extra fire needed on cold days when cleaning.

The guides can be used either with or without weights, D, and with sashes containing one, two, or more lights, as shown in the engraving. Old windows can be fitted by grooving the sash and frame. The window thus made costs but a trifle more than the ordinary frame, as no stops or beads are used, the guides acting as draft obstructors; and the strength of the sash is undiminished, the groove being but one fourth of an inch deep by five eighths of an inch wide, and the pivot three eighths of an inch in diameter, the head coming just inside the glass; while the saving in health fuel, time consumed in cleaning, etc., would, especially in hotels, etc, repay ten times the cost. To take the sash out it is only necessary to unscrew the pivots, E. To replace a pane, however, or to paint the sash, it can be turned over as when cleaning.

Patented June 6, 1871. For further information, rights to manufacture, State rights, etc., call on or address the inventor and patentee, W. P. Nelson, 618 N. Main street, St. Louis, Mo.

Correspondence.

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

Mechanical Equivalent of Zinc.

To the Editor of the Scientific American:

As I have now my hand in it, I may as well go on and answer Mr. Paine's arguments found under the above head on page 36. I hope Mr. Paine will return the compliment and also answer my arguments found on the same page, so as to keep up a cross fire for the instruction and amusement of the readers of the SCIENTIFIC AMERICAN, and for the edification of "the gentlemen associated with him," the stockholders in the new electric company, the ups and downs being the only thing needed now, as it is bound to be the *finale* of the whole affair.

However, as Mr. Paine has come down from the absurd assertion of 67,000,000 foot pounds from 3 grains of zinc, made before, to the more reasonable claim 23,000,000 foot pounds from 33 ounces of zinc, I will not ridicule it this time, but consider it seriously, scientifically, and practically, for the instruction of all concerned.

The theoretical mechanical equivalent of zinc depends, as does that of all other combustible substances, chiefly on the amount of oxygen it is able to consume in oxidizing. The oxygen is here, as well as in any fuel engine, or in any animal power, the great motion-giving, or life-giving agent; and when we say that one pound of coal has the capacity to produce 14,000 units of heat, it is on the condition that this coal shall combine with two and two thirds lbs. of oxygen. Therefore, we may just as well say that the consumption of two and two thirds lbs. of oxygen with the proper amount of coal, produces the 14,000 units of heat; a view for which there is fully as much ground as for the ordinary statement, and which is besides sustained by the fact that the amount of heat produced, if not exactly proportioned to the amount of oxygen consumed, depends much more on this amount than on the amount of the combustible. So we find that the amounts of heat developed by the combustion of equal parts of zinc, sulphur, carbon, and hydrogen, are equal, respectively, in ratio, to the numbers 1, 4, 16, and 64, while the amounts of oxygen consumed, during combustion of equal parts, is respectively 1, 4, 10, and 32. Therefore, in place of saying that the potential heat is stored up in the combustible, we may as well maintain that it is stored up in the oxygen or its equivalent, the supporter of combustion (chlorine, bromine vapor, sulphur vapor, etc). This is a view which for many years I have defended in my lectures, and which I have only abandoned recently for the better information now in our possession, by the discovery of the latent heat of dissociation, which is the true origin of the heat developed during combustion, and which has cleared away the mystery which thus far always surrounded the phenomena of combustion and flame.

Heat being nothing but a mode of molecular motion (see Tyndall), and always directly convertible into motion of the mass, every unit of heat being equivalent to 772 foot pounds, we may directly calculate the mechanical equivalent of any substance from which we may develop heat. Electricity is nothing but another mode of molecular motion; this is a theory of which there is a direct proof, and which is, therefore, even better established than the heat motion theory.

There is no room here to go into the details proving this, and disproving totally and flatly the existence of the caloric and electric fluid. The difference between the two is that when we oxidize zinc in the air, we obtain heat motion; when we oxidize it in a liquid, we obtain electric motion, both molecular, and both convertible into motion of the masses, which is the so-called force or power. And even as we may collect and utilize the heat more or less perfectly in furnaces of different construction, so we may collect and utilize the electricity more or less perfectly in galvanic batteries of different construction; and the amount of latent force thus obtained may differ in both cases, depending as it does on circumstances. Therefore, the argument of Mr. Paine that "a Daniell battery uses 75 pounds zinc, and a Grove only 50 pounds, to do the same duty," proves as little in regard to the accepted theory, as the well known fact that a tubular steam boiler evaporates 5 pounds of water for every pound of coal, while a Cornish boiler evaporates ten pounds of water for the same combustion; in fact, there is in this respect as much variety in steam boilers as there is in galvanic batteries.

As now, during oxidation of the zinc, one pound of this metal combines with four ounces oxygen, while 1 pound of coal combines with 2¾ pounds oxygen, and as the molecular motion or potential force developed—whether of a caloric or electric nature—is ten times greater in using coal than in using an equal amount of zinc, the mechanical equivalent of zinc has been established to be 772 × 1,400 or 1,080,800, while that of coal is 772 × 14,000 or 10,808,000 foot pounds.

The great error of Mr. Paine is that he overrates the zinc equivalent, believing, as he does, that "the world knows nothing about the mechanical equivalent of zinc under combustion in a battery." To this I answer that *that* portion of the world consisting of the hard working investigators, who, without prejudice, and with indefatigable energy, search for the truth and nothing but the truth, know more about this subject than Mr. Paine, by his own showing, proves to be aware of. I will attempt to give him a slight insight into the matter, first by explaining the discrepancies in the statements of equivalents, and then by mentioning some important facts discovered.

Firstly, the differences in the statements of the mechanical equivalents of zinc, are, as mentioned before, not greater than those of coal in the steam engine. Theoretically, 1 pound coal must produce in round numbers 10,000,000 foot pounds, which, when consumed in one hour, corresponds with nearly 5 horse power, while in practice the best engines seldom have succeeded in reaching one tenth of this, or 2 pounds of coal per hour for 1 horse power, while others give only one twentieth of the theoretical power, using 4 pounds of coal, and even more, per horse power. As the theoretical mechanical equivalent of zinc is in round numbers 1,000,000 foot pounds per pound of zinc, we have here—assuming that the electromagnetic motors are, on the average, as good as the modern steam engines—a range from 1,000,000 to 100,000 and 90,000 foot pounds, and even less per pound of zinc.

The complex statement at the head of the article on page 36, that 22 lbs. zinc gave 2 horse power for 9 hours, properly reduced to foot pounds for comparison, gives $\frac{33000 \times 2 \times 9 \times 60}{22}$, or 1,620,000 foot pounds per pound of zinc; it is too large. Page's estimate of 3 pounds of zinc per horse power gives $\frac{33000 \times 60}{3}$ or 660,000 foot pounds per pound of zinc; it is too small, being made up in the supposition that not much over one half of the theoretical power is obtained, while Liebig's 64 pounds corresponding with $\frac{33000 \times 60}{64} = 30{,}937$ foot pounds per pound of zinc, is based on the observation, that electromagnetic motors are not quite as good as the steam engines, in regard to the utilization of fuel, as they only utilize about $\frac{1}{30}$th of the theoretical amount, which is only one half or one third of the capacity of the ordinary steam engine. And I must confess that as far as my measurements of practical results, obtained by the many electromagnetic motors which I have tested, have gone, the estimate of Liebig is the nearest to the truth. However, I do not deny, that when *those* who have made the study of electromagnetism a specialty, and are well posted in regard to the extensive labors of the French, and especially of the German investigators, apply special improvements in diverse details, these results may be surpassed, and even electromagnetic engines made which utilize more of the existing power than the steam engine does; but even if one does succeed in making a machine which utilizes the full theoretical amount of 1,000,000 foot pounds per pound of zinc, it will only be $\frac{1000000}{33000 \times 60}$ or nearly ½ horse power per pound of zinc, which, with the required oxidizing acids, will cost about one hundred times the equivalent amount of coal, combining with the oxygen of the air, which costs nothing.

But the principal feature of the task I have taken here upon myself, is to consider Mr. Paine's *experimentum crucis*. He takes 120 electromagnets, each of which may lift 50 pounds one tenth of an inch high; and then assumes that he may pass, in a single second, by means of a proper commutator connected with the coils, the same current successively through all these magnets, so as to obtain, in a second, 120 times the raising of 50 pounds through the space of one tenth of an inch each. This would give $\frac{120 \times 50 \times \frac{1}{10} \times 60}{12}$, or 3,000 foot pounds per minute, or nearly one eleventh part of a horse power. Then he proceeds to state the consumption of zinc required to perform this labor, and says that "four eight inch zincs, under the resistance of 1,100 feet, No. 14 wire (that of the coils) will, in 12 hours, lose 3 ounces in weight." This is 2 grains per minute, or, in other words, 33 ounces per horse power for 12 hours. Reduced to my uniform standard it is $\frac{12 \times 60 \times 33000 \times 16}{33}$ or 11,520,000 foot pounds per pound of zinc. It is seen that he obtains thus a mechanical equivalent over ten times that of coal, while, in fact, he should obtain it ten times smaller, a difference of one hundred times. If his reasoning were correct, the expense of coal and zinc to obtain motive power would be equal.

It is easy to see the cause of this error; he starts from the assumption that the consumption of zinc in the battery is the same whether he passes the current quietly through 1,100 feet No. 14 wire, giving it no other labor to perform but to raise the temperature of the wire by an uninterrupted current, or whether he passes it in one second, through 120 such wires, interrupting it 120 times, and giving it mechanical labor to perform in lifting 120×50 pounds one tenth of an inch high, or obtaining 600 foot pounds per second. Unfortunately for Mr. Paine's theory, this assumption is totally false.

He will know that when currents run in helices around electromagnets, that then, at every break, at every change of the current from one coil to another, nay, at every fluctuation or variation produced in the discharge by varying contact or other causes, induced or secondary currents are produced which re-act on the battery, and tell, most strikingly, their effects in the enormous increase in the consumption of the zinc. This, by the way, is the reason why the use of a Rhumkorf coil wears any battery out so very rapidly. Then there is another fact. According to experiments of Du Moncel, the maximum distance of magnetic attraction of the iron of electromagnets diminishes when constantly used; it wears out, or the amount of attraction under equal circumstances becomes unmistakably smaller under successive charges.

But the main point to which I wish to call special attention, and which overthrows Mr. Paine's whole reasoning, is the discovery of Feilitch, made many years ago, but of which Mr. Paine appears to be totally ignorant. It is this: *As soon as an electromagnet is made to exert attractions and repulsions, then immediately a proportional increase of the currents takes place, and a consequent proportional increase in the consumption of the zinc.* If it were practically possible to make the arrangement of the 120 electromagnets charged successively in one second, the consumption of the zinc would rise, from three ounces in twelve hours, to thirty, forty, or fifty ounces; and I wonder that Mr. Paine, if he be a conscientious experimentor, has not found this out before, as I did.

If such a reasoning about 120 magnets be correct, why not say 2,000,000? And you have $\frac{2000000 \times 50 \times \frac{1}{10} \times 60}{12}$ or 50,000,000 foot pounds per minute for two grains of zinc; this beats even the highest assertion Mr. Paine indulged in on page 104 of the last volume.

I hope Mr. Paine is also aware that there exists such a thing as resistance in the iron. To acquire and lose magnetism it takes a certain time, however short, and therefore it is very doubtful if practically even the number of 120 magnets could be arranged so as to have all in succession magnetized, each in the 120th part of a second.

It is *a priori* absurd to think that the consumption of zinc will not increase with the labor performed. One may as well expect that a steam boiler will consume no more fuel when the engine has to drive the machinery of a whole factory than it will when it is disconnected by throwing off the belts, and the engine runs alone, having only to overcome its own resistance.

Finally, Mr. Paine's last sentence, that "the battery cost has nothing to do with the success," and that "if electric currents were absolutely costless, they never would be more than a large toy," is a curious illustration of the turn of his mind. He ought to consider that the final and crucial question of any enterprise is: *Does it pay?* and that, therefore, the great battery cost is *the* sole question in the matter, and has always been the fatal rock on which all attempts in this direction have been shipwrecked. He ought to consider that, supposing we succeeded in storing up electricity from the clouds, like we do the rain water from the same source, either naturally or artificially, we might have absolutely costless electric currents, which would, as well as the costless water power so universally utilized, be more than a large toy.

New York city. P. H. VANDER WEYDE, M.D.

Flying Machine.

To the Editor of the Scientific American:

I have now been a constant reader of your valuable scientific paper for the last ten years, and the more I read it the more I am convinced that no one who has any desire of keeping up with the rapid progress of the times, should be without it. The inventor, especially, will find it greatly to his interest, for not only will he obtain a multitude of new ideas, but moreover he will often save himself a great deal of trouble and expense, by simply perusing your valuable comments on principles which time and the experience of many have proved to be unalterable.

Moreover, one may, now and then, experience a novel and very striking sensation, through your columns, by finding that somebody has been experimenting on some cherished hobby of his own. Such has been my luck, in perusing your number of June 24th, for great was my astonishment at finding a full and complete description of an invention which I considered mine, and for which I obtained a *caveat* some few years past. I then applied the device to balloons for the purpose of elevating and lowering them without any use of ballast or loss of gas.

My experiments succeeded beyond my expectations, for not only could I elevate and lower my balloon by these means but moreover, I was enabled to draw it some 35° from its natural course.

Noticing the great power which could be exerted on the air by means of this contrivance, I applied the same principle to a self air propeller, and in the fall of 1866, I constructed a small model in every respect similar to the one described on page 407, last volume.

I did not, at the time, push my idea any further, for the want of a suitable motive power, in reference to which I wrote to you, inquiring whether gun cotton or nitro-glycerin done up in small cartridges, could be used for the purpose if exploded in suitable cylinders. Your answer, which I now have before me, was in the affirmative, but not daring to experiment with such terrible explosives, I let the subject drop until about a year ago, when I got up full drawings of my apparatus, and showed it to several engineers of New Orleans, who expressed the firm belief that with some suitable motive power it might be made to work.

However, my air propeller remained *in statu quo* until some six months ago, when some of those kind individuals with whom inventors often meet, relieved me of my drawing; and now, through your valuable columns, I am informed that some one has been kind enough to get me up, at his own expense, "and without the least trouble to myself," a full size working model, and that it is now hanging in the old Novelty Works, New York, awaiting some one to claim it. I am sorry for those worthy projectors that they could not make it go, but I am pleased that they have, at least, reaped some of the reward so justly due to them. It would be a great satisfaction to me if I could obtain their names and addresses. I might probably give them some valuable information concerning the proportions of the machine, and the power to be used, for I notice that they have made some grave mistakes in their calculations.

Now, for the benefit of your numerous readers who are interested in aerial navigation, I would be pleased to have you give them an illustration of the apparatus in question, as you have a full size working model within your reach. You might add to it a parachute, closed like an umbrella, and attached to the top end of the center iron shaft; in case of a too rapid descent, it would open of itself.

I should also suggest to Mr. Paine, that now is his chance to elevate prominently before the people his new electromagnetic motor; and if he will furnish the power, I will furnish the propeller, and we will both seek a more suitable planet for our advancing ideas.

New Orleans, La. SAMUEL TRUDELL.

Paine's Perpetual Motion.—A Reply to Dr. Vander Weyde.

To the Editor of the Scientific American:

I have read Dr. Vander Weyde's elaborate article in your journal of July 15th. I cannot allow him to assume that I have made certain statements, and then proceed to demolish them. I have never said or written that I could drive the largest ship afloat with any amount of zinc. My language was, "the forces developed by the action of a single Bunsen cell, *if* utilized and converted into power, *would* drive the largest ship afloat."

Allow me to assure the Doctor that I am familiar with all the authorities he quotes, and with many of them have personal correspondence, which I shall be pleased to show him, should he do me the honor to call on me.

If the Doctor knows anything of the subject he has undertaken to discuss, he knows that in order to obtain the dynamical (not voltametrical) value of four 8 inch Bunsen cells by magneto-electricity, we would require a power on the best constructed of the magneto-electric engines of at least three horse, which greatly exceeds the duty of the engine that is to operate it, and thus easily is the grand structure of the Doctor tumbled down. Mr Paine's perpetual motion only exists in somebody's mind who is evidently hurt. When I obtain perpetual motion, I shall probably know it as soon as the Doctor.

If the Doctor will have a little patience, and carefully read some of the articles I am preparing for your paper, he will learn that it is possible that there are some things that neither he nor his authorities are familiar with.

Newark, N. J., July, 1871. H. M. PAINE.

P. S. I have no fears that your readers will misconstrue the sense in which I used the word "peer," in a former communication. H. M. P.

The Depths of the Sea.—No. 1.

To the Editor of the Scientific American:

Astronomical calculations of the equinoxes show that by their advancing during a period of 10,000 years, an inundation alternately of each half of the earth's surface, the northern or southern hemisphere, is produced, the other half rising during the same period from the water.

The northern hemisphere has now about seven minutes longer winter than the southern, which, in 10,000 years, gives such an overflow of ice and water on our side of the globe, that it will be, in the time stated, covered up to the equator. We now have come almost to the middle of this period; the advancing of the ice from the north pole towards the equator has been perceived during several centuries past. Greenland long ago lost its vegetation, its green garment, from whence its name is derived; it is now merely a "white land," vailed in ice and snow entirely. Iceland is following; two thirds

of its surface is really ice land, for on its southern extremity only there exist a few colonists.

In the course of 3,000 years the northern hemisphere of our globe will be entirely under water; our cities and villages, with their palaces and magnificent buildings, their splendid churches, and spacious halls of science and art, their warerooms, houses, and humble shanties, will once more form the bottom of the endless main—as has been often done before. Culture and civilization will be concentrated again on the southern hemisphere, from whence they formerly had wandered over to our northern half of the globe. How often may this revolution of the earth have passed, how often will it still take place, and who is able to measure it? The immense depths of the oceans are wrapped in an impenetrable vail of mystery—as are many other things which our earthly science is unable to discover. How many fancies may be occupied by these unfathomable depths! For there is nothing on earth more interesting to us than that which is unknown—but yet full of presentiment; though, as yet, it has yielded but little to our investigations. So much, however, is known: That the bottom of the sea is not a gloomy or a volatile wilderness or a barren rock; it is no open grave, ready to bury forever the fragments of ships or the convulsive limbs of drowned men. It is no place where death alone is ruling in its dreadful glory. Munificent Nature, always creative, has not abandoned the valleys of the sea to eternal silence and obscurity. All-vivifying light penetrates even into these unexplored regions; splendid water plants trim the rolling bottom of the sea; animals of the most various species and classes wander through these endless abysses. Here meet a world of fantastic creatures, whose forms resemble the first oddly shaped inhabitants of our globe, whose remains are still inclosed in the petrified layers of our mountains. The bottom of the sea, being only submitted to natural changes and revolutions, and not to those caused by men, bears more traits from the primitive world than the surface of the earth. The productive hand of the master of the earth is not in action on the bottom of the sea, except in the mournful accidents of shipwreck, when man's productions are drawn down to these depths, either to be dissolved into their atoms or to lie untouched in an eternal grave.

Important revolutions have passed, and are still going on, at the bottom of the sea; but, alas! man cannot penetrate far enough into these mysterious depths. There may live creatures, whose huge, ill shaped forms would terrify us; and others, which are organized so delicately, that our senses are not able to perceive them. The whale and narwhal, the polypi and radiates live here. But the constitution of the human body does not allow us to be far from the surface of the earth, neither up to great hights, nor down to great depths. Although, in proportion to the immense circumference of our globe, the elevations on its surface are not larger than the protuberances on the skin of an orange, yet man is so impotent, that even high mountain peaks are often an insurmountable obstacle to him. How should such a feeble creature, which, in order to live, has to respire ten times every minute, be able to penetrate into depths extending down a great many miles?

The air, by which we are surrounded, presses upon us with a weight equal to that we would have to bear if we were on the bottom of a sea, whose surface would be at a distance of ten miles above our heads. This pressure decreases in the same proportion as we climb up high mountains, or rise in a balloon to a considerable hight. The pressure of the air is necessary to keep the blood, flowing in our veins, within its proper limits. The higher we rise, the thinner the air is growing, the more and oftener we have to take breath; the skin is swelling painfully, our organ of sight grows dim, we turn giddy or even faint away. At a hight of 7,000 meters, the greatest which man has ventured to reach, there is such an intense cold, that our limbs grow stiff; the air, being now too thin, is no longer the carrier of sound, we grow deaf; the blood, no longer retained by a sufficient pressure of the air, squeezes through all the pores on the surface of our skin; the pulsation of our heart is slower; now we have to descend immediately—a few moments longer, a few steps higher—and it will be too late!

In descending into the sea, we are still more unavoidably exposed to danger. At a depth of 20 meters, a weight three times larger than that of our atmosphere is pressing upon our organs. To descend further is very dangerous, for a much heavier weight will press upon us. At a pressure four times as great as our atmosphere, upon the surface of the human body, that is, at a depth of about 140 feet, our blood, being charged with a too heavy pressure, and consequently compressed too much in all our limbs, flows back towards the inner organs; the color of our skin turns leaden; the heart stagnating, pulsates slowly; and torpidity, a true harbinger of death, reminds us of the danger, which would inevitably be the consequence of a prolonged sojourn in such a depth of water. We can hardly remain one minute under water without taking breath. On the island of Ceylon, where pearl fishers practise from their youth the art of diving, they nevertheless seldom succeed in remaining three minutes under water. Of course, we can, by means of a diving bell or another artificial mechanism, carry a small portion of air under water and renew it from time to time; but, although such an artificial apparatus enables man to remain 3 or 4 hours under water, yet it cannot lessen the effect of the pressure of the air, which becomes condensed more and more, in proportion to the descent. We can, by means of such a diving apparatus, repair piers of harbors, bring treasures, lost in shipwreck, again to the surface of the water; and more, such an apparatus enables the raising of sunken ships. We can by means of it with ease work under the water, at a depth of 120 feet, but there is no medium in the world, by which we could descend into the depths of the oceans; yet the production of its depths are carried up by the plumb line to the surface of the water.

La Place, the mathematician, and renowned author of "The Mechanism of the Heavens," has proved radically, that the deepest valleys of the sea cannot extend further down than 8,000 meters; and very often does the plumb line in the main sea reach the bottom at a depth much less than that. If the oceans could be drained we should see immense regions of land, composing extensive plains and pleasant valleys; lofty mountains and deep, dark ravines and abysses, extending as far down below the general surface of the earth as the highest peaks of the mountains rise above it. The depths of the sea were formerly involved in a nimbus of odd theories. These strange illusions are now cleared up entirely; the sea is no longer waving around the fluid interior of the earth; fancy, which so readily deepened the abysses of the sea *ad infinitum*, has now to be contented with a knowledge of its dimensions.

In comparison with the diameter of the earth's surface, the sea is only a thin layer of water, spread around our planet like the dew which settles during night around an apple or a plumb. Such a mass of water, however, in which the highest peaks of the Cordilleras can be nearly submerged, leaving only the utmost extremities visible sufficiently to serve as a support for a wavering boat, is something to us, insignificant pilgrims on earth.

There is still an endless, miraculous world to be explored, a world full of mysteries and splendor, which has never been seen before; but, the time cannot be far off when the plumb line of navigators and explorators will give information of it and will reveal, what has been hitherto unknown of the bottom of the deep! The bottom of the sea is as uneven as the surface of the earth—large mountain chains are running along it, the highest peaks of which form islands in our seas.

This submarine world contains, like ours, rich valleys, fertile plains, and barren deserts, but has its peculiar animal and vegetable kingdom and its peculiar sky. There are immeasurable craters, forges glowing eternally, from which boiling hot lava rises and pushes fluid matters up to the water's surface. The Antilles, Maldives, and other groups of islands of volcanic origin, are formed entirely by such eruptions. Navigators often meet, far from any trace of land, hot, sweet water, spouts of large dimensions, rising up with a dreadful roaring, after having penetrated the endless surges of salt water. In the Bay of Xagua, sweet water fountains are breaking forth with such a power, that small vessels cannot approach them. The bottom of the sea is submitted to the same revolutions as the earth's surface; it is not very seldom that these depths are shaken by earthquakes; new islands are raised from the oceans, and the waves devour older ones, known to us long ago. Nature, never resting, can here, by means of raging surges, produce the same devastations which continually take place on some part of the earth's firm surface. What curious things we should see if we were allowed to descend *ad libitum* into these unexplored depths! We should view endless sand plains, on whose volatile downs rest the goods of foundered ships; inheritances of nations, which have become extinct on our globe long ago; and wonderful specimens of antediluvian industry. There we could follow the course of the narrow, winding dales, as if they were arteries of our world, conveying, like river beds, the wild currents, from the poles towards the equator, by which the water of all the oceans is mixed so that an equality of temperature is produced. We should see enormous ranges of mountains and bare rocks, glittering in the bright colors of the jasper, of granite, of silver mica, whose metallic crystal forms reflect, upon their thousandfold edges, all the colors of the rainbow, and form, in many spots, beautiful grottos. A transparent sky of a deeper blue than ours would shine there above our heads, animals of the strangest forms and size would be seen passing to and fro in this transparent sky; gigantic whales would be seen swimming there as comfortably as vultures, when roaring in the air or resting for a moment on the steep, rocky precipices of high mountains. Whose fancy is rich and lively enough to image what a splendid spectacle Nature would display to us at the bottom of the sea: where a weight of 800 atmospheres presses upon everything, where a hollow iron ball, the size of a a man's head, and as thick as three fingers' breadth, would be dashed into dust, like a soap bubble: where gunpowder would fail to drive a bomb shell out of the mortar? Most likely this immense pressure would make the water penetrate through the pores of rocks and other minerals, so that marble would become as transparent as glass; and we might even be able to view, in these depths, the process of crystallization of the minerals, or to find out how their various component parts are combined. But, it seems, Nature does not desire that the human eye should look down into her secret workshop, and penetrate into the great mysteries surrounding us everywhere, but prefers to encourage us to overcome the weakness of our organs by constantly increased activity of our senses.

AMALIE PFUND, *née* JANSSEN.

Extracting Gold from Ores.

To the Editor of the Scientific American:

In your late Australian advices there is reported a discovery of a new agent for the extraction of gold from ores and tailings, and calling attention to its importance to the miners of the West. A large class of your readers are occupied in the different processes for the extraction of the metals, and will hail any information you can give them with great satisfaction. It will be necessary to point out to those who are not occupied in the study of those matters, that there is some little difficulty in the way of its ultimate success. Triturating mercury with sugar is to produce the impalpable powder spoken of, called saccharate of mercury. Its effect on the process of amalgamation requires to be explained.

The only intelligible result of triturating mercury and sugar is to oxidize the former. In this state it may be considered atoms, a state favorable to meet the corresponding fine gold. The condition of things being equal, the sugar takes no part chemically in oxidizing the mercury. Chalk, molasses, and many other substances, have the same effect.

Oxygen, sulphur, and tellurium are not the best combinations of mercury, for reasons that the oxide would be carried off, combined with gold unreduced, and be lost in the subsequent washings.

Again, much of the gold is not in suspension, but is to be found in the matrix, combined with other substances, and requires very different treatment than the one suggested.

Newark, N. J. J. TUNBRIDGE.

Oiling Sheaves.

To the Editor of the Scientific American:



The accompanying engraving represents the section of a sheave, cut through the center to show an oil chamber. The chamber is made by running a quarter of an inch drill into the sheave till the point shows in the center hole. Then follow with a three eighths of an inch drill, say for a quarter of an inch, to get a shoulder for the stopper to go against. If the oil gets out too fast, put a little wool in the bottom of the hole.

I have used this device for several years to advantage, and I believe that this was invented by me. I have sent this, thinking it might interest some of the readers of the SCIENTIFIC AMERICAN. FRANK ALSOP.

McGregor, Iowa.

Steam Plows.

To the Editor of the Scientific American:

The subject of steam plowing, recently so energetically stirred up by H. G. and others, will no doubt continue to be one of the leading topics for inventors to think about, till the machine is brought out. I, for one, am satisfied that the cumbrous stationary engine, or English system, drawing gangs of plows back and forth across the land with ropes, will never do for our wide prairies. Nor do I believe that traction engines moving over the ground at high speed, thereby using up most of their power in their own propulsion, will ever be found economical.

What is wanted is an engine of 10 to 20 horse power, to move slowly over the unbroken ground, and work up the soil behind it as it moves, to a width as great as a system of outrigged spars, shafts, pulleys, draft chains, and mold boards or other diggers attached, can be made to operate in a substantial manner, thus taking along and finishing a "land" of, say 40 or even 50 feet wide, as the whole machine moves forward at a rate of not over one fourth or half mile per hour. I see no difficulty whatever in devising a machine to work on this principle.

A revolving endless chain, or two such chains, working against each other, so as to prevent the machine from being drawn to one side, reaching out twenty feet or more upon each side, and carrying shares, or cutters, or diggers of any efficient form, and supported by a framework and an outside idle wheel, could certainly be made to slice off and work up the ground to any degree of fineness desired, or to any reasonable depth. And the forward motion could be so geared down, that but a small portion of the power will be required for that.

The greatest difficulty in the problem of steam plowing on the western prairies, will be the supply of water. A twenty horse engine requires about a bucketfull a minute, and in most localities this will be hard to get. Some system of air surface condensers, will, I think, be found a necessary appurtenance of any portable or traction engine for farm use. This can be made of tin plate, and need not be costly or heavy. A tin pipe four inches in diameter at the escape, and decreasing in size as it lengthened in a coil, supported by light frame work in an airy situation, could be made to condense most of the steam without much back pressure, and thus save the water to be used over. On the Mississippi bottoms this would not be necessary, as water is always near.

Hoping these suggestions may be of use to those able to execute as well as plan, I submit them for the public.

Memphis, Tenn. CHARLES BOYNTON.

A Pin in the Heart of a Chicken.

To the Editor of the Scientific American:

A ruralist's wife, upon dissecting a fowl, preparatory to cooking, noticed a slight enlargement of the heart, and a more minute observation revealed a pin that was imbedded nearly its whole length, near the right auricle of the heart. The pin had worn a small cavity, and was in a corroded condition. The inquiring mind is anxious to know how the pin found its way to this vital and important organ.

L. G.

[The occurrence narrated by our correspondent is only one of many on record. How sharp pointed articles, like pins and needles, find their way through delicate tissues and organs of the human body to the surface, sometimes by long and tortuous routes, is a mystery which we believe is yet unsolved. The fact is, however, well established.—EDS.

Improved Hot Air Register.

Two serious evils attend the use of hot air furnaces. In the first place, there is a continuous ascension of particles of carbon, dust, etc., which accumulate in the flues, and are carried up with the heated air into the apartments. And, secondly, there is a distressing dryness of the atmosphere, notwithstanding all the attempts hitherto made to charge it with vapor. Both these evils are not only disagreeable, but positively injurious to health.

Heated air has an avidity for moisture, and absorbs it not only from the human body, but from articles of furniture, etc. Advantage has been taken of this peculiarity in constructing the register shown in the accompanying engravings, so that the dry air in passing through the screen, I, comes in contact with, and takes up water, whilst particles of dust, etc., floating in the air, are effectually intercepted. The heated air thus enters the room moist and free from impurity.

It may be desirable to have the atmosphere in an invalid's room medicated. To accomplish this, a solution of the drug is placed in the water tank of the register, and thus the air is impregnated with it.

Lime water in the tank, will, in the same way, rid the air of carbonic acid gas.

A delicate perfume may be communicated to the atmosphere of a room, by a drop or two of essential oil in the water tank.

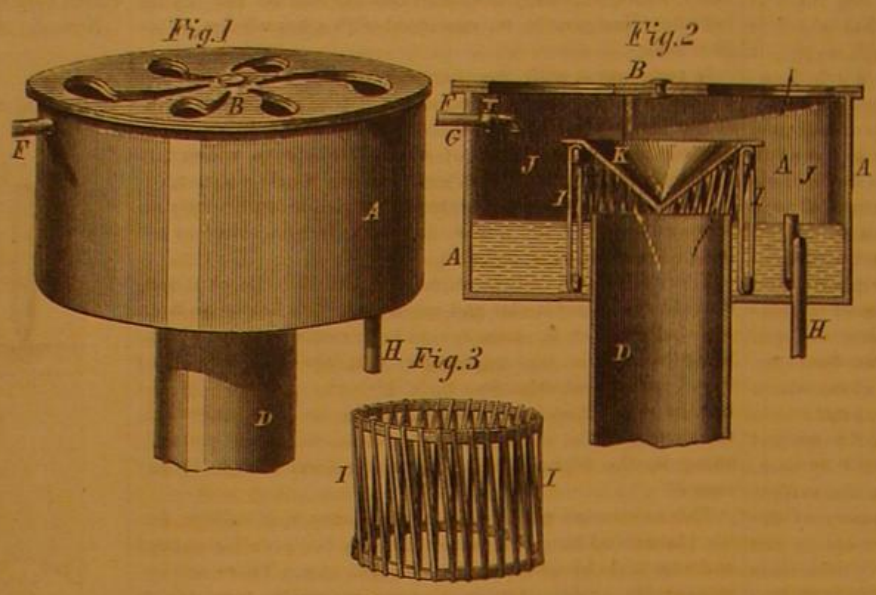
Fig. 1 is an outside view, showing the ap pearance of the register when the parts are placed together and ready for use.

A represents the usual casing of a register, its lower part, together with a portion of the flue, D, forming the water tank: the depth of the water (Fig. 2,) being regulated by a discharge pipe, H. An inlet pipe, F, and cock, G, supplies water. The action of the cock, if necessary, may be made automatic by means of an arm and hollow ball.

The screen or dust arrester, I, Fig. 3, is a light frame covered with yarn or any suitable fibrous material, which, by its capillary attraction, will constantly absorb water. The lower portion of the screen is immersed in the water. Its upper portion forms a partition in the air space, J, above the water, as represented in Fig. 2. It is surmounted by an inverted conical cap, K, which guides the ascending air through the saturated interstices of the screen, thence through the register, B, to the apartment to be warmed. The screen is movable, and can be inverted at will.

State rights (or the whole) of this patent will be sold. Patented through the Scientific American Patent Agency, June 27, 1871.

For terms, and all other information, apply to J. W. McGlashan, 210 St. James street, Montreal, Canada.



McGLASHAN'S PURIFYING AND EVAPORATING HOT AIR REGISTER.

Van Pappelendam's Metallic Tiles.

Our engraving shows an undoubted improvement in the construction of metallic tiles, whereby, it is claimed, perfect security against leakage of roofs is obtained; while, at the same time, a great variety of ornamental design is possible, without much increase of cost over that of perfectly plain tiles. The raised ornamental designs, furthermore, serve to strengthen the tiles, acting as corrugations to prevent rolling up by the action of violent winds.

The tiles may be made of iron, zinc, or any other suitable metal, and either of cast or sheet metal, the ornament being stamped thereon when rolled sheets are used. The tiles are shown singly in Figs. 4 and 5, obverse sides of two different tiles being shown. One side of the tile has two parallel ribs formed along two of its edges, as shown, forming a channel. Below these ribs, a single rib on another tile rests, when the tiles are placed together on the roof, as shown in Fig. 2, and more clearly in Fig. 3.

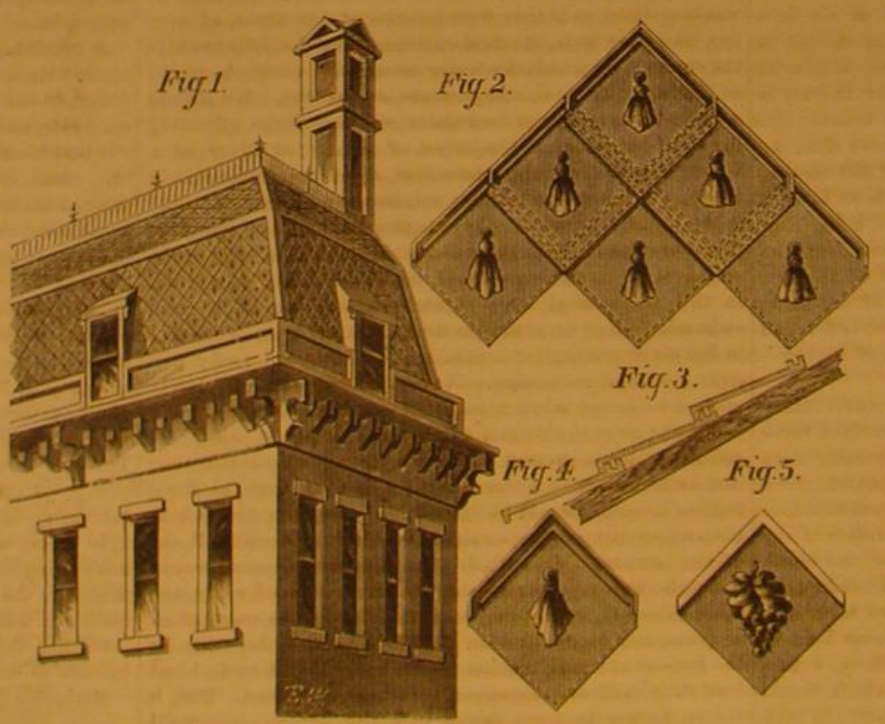
The two angles of the tiles on the right and left are cut off, as shown, and the channel formed by the parallel ribs is bent so as to conduct any water that may pass over the lower ribs, downward, and deliver it upon the upper surface of the next tile below.

By these means, it is claimed that the penetration of water through the joints is effectually prevented.

The tiles may be made square or diamond shaped, either form being ornamental as well as effective.

The tiles thus made will, it is thought, find a wide application in this country and abroad.

Patented through the Scientific American Patent Agency, June 13, 1871, by Cornelius G. Van Pappelendam, of Charlestown, Iowa. The entire right will be sold. Address, for further information, as above.



PAPPELENDAM'S METALLIC TILES FOR WALLS. ROOFING, Etc.

Xylatechnigraphy.

We lately, says the *Building News*, called attention, in our review upon the furniture in the International Exhibition, to some specimens by Messrs. Trollope, decorated by their new patented process for the decoration of natural wood.

As a process of artistic decoration this invention is a highly valuable one, but a "new art," as they call it, it certainly is not. Although woods have been stained previously, and that in more than one color, by means of stenciling, nothing, as far as we are aware, has hitherto been attempted of the delicate and elaborate character of which this process is capable. By its means every shade, from white to black, buffs, browns, reds, and neutral green are produced, and penciled on by hand with the finest lines if needed, or laid on broadly and with clearly defined edges. Through all their varied tints the natural grain and transparent luster of the wood is retained, and the effect is soft, rich, and harmonious. Indeed, one considerable advantage in the process, according to our opinion, is that it does not seem to lend itself to strong or violent coloring, and that blues and pure greens, which are such dangerous implements in the hands of modern designers, do not make their appearance among the colors employed.

Among the articles to be seen are several doors with highly enriched panels and architraves, the designs of which are good, and the effect striking and pleasing. Another fine example shows the complete treatment of a side and ceiling of a room with dado, cornice, etc. In this are some groups of fruits and leaves, which admirably exhibit the capabilities of the process. In a group of leaves, each leaf may have a slightly varied hue, and thus great variety is obtained. Some specimens of furniture—as sideboards and cabinets—deserve attention, as illustrations of the richest and most elaborate character of work. In many of these gold is judiciously used in the moldings to lighten the effect. Articles of bedroom furniture are decorated in a simpler manner, but, perhaps, are not so successful, some of them being rather heavy and dark.

On the whole we were very favorably impressed with this new process, and believe that architects will be grateful for the opportunities it will afford them, as they may have their own designs carried out in exact accordance with their drawings to the minutest details. The work, when done, is French polished or varnished, and the highly glazed surface thus obtained is perhaps the greatest present drawback, but we doubt not that this may be avoided, in which case we think that but little will be left to be desired by either artist or architect.

THERE is a sharp rivalry just now in Alabama among different guano dealers. One of them, by way of showing the superiority of his guano over any other, says that a farmer recently put a sample of it into his pocket, in which there happened to be a carpet tack, and started home on horseback. Before reaching his house his steed broke down, and the farmer was at a loss to discover the cause until he found that the carpet tack had grown to be a long bar of railway iron.

Siphon Recording Telegraphic Instrument.

Sir William Thomson's siphon recorder, which is the great telegraph novelty of the day, is a most marvelous combination of strength and weakness; and the strength and the weakness are so remarkably combined that it produces effects which, until its appearance in public, a few months ago, were totally undreamed of by the most sanguine of telegraph engineers.

This instrument consists of a very powerful electromagnet, between the poles of which (therefore in a magnetic field of great intensity) is suspended a core wound with fine silk covered copper wire. This wire is put in the circuits of the telegraph line, through which the signals are received. The reading of the signals is effected by means of a siphon of capillary glass tube, about two inches long, the shorter end of which dips into a dish of ink, while the larger hangs down, in front of a paper strip moved forward by clockwork. The miniature glass siphon is connected, by a very fine aluminum wire, with the coil suspended between the poles of the electromagnet, and is moved backwards and forwards as it is deflected to the right or the left. To persuade a camel to get through the eye of a needle would, under ordinary circumstances, not be a more difficult feat than to get ink through the capillary tube under ordinary pressure. But the way in which it is got through it, and not only got through it, but actually ejected in a tiny stream from the lower end of the siphon, is by the simple and ingenious expedient of keeping the ink electrified to a high tension. It is a well known fact that, when any liquid is electrified, its particles repelling each other, it is enabled to flow through the finest orifice; and this fact, judiciously taken advantage of by Sir William Thomson, has enabled him to produce a frictionless pen point. The electrification of the ink in the reservoir is done by a rotating electrophorus or replenisher, kept in movement by an electromagnetic machine.

A Nonsensical Patent.

A Mr. Macdonell, of London, England, "believes that if he fits the poles or shafts of carriages with large wheels," which he is pleased to term "auxiliary horse wheels," these wheels having received "the initial force of the horse or horses," will, by tending to keep in motion, help to draw the carriage behind them! To facilitate the motion, Mr. Macdonell proposes to load the axles with weights to increase the adhesion between the "auxiliary horse wheels" and the road.

A patent has been granted for this device, in Great Britain. See "Pickwick," chapter 2, wherein the cabman says, "We've got a pair of precious large wheels on; and when the horse does go, they run after him, and he must go on he can't help it."

Tamping Apparatus for Blasting.

Daniel Corgan, of Sugar Notch, Pa., has invented an improved tamping injector for use in blasting. It consists in a tamping injector, having a cylinder or barrel with a handle or rod connected therewith. The tamping material is placed in the cylinder or barrel. A rod, the end of which is made to fit the inside of the barrel, so that it may act as a plunger therein for forcing out the tamping material into the drill hole, where powder or other explosive substance has been placed, is also used. The cylinder is bent slightly inward at the lower end, so as to prevent it from being drawn off the plunger, whose head or upper end is made larger than its body or remaining portion. A stop prevents the plunger from passing entirely through the barrel. The diameter of the barrel is slightly greater than that of the drill hole. The end of the barrel is placed so as to inclose the drill hole, and the tamping material is forced into the hole and pressed by the plunger, so that it will remain in a hole drilled upward into a seam of coal, which is worked from the bottom, as is frequently the case in mining anthracite coal. When the tamping material has been pressed into the hole, the tamping bar is applied, by which the material is rendered as compact as may be desired. By the use of the tamping injector much valuable time is saved, and the risk to life and limb from this dangerous occupation is greatly lessened.

BY having his wits about him and a plentiful supply of eggs, Mr. Joseph Hale succeeded in saving the life of his wife, recently, in Portland, Maine, who, in a fit of abstraction, had swallowed a dose of corrosive sublimate, thinking it was laudanum. Given over by the frightened neighbors for as good as dead, her husband at once administered to the terrified victim the whites of fifteen eggs, which completely neutralized the effects of the poison.

IN Massachusetts recently, a lady overtaken by a thunder storm, suddenly felt a shock of electricity which numbed her, but, recovering almost instantly, she continued her walk home. On arriving, she found that the lightning had actually struck a fold of her black alpaca dress, near the ground, where it was wet by the shower, and had scorched the edge of the fold, and then leaped off to the wet ground.

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MENTAL ORDER AND SYSTEM.

We are all tolerably familiar with the fact, that no generator of power approaches in efficiency the half of its theoretical capacity. In the best modern steam engines, the conversion of ten per cent of the capability of the coal into efficient power, is an unusually high result. The loss in the use of electro-magnetism is still greater in proportion. And, labor as we will, we shall never arrive at absolute perfection in the use of force generators, if we ever approach it.

But what shall we say of the enormous waste of a force, more powerful than steam and more subtle than electricity, which goes on daily within us? How much of our mental capacity is lost, through desultory habits of thinking, and loose, irregular exertion of the mind? We believe that the actual product of the brain's working through the day is lamentably below its possible achievement, and the cause of this we propose to consider.

The faculty of concentrating the mind on the matter in hand, to the exclusion of all other things, is one of the rarest and most valuable gifts with which a man can be endowed. To commence with a theory, to think it out to its legitimate results, to reduce those results to a concrete form, and, if it be in material science, to proceed to experiment and practice, without diverging, in any direction, from the purpose, is possible to very few men. And we do not think we are overstating the case when we assert that, in proportion as a man is gifted with this faculty, he will become a successful investigator of the phenomena of Nature. Certain it is, that the most eminent men in the scientific world have been remarkable for this power of self-concentration; and the study of Nature and her laws—which go from process to process, and from fact to fact, by strict induction and with inexorable logic—is the pursuit of all others, for the employment of this invaluable talent, as well as for the increase of its strength. The study of Nature—in another word, science—is the best occupation for the mind, if it be desired to systematize the thinking faculty, and to produce the greatest result from the exertion of the intellect. It is one phase of the same power, of which thoroughness of work is another; for, if the ability of mental concentration can be acquired, it is by doing most thoroughly and earnestly the work in hand. So the true worker or thinker never wastes time and strength in going back to what he has already accomplished, but, having done it once, he is prepared for the next process, and so goes on with the least possible dispersion of his mental force. Similarly, the studies of mathematics and logic are useful to mental discipline; and the former, especially, has done the world good service in forming the invaluable habit of reasoning by strict induction.

As a marvellous instance of what one man may achieve by doing systematically and thoroughly whatever he undertakes, we cannot do better than consider the life of Alexander von Humboldt. There was no part of the world he had not visited, and he had been nowhere without acquiring the most exact knowledge of the whole country, its geology, its animal life, its botany, all its physical characteristics, as well as the language, habits, customs, laws, religion, and history of its people. He led this life till he was ninety years of age, and even then no fact, in any part of the world, that had any bearing on scientific truth, escaped his notice. His mind was a museum, where all the knowledge that had been brought into the world was placed in order, carefully guarded, and always ready for use. We are not wrong in attributing the boundless learning and prodigious memory of this great man to his habit of systematizing his mental labor, and to his power of self-concentration; and to his belief in the wisdom of that great command: "Whatsoever thy hand findeth to do, do it with all thy might."

EXTINGUISHING FIRES AT THEIR COMMENCEMENT.

A quick practical means of extinguishing fires at their commencement, on hand, ready for immediate use, in every building, would lessen the annual destruction of property by burning to an extent difficult to estimate.

The rule is that the beginnings of fires are small, and their early progress comparatively slow. There are buildings which contain such inflammable materials that a spark will communicate flame almost instantly to all parts of the structure, but these cases are exceptional. In most cases a very little water judiciously employed will extinguish a fire within five minutes from its ignition.

We say judiciously employed, for in this lies the secret of successful combat with the devouring element. To throw water indiscriminately wherever it may chance to hit, is to waste our ammunition. The attempt should be to cover the burning surfaces with water as speedily as possible. No matter how thin the film of water may be, it excludes the oxygen of the air, and fire can live no more without air than an animal. A thin stratum of any non-combustible material extinguishes it just as thoroughly as though a foot thick were used.

To apply water thus economically requires more refined means than slopping it out of a bucket. In this way, but a little space can be covered; but a bucket of water will cover many feet if well husbanded.

It is for this reason that small portable hand forcing pumps have been approved by the best and most experienced firemen, as the very best means, all things considered, for extinguishing fires.

Those extinguishers employing a solution of carbonic acid in water, or solutions of salts which, decomposed by heat, yield gases that do not support combustion, have some of them proved very useful, but their cost is far more than small force pumps, which answer nearly as well.

We would suggest to inventors that a field is open for the introduction of apparatus of this kind. And there will be room for competition in supplying the demand, as much as in pianos and sewing machines. The attention of manufacturers is especially fixed at the present time upon the subject, and we believe we express the prevailing opinion, when we assert, that portable apparatus, employing only water, is what is regarded with highest favor by this class of men. There are some devices of this kind now in use, but, as we have intimated, there is room for others. The field is large and comparatively unworked. The time will, however, come when something of this kind will be made a condition of insurance, in all buildings much exposed.

GRAPHITE, PLUMBAGO, BLACK LEAD.

Although graphite has been known from time immemorial, and its name at once indicates the antiquity of its principal use, its geological origin is still a matter of doubt, and its properties are not yet half understood. It belongs to no particular geological horizon, but occurs in rocks of all ages, in beds, imbedded masses, laminæ, or scales, more commonly in granite, gneiss, mica slate, crystalline limestone, and occasionally with deposits of coal. The famous Borrowdale variety is found in nests, in trap in clay slate. Nearly every locality presents it in some new association, so that it is scarcely to be wondered at that geologists have been puzzled to account for the origin of a mineral that makes its appearance in utter disregard of the laws of deposition, stratification, injection, or age. The recent progress of chemistry has thrown some light on this subject, and new theories have been advanced, tending to dispute the vegetable origin of graphite and to explain its presence on the principle of the decomposition of cyanogen or of other nitro-carbon compounds. In the preparation of caustic soda, cyanide of sodium is produced, and when, in the course of the operation, Chili saltpeter is added, to oxidize the sulphides of iron and sodium, and the mass is in a state of fusion, graphite arising from the decomposition of the cyanide rises to the top, where it swims and can be skimmed off, washed and dried, when it presents the appearance of brilliant, light powder, perfectly pure and admirably adapted to the manufacture of pencils and many other purposes. We need hardly say that in many soda ash establishments, the graphite produced in this way is economized and highly valued on account of its great purity. The brilliant red crystals which form in blast furnaces, and now and then give rise to what is called "salamander," were formerly supposed to be pure titanium. Wöhler afterwards showed that they contained cyanogen, and this discovery, together with the appearance of cyanogen in the soda ash manufacture, has led chemists to suspect that the formation of artificial graphite in iron furnaces is not always due to the solution of an excess of carbon in the molten iron, but may be referred back to a compound of nitrogen with carbon, in other words, to the decomposition of cyanogen.

Applying these observations to geological phenomena, some authors, especially Wagner, seek to account for the formation of graphite in nature, on the principle of the chemical decomposition of the cyanides. It is certainly a very ingenious theory, and has many strong points to sustain it; and as it may finally conduct us to an artificial method for the production of graphite, in any quantity and at reasonable rates, it deserves the careful study and experimental research of all parties interested in the development of this branch of industry.

Scientific men have long been in the habit of describing graphite as a variety of carbon. They call it an allotropic condition of carbon, as the diamond, charcoal, etc., are considered to be different forms of this element. This explanation has been quietly accepted until recent times, when the progress of research has disclosed so many new properties for graphite as to entitle it, in the opinion of many authorities, to an independent position among the list of elementary bodies. It has been proposed to call it graphon or graphium, but no writer of chemical text-books has thus far been found to adopt the new name in his list of elements.

Berthelot has found that there are three distinct varieties of graphite: 1. The native; 2. The crystalline, from cast iron. 3. The electric, from the galvanic battery. These give rise to characteristic and different chemical compounds, the perfection and properties of which he describes in a learned paper on the subject.

Brodie has also explained the striking differences between charcoal and graphite, and has shown how to prepare pure graphite as well as graphitic acid. Older and more familiar writers on the subject describe two kinds of native graphite—the crystalline and the granular.

The value of the article for commercial purposes does not depend upon purity, but on grain and texture. The crystalized graphite of Ceylon, with only 1½ to 6 per cent impurities, is not fit for lead pencils, whereas the Borrowdale black lead, with sometimes 13 per cent foreign matter, is the best in the market.

A compact, grainy variety is preferred for pencils, and a loose mold, with shiny particles and scales, is better adapted to crucibles. The best crucible material is really gneiss containing 35 to 45 per cent graphite; this is reduced to fine powder, mixed with one half or one third clay, stamped into forms and moderately heated.

Many attempts have been made to purify graphite in order to fit it for the various purposes to which is adapted. Some of these may be mentioned as offering suggestions to practical men. The most famous method is the one invented by Brodie, which consists in adding chlorate of potash in the proportion of one twentieth to one sixteenth of the original pulverized graphite and afterwards stirring in twice the weight of sulphuric acid, sp. gr. 1·8, and heating gently and with great caution, to avoid explosions, until the evolution of fumes of chlorous acid has nearly ceased; the mass is allowed to cool, and is then washed by decantation in water. After drying, it is calcined in a furnace at a red heat, and the resulting mass triturated with water, upon the surface of which the finely divided graphite swims while the heavier particles of silica, iron, and other impurities sink to the bottom.

Graphite obtained in this way is absolutely pure, and possesses properties different from the original article. It is admirably adapted to the manufacture of pencils, for glazing powder, for crucibles, for electric conductors, and the like. Where the native material contains considerable silica, some fluoride of sodium may be added in the first stage of the process, after the evolution of chlorous acid has ceased, by which the excess of silica is removed in the form of a fluoride. Winkler purifies graphite by finely pulverizing, mixing with equal or double weight of a mixture of soda and sulphur, fusing and ultimately washing with dilute hydrochloric acid. Boiling in caustic soda, and subsequently fusing with soda, and washing in hot water has also been recommended. Other methods have been tried in this country and Europe, but as they are the result of costly experiments, the details of the improvements have not been published.

The most extensive establishments for the manufacture of black lead crucibles are at Passau, in Bavaria; at Battersea, near London; and at Jersey City. Enormous quantities of graphite are now consumed in the market, and it is said that $600,000 worth per annum is required for stove polish alone.

It may be well to mention some of the chief uses to which this valuable article is now applied. The best known are for crucibles, stove polish, glazing gunpowder, lead pencils, linings for iron castings; to these may be added the great use in galvano-plastic and electro plating; the manufacture of cements; as a priming for all colors in painting boats, roofs, iron ships, tin ware; for lining to acid tubes; for packing steam joints; as a lubricator; in the manufacture of Bessemer steel; as a substitute for emery; as polishing powder; for copying impressions, and in photography; for printing ink; to stop the incrustations of boilers; as a wash for trees; in repairing roads; in agriculture; as an antiseptic; as a coating for barrels; for electric conductors; in fireproof safes; and many other applications to which we cannot refer in detail, for want of space. We have said enough to show that, although the progress of our knowledge of graphite has been considerable, there still remains much to be learned, both in reference to its properties and its employment in the arts.

INFRINGEMENT TRIAL.

This was a recent action for infringement brought in the United States Court, Illinois, under the patent granted to William P. Heffron, July 23, 1867, for an improved boiler tube cleaner, against the Chicago, Alton and St. Louis Railroad Company.

One of the leading features of the patent consists in the combination of traveling feed wheels and a series of revolving cutters or cutter heads.

The defendants had not made use of the identical device shown in the patent, but had used an improved device, namely, the patent for a machine for cleaning and polishing tubes, granted to Horace S. Smith and William Hughes, March 1, 1870.

The Court instructed the jury, among other things, that plaintiff was not confined to an apparatus identical with his

model and specifications, but might make use of any other form of apparatus in applying his principle which would suggest itself to a skilled mechanic, no inventive genius being necessary to originate it. However much Smith & Hughes might have improved the Heffron machine, if they made use of the combination of the feed wheel or rollers with a revolving cutter head, it was an infringement. The jury returned a verdict of $720 damages in favor of the Heffron patent.

THE THREADED ENVELOPE PATENTS.

In recently publishing illustrations of the threaded envelope patents—the original, of Phelps, covering the insertion of the thread, and the subsequent patent of Gregg, covering the knotting of the thread—we had no purpose to cast discredit upon the Patent Office, much less to reflect upon the action of the able and worthy examiner, to whom belongs the supervision of all improvements of the class. That gentleman is well known as a painstaking, efficient officer, whose services are of great value to the Patent Office, and we should be the last, knowingly, to do him an injustice.

On examination of the full specification of the Gregg patent, we find that the advantages of the improvement are fully set forth: and there was probably as much reason for its issue as for the grant of the original patent. Both inventions are of more importance than most people would suppose, if we may judge from the curious fact that no less than forty-three applications for patents have been made by other persons for substantially the same thing since the issue of the Phelps patent, all of which were necessarily rejected.

The duties of an examiner at the Patent Office are oftentimes peculiar and difficult; perhaps nothing is more perplexing for him than the decision of some questions of novelty. Especially is this true in cases where the devices are simple and the resemblance close. A wrong decision may prove to be a great injustice. In hundreds of instances of small devices, having what at first seemed scarcely a first point of novelty, the subsequent development of the patents has proven them to be inventions of decided importance.

Not the degree, not *how much*, but has the invention *any* novelty and utility, is the question for the Examiner to determine. In some cases it is impossible to decide this question except by the results produced.

The enlightened Examiner will read the laws with a liberal mind, gladly giving to the applicant the benefit of any doubts he may have upon the propriety of granting the patent. He will moreover be impartial in his decisions, treating all applicants alike, whether their inventions are great or small, applying in each case the same general tests of practicability.

[Special Correspondence of the Scientific American.]

WHAT IS DOING AT THE PATENT OFFICE.—GREAT NUMBER OF APPLICANTS FOR EXTENSIONS.

Washington, D.C., July 11, 1871.

The late extension of Kelly's patent for the manufacture of steel, referred to in your issue of July 1, is causing much excitement, the opponents making a fiery onslaught upon the Commissioner and Examiner, in the New York *World* and other papers. A vigorous reply is daily looked for, as well as the Commissioner's decision, in full, which has not yet been made public, though the extension was granted almost immediately after the hearing. Perhaps no extension was ever opposed by so many and weighty capitalists and corporations.

The current month carries a full share of extension cases, and some will be strongly contested, such as the patent to John B. Slawson, for the well known car fare box, used on street cars for the purpose of preventing fraud, and dispensing with the services of the toe-treading conductor; the patent to Arnton Smith (deceased) for a plow: the patent to Charles Winslow for elastic gore cloth, to be contested by the National Rubber Company; also, the patent to Levi Bissell for locomotive truck, contested by the Brook Locomotive Works. Other applicants to be heard this month are W. R. Fee, for hulling cotton seeds; Baxter D. Whitney, for smoothing plane; Alfred Monnier, for manufacture of sulphuric acid; Beniah Fitts, for planing machine feed roller; Wm. M. Welling, for factitious ivory; Isaac Hayden, for bobbins for roving and slubbing. The application for an extension of Smith's patent was made in 1868, and refused, but Congress, last winter, passed an act authorizing a re-examination of the case.

The patents issued during the last six months number 5,913, designs not included, a falling off of about 500 from corresponding period of last year. Being curious to draw a comparison between the several States, as to their relative interests in the Patent Office, I have examined the issues of the last two months, as likely to give an approximately fair guide, and find that New York received 216; Pennsylvania, 110; Massachusetts, 100; Illinois, 78; Ohio, 65; Connecticut, 54; Indiana, 41; New Jersey, 33; Maryland, 26; Missouri, 22; Michigan, 20; Wisconsin, 19; Maine and Rhode Island, each 15; Iowa, 13; California, 12; Virginia, 11; Kentucky, 10; Vermont, 9; Louisiana, 8; Georgia, 8; Delaware, 6; New Hampshire, 6; Texas, 5; North Carolina, 4; Kansas, 3; West Virginia, 3; Tennessee, 3; Mississippi, 3; Arkansas, 2; Oregon, 2; South Carolina, 1; Nebraska, 1; Florida, 1; Minnesota, 1; Alabama, 0; Nevada, 0.

It is encouraging to note that of these 926 patents, 113 were issued to inventors in the so-called slave States, and among them we find a great variety; not only cotton gins, cotton planters, cotton cleaners, and other machines pertaining to this particular branch of agriculture, but also a car coupling, a wood pavement, firearm, bridge truss, canal boat, steam engine piston, etc., etc. Gibbs, of the firm of Willcox & Gibbs, is a Virginian, and Slawson, already referred to, is from New Orleans.

It is quite apparent that the abolition of slavery has stimulated invention at the South, especially in the class of mechanisms connected with agriculture, the records of the Patent Office showing that the applications for patents of this kind have increased from two per cent, before the war, to nearly thirty per cent of all cases filed; and the improved methods of cultivating cotton are already affecting the average yield.

In the class of inventors connected with railroads, there is no abatement of interest nor lack of talent. What greater boon to the traveling public than a well arranged sleeping car, or a Pullman palace car! Whole trains are now made up exclusively of palace cars, and they return immense profits to the company that owns most or all of them, from 200 to 300 per cent, it is said. Consideration for the comfort of human travellers, combined with a clear eye to the dividends, has given rise to equally substantial improvements in transportation cattle cars. Excellent contrivances have already been patented, and new applications are made. Under the old and still common mode of transportation, the animals suffer an average loss, or shrinkage, between St. Louis and Philadelphia, of fifty-seven pounds each; ten or twelve days are consumed in the transit; five or six stops, or even more, of twelve hours each, are required for unloading, feeding, rest, and reloading; and, on an average, two animals in each car, are killed or maimed by falling and being trampled upon, or by some other accident. Under the new arrangement, at least one half the shrinkage is saved, no injuries are incurred, and the time is reduced to five, and even four days, as no stops are necessary, except for supplies of fresh water. The cattle are placed in separate stalls, necessarily narrow, but wide enough to allow of lying down. The partitions are thin, to economize room, and are constructed of wooden slats and ropes, or of canvas, so that they can be rolled up out of the way on the return trip, the cars then being used for ordinary freight and merchandize. These partitions are, however, so firmly secured as to support the animals, and prevent them from being thrown down by the sudden starting or stopping of the train, a very common occurrence in the old fashioned car. Food and water are supplied from the top of the car, through suitable openings and connections, and a tank of cold water is so placed as to give the cattle an occasional shower bath in warm weather.

A successful construction and arrangement of these devices presents an inviting field to the practical inventor. The railroads to the Pacific and Southwest are developing a large cattle trade with Texas, the cattle being driven in large herds across the plains to various points on the Kansas Pacific and Union Pacific roads, and even as far north as Sioux City. Such places as Cheyenne, Schuyler, Laramie, Abeline, Kansas City, and others, have already become great center posts for this traffic, and at some stations eighty-five car loads are shipped daily. The Texas cattle, born and reared in woodland, or on the wide plain, and having the free range of an extended tract of country, are semi-wild creatures, very unlike the mild and domestic occupant of the farm yard; and an ordinary car filled with them, fretting under their imprisonment, and striking right and left with their wide branching horns, does not present a "happy family" for Barnum, but with a "stalled ox," and "a dinner of herbs," the "hatred therewith" is effectually banished.

The manufacturing establishments of the two companies who are introducing these improvements are located at Chicago, Ill., and at Salem, Ohio, and negotiations with the railroad companies are in progress, which will soon establish them as essential parts of the transportation system between the West and the seaboard.

Mr. Amos Rank, the President of the Salem company, is a leading inventor in this class of improvements.

Last winter an attempt was made in Congress by some humane member to pass such enactments as should compel all railroads to make more merciful provisions for the transportation of all live stock, both in the construction of the cars and in supplying food and water on the train at suitable intervals. The bill, however, was not passed. Did the members quote Paul's inconsiderate remark to the Corinthians: "Doth God take care for oxen?"

The allusion to Texas reminds me of a patent just granted to a photographer of that State. Can you, good reader, discover any close relation between the modern art of photography and the ancient amusement of swinging, a very ancient amusement, it having, no doubt, originated with our honored progenitors, the monkeys? You are aware that the long standing and momentous problem of the art referred to is, how to get good pictures of children. The Texan has solved it. He places the infant, whether of days or years, on a swinging platform, together with his camera, and both are then set in lively motion. To the innocent sitter peace and quiet are imparted, to the delight of the fond parent and abundant satisfaction of the operator.

Have you recorded another recent invention, illustrating the fertility of human genius, namely, a garter constructed of two dissimilar metals, in the form of delicate coiled wires, to create a galvanic current around the leg as an effectual cure of rheumatism? ‡

INTERNATIONAL INDUSTRIAL EXHIBITION AT BUFFALO.—The Mechanics' Institute of Buffalo, N. Y., announces a second exhibition, to commence on September 18, and to remain open until October 14. The managers state that they are induced to make this announcement by the great success of, and public interest in the first exhibition, which took place in 1869. The building (the Skating Rink, on Pearl street) will be ready for the reception of goods on and after Monday, September 4th.

PHOTOGRAPHIC NOTES.

A CONCENTRATED IRON DEVELOPER.

Mr. Edwards has found that the addition of a small quantity of copper to the iron developer hastens action, secures immunity from fogging, and brings out the finest details without impairing the contrast of shadows. He prepares a stock solution as follows: Protosulphate of iron, 1 pound; double salt of iron and ammonia, 1 pound; sulphate of copper, 1 ounce; water, 40 ounces, or enough to make a saturated solution. When required for use, take one ounce of the stock solution, dilute with 16 ounces of water, and add an ounce each of acetic acid and alcohol, but their proportions may be varied to suit the requirements of temperature and the special class of work.

There are advantages in having a stock bottle ready to be diluted and mixed when about to be used, and for the tourist who employs the wet process, it is an invaluable method of working, as it is very portable, and can be modified by the addition of one or another solution, to suit the character of the work. A little nitrate of silver solution can be used as an intensifier, if required.

PURIFICATION OF OLD NEGATIVE BATHS.

Worn out negative baths are usually got rid of by precipitating the silver, reducing to metallic state, fusing, and again dissolving. This is a process so long and complicated that most photographers shun to make it, and pour their old baths into the general receptacle for slops, to be sold or got rid of in the easiest way possible.

Mr. Brooks in the "Year Book" proposes the reduction of the negative bath to carbonate of silver to purify it. Dilute the bath to about three times its bulk with distilled water, neutralize with carbonate of soda until a slight turbidity is produced, and sun for several hours; then decant, if necessary, and add sufficient carbonate of soda, free from chloride, to precipitate all of the silver as carbonate. After well washing this precipitate in water, it is in condition to be dissolved in nitric acid of a proper strength to yield a new negative bath.

PAPIER MACHÉ TRAYS.

There is no reason why dishes, trays, pails, bottles and other utensils for photographers' use should not be made of papier maché. This material is not liable to shrink or break. It is very light, unacted upon by acids, impervious to water, unaffected by silver, and is in every way preferable to ordinary porcelain. The difference in cost as compared with porcelain, is now quite trifling.

NEGATIVE PRESERVERS.

All sorts of contrivances have been suggested for preserving negatives, but most of them are cumbersome and expansive. It is now proposed to put them into paper envelopes, and set them aside in boxes, after they have been properly designated. The paper protects them from rubbing, and the expense of grooves, partitions, slides, and other contrivances is avoided. They occupy the least possible bulk when put up in this way, and if laid on edge in boxes, like shelves, can be readily removed in case of fire. Envelopes are now made of the sizes to fit the glasses usually employed by photographers.

HOT CAST CRYOLITE PLATES.

These are now made in this country perfectly flat, from three sixteenths to one quarter inch in thickness, and are ground on one side and polished on the other. They are a great improvement on the milk glass and porcelain, formerly used by photographers. Being of a pure white color, rich tones and beautiful results are easily obtainable. Their flatness and thickness render them secure from breakage.

AN AUXILIARY NEGATIVE.

One of the novelties introduced at the Philadelphia Convention, was a negative for producing a watered or grained effect over such parts of the print as may be desired. The result is obtained by printing for a few moments under a fixed position, and then changing ever so little the position of the auxiliary negative. Imitations of watered silk, also of grains of wood can be readily obtained, and serve to give a new character to the picture.

The East River Bridge.

We have received further intelligence of the progress of this work, which informs us that the tower on the Brooklyn side is fast progressing.

Mr. Martin, the superintendent in charge, reports that not the slightest settlement, even under the enormous weight of the structure, has taken place, nor is it possible that it should, the foundation being solid and absolutely immovable. The work is going on well, and the building on the Brooklyn side having given the engineers experience, and the necessary apparatus being at hand, the New York caisson will proceed much faster than did its sister structure.

The Brooklyn tower, an erection of immense solidity of construction and material, has already reached a hight of some 30 feet above high water mark, and is intended to be 270 feet in hight. It is 100 feet in length by about 170 in width as the river runs, and is built of solid stone, each block weighing several tuns, the interstices between the blocks being filled in with Rosendale cement, which, when thoroughly dry, is as hard as the stone itself.

In the center two large square spaces have been left open, the tower, in the opinion of the engineer, losing nothing in strength thereby. It will be continued to the top on the same plan. When both towers are finished, a span of 1,600 feet will be swung across the river, permitting the passage of nearly all vessels underneath of less than 2,500 tuns burden. Most vessels over that tunnage will be obliged to lower their topmasts before they can pass under.

PROFESSOR TYNDALL ON "DUST AND SMOKE."

On the evening of Friday, the 9th of June, Professor Tyndall delivered a lecture on "Dust and Smoke," to a crowded audience at the Royal Institution. He began by saying that apparently unpractical and purely theoretical scientific investigations often led incidentally, if not directly, to eminently practical results. With reference to the subject of the present lecture, he had been led to study the nature of dust and smoke in consequence of some experiments he had made as to the condensation of certain gases and vapors, on plates of rock salt, closing the extremities of the glass tubes in which they were confined—an inquiry of really little practical importance. The beam of light used to illuminate the tube was found to be polarized, and this led to an investigation of the dust suspended in the aerial medium through which it passed. Ordinary dust consisted largely, as he had explained in his lecture last year on the subject, of minute particles of organic matter. Of these there could now be no doubt that some were of the character of seeds, and that each particular contagious disease, whether smallpox, typhoid fever, or scarlatina, was spread and propagated by its own particular seed; just as a thistle sprang from a thistle, a grape from a grape, or a thorn from a thorn. Putrefaction of wounds and sores arose from the organic germs contained in the atmosphere coming in contact with, and taking root and developing in, the abraded and exposed tissues of the body. Corruption could, indeed, be in a great measure arrested by simply excluding dust, as had been found by a German professor who had succeeded in keeping blood untainted for a considerable length of time in saucers under glass shades, every precaution being taken to keep out dust.

Professor Tyndall then alluded to the cotton wool respirators, which we believe that he was the first to introduce, and which have been found so effectual in guarding the lungs of those engaged in such mechanical operations as are attended with the production of dust. He read a letter from a seed merchant in the north of England, testifying the benefit derived by the persons in his employ from their use. One disadvantage had attended these respirators in the form in which they were at first constructed. The exhaled carbonic acid, which, as well as the inhaled air pass through the cotton wool, rendered this soon damp and unfit for use. By adapting two valves to the apparatus, however, the exhaled gas passed, not through the cotton wool as before, but directly from the mouth into the open air, thus entirely remedying the defect referred to.

In consequence of observing the efficacy of this respirator in preventing the passage of dust into the lungs, Professor Tyndall had been led to inquire if it might not also be successfully employed in excluding smoke. A contrivance which would answer this purpose was much needed by firemen, who were constantly required to enter an atmosphere highly charged with smoke. Various kinds of apparatus had, indeed, been suggested with the object of supplying firemen, under such circumstances, with fresh air. One of these—the smoke jacket—was in actual use by the London fire brigade. Through the kindness of Captain Shaw, the superintendent of the force, he could introduce to the audience a London fireman equipped in this contrivance.

Two or three men of the fire brigade then entered the theatre, and one of them proceeded to don the "smoke jacket." This is simply a loose leathern blouse, with a head piece, fitted with glazed holes to look through. The sleeves are tightly fastened at the wrists, and the garment is also secured at the skirts in a manner which, of course, is far from being absolutely airtight, but which nevertheless suffices to retain a considerable amount of air between the jacket and the body of the wearer. A hose is attached to the jacket, and a constant supply of fresh air is forced into it by a pump on the fire engine. Equipped in this manner, the fireman can penetrate into a burning house, and work with comparative ease in a smoky atmosphere. Professor Tyndall, however, pointed out the obvious defect of the contrivance, viz., that it requires the presence of at least a second man with a pump to keep up the supply of air. The fire escape men, he remarked, had frequently to work single handed, and, accordingly, could not avail themselves of this apparatus, which, in consequence, had really not been found of much service in saving life. A Mr. Sinclair had introduced a contrivance which to a certain extent remedied this defect. This gentleman also appeared before the audience wearing his invention, which may be briefly described as a knapsack "full of air communicating with the mouth through an airtight head piece," where, in virtue of its great specific gravity, it remained and accumulated, thus materially assisting in the outflow of the atmospheric air from the upper portion of the chamber.

After explaining these hitherto employed expedients, Professor Tyndall returned to the subject of cotton wool respirators. Experimenting with these in a smoky atmosphere, he had found them useful to a certain extent; but, nevertheless, insufficient to exclude the irritating fumes from the lungs. By moistening the cotton wool with glycerin its action had been much improved; the sticky character of this substance causing the arrest and retention of a larger quantity of the particles held in mechanical suspension in the smoky atmosphere. Still even with this improvement the apparatus was far from completely answering the desired purpose. On reflection it had occurred to him that, as smoke contained, in addition to particles of matter, various irritating gases—chiefly hydrocarbon compounds—the introduction of charcoal into the respirator might increase its efficiency. The action of this substance in filtering water and purifying air was, he said, well known to the audience. Charcoal respirators had been successfully used for some time in hospitals and other places where foul air is apt to be engendered. Accordingly he had constructed a respirator through which the inhaled air passed, first through a layer of dry cotton wool, then through cotton wool moistened with glycerin, and finally through charcoal. This contrivance was a perfect success. He had filled a cellar in the institution with the densest and most irritating smoke which he could devise—viz., that of resinous pine wood, and he found that he could remain in this atmosphere for an indefinite time without any inconvenience.

During the progress of these experiments, he had communicated with the superintendent of the London fire brigade. This gentleman—Captain Shaw—while acknowledging the great value which an effectual respirator of this kind would be to firemen, had been at first a little skeptical as to the possibility of producing a really serviceable apparatus. On seeing, however, the action of this combination of cotton wool, glycerin, and charcoal, he had at once recognized its utility, and thrown himself heartily into adapting the best form of the contrivance to the wants of the firemen. Professor Tyndall then exhibited various forms of masks and respirators, in all of which this principle had been introduced. The firemen themselves were perfectly satisfied with the apparatus. Several of them had tried it in the smoke filled cellar of the Institution, and stated that they could "remain all day" in that atmosphere.

It will, we think, be obvious to our readers that this invention of Professor Tyndall is really a most valuable and important one. These respirators will doubtless be the means of saving many lives and much valuable property. But we venture to think that they ought also to be in the possession of others than firemen.

The inmates of a dwelling and the owners or people employed in a place of business of course know what rooms (if any) are inhabited, who the occupants are, what valuable portable property they have, and where it is deposited, much better than the firemen can possibly learn it on being suddenly called in to extinguish a conflagration. Provided with these respirators, then, the inhabitants of a dwelling might do much to save life and property, either by their own personal exertions or by guiding the firemen. As a preliminary step towards a somewhat more general adoption of this valuable contrivance, we may suggest that it should be supplied to all watchmen and night porters, in places of business and public offices. It ought also to be carried on board of all seagoing ships.

Sleep Walkers.

The sleep walkers who go from room to room, and are very busy in a sort of world of their own, without actually composing new music or writing new compositions, are numerous. The *Morning Chronicle*, in 1822, gave an account of a seaman who slept for a night at an inn in York. Wishing to be called early next morning, and knowing himself to be a heavy sleeper, he directed the chambermaid to come into his room and call him if he did not hear her knock at the door. Waking when the sun was high in the heavens, he felt certain that he had slept far beyond the proper time; but looking for his watch to know the hour, he found that it was not in its place under the pillow where he had placed it. He jumped out of bed to dress, but his clothes were gone; and looking round, he found himself in a strange room. He rang the bell; the chambermaid appeared, and then he found that he had, at some early hour in the morning, left his bed, and wandered in a somnambulistic sleep into another room, for when the maid came to call him he was not in his proper room.

Wienholt relates the case of a student who, when in a somnambulistic state, was wont to leave his bed, go to the parlor or to his study, take out pen, ink, and paper, place music in its proper position on the pianoforte, and play a whole piece through, with his eyes shut. His friends once turned the music upside down while he was playing. He somehow detected the change, and replaced the paper in the proper position. On another occasion his ear detected a note out of tune; he tuned the string, and went on again. On a third occasion he wrote a letter to his brother, rational and legible to a certain point; but it was singular to observe that he continued to write after the pen had lost its ink, making all the proper movements without being conscious that he made no more marks on the paper.

A case is on record of a young lady who, when under the influence of a particular nervous complaint, would walk about the house in a state of sleep or coma, steering her way safely between the articles of furniture, and even avoiding objects purposely placed to obstruct her path. Her eyes were open, but she evidently did not see through them in the ordinary sense; for she entirely disregarded strong lights held close to her eyes, and even a finger that was actually placed against the eyeball. Physicians are acquainted with many evidences of persons who do not see with the eyes, but have some unexplained kind of vision in certain morbid states of the nervous system.

Those somnambulists who wander about in streets and roads, and (like Amina in Bellini's opera) walk along narrow planks in perilous situations, have the muscular sense, whatever it may be, effectively awake. Dr. Carpenter notices, at some length, "the sleep walkers who make their way over the roofs of houses, steadily traverse narrow planks, and even clamber precipices; and this they do with far less hesitation than they would do in the waking state." The sense of fear is asleep, whatever else may be awake. Some somnambulists start off while asleep to attend to their regular work, though under very irregular circumstances. Not very many years ago, a working stone mason in Kent was on a evening requested by his master to go next morning the churchyard in the neighborhood and measure the work which had been done to a wall, in order that an account might be sent in to the churchwardens. The man went to bed at the usual time; but when he awoke he found himself fully dressed, in the open air, and in the dark. Presently a clock struck two, and he knew that he was in the churchyard. As he found that he had a measuring rod and a book in his hand, he resolved to walk about till daybreak (it being summer weather) and ascertain what it was that he had really done. He then found that he had measured the wall correctly, and had entered the particulars in his book. Sometimes, instead of starting up from sleep to go to work, persons will fall asleep while working or walking. When Sir John Moore made his famous retreat to Corunna, whole battalions of exhausted troops slumbered as they marched. Muleteers have been known to sleep while guiding their mules, coachmen while driving on the box, postboys while trotting on their horses, and factory children while at work. There was a rope maker in Germany, who often fell asleep when at work, and either continued his work in a proper way, or uselessly remade cordage already finished. Sometimes when walking long distances he was similarly overtaken with sleep; he went on safely, avoiding horses and carriages, and timber lying in the road. On one occasion he fell asleep just as he got on horseback; yet he went on, rode through a shallow river, allowed his horse to drink, drew up his legs to prevent his feet from being wetted, passed through a crowded market place, and arrived safely at the house of an acquaintance; his eyes were closed the whole time, and he awoke just after reaching the house.

Gassendi describes a case of a man who used to rise in the night, dress himself while asleep, go down to the cellar, draw wine from a cask, and walk back to his bed without stumbling over anything. If he chanced to wake while in the cellar, which once or twice occurred, he groped his way back in the dark with more difficulty than when the sleep was upon him. Another Italian, also mentioned by Gassendi, passed on stilts over a swollen torrent in the night while asleep, then awoke, and was too much afraid to cross until daylight came.

The Highest Type of Humanity.

Prof. Huxley, in responding to the customary compliments to science at the Royal Academy dinner (London), said, in concluding his speech: "I will be generous, and acquaint you with a fact not generally known, to wit, that the recent progress of biological speculation leads to the conclusion that the scale of being must be thus stated: minerals, plants, animals, men who cannot draw—artists. [A man who knows nothing but to draw is a draftsman, not an artist. An artist is one who can draw, or give shape to, ideas.—*Ed. Good Health.*] Thence I conclude, Sir, that you, as President of the Academy, are the crown and summit of creation. My statement, however complimentary, may be a little startling, and you will therefore, I hope, permit me to state the grounds on which it takes rank as scientific truth. We have been long seeking, as you may be aware, for a distinction between men and animals. The old barriers have long broken away. Other things walk on two legs and have no feathers, caterpillars make themselves clothes, kangaroos have pockets. If I am not to believe that my dog reasons, loves, and hates, how am I to be sure that my neighbor does? Parrots, again, talk what deserves the name of sense as much as a great deal which it would be rude to call nonsense. Again, beavers and ants engineer as well as the members of the noblest of professions. But, as a friend of mine discovered a few years ago, man alone can draw, or make unto himself a likeness. This, then, is the great distinction of humanity; and it follows that the most pre-eminently human of creatures are those who possess this distinction in the highest degree."

On the Transmission of the Sound of the Human Voice by Rods of English Deal.

An interesting modification of Wheatstone's celebrated experiment of the Telephonic Concert was recently tried at the Central High School of Philadelphia. A rod of English deal, about twenty feet in length and three quarters of an inch thick, was let down through a platform into the room below. Insulation from the platform and the ceiling of the lower room was obtained by enclosing the rod with small sections of thick rubber hose. Against the lower end of the sounding box, a small tuning fork was placed. On speaking or singing into the open end of this, the sounds were transmitted by the rod to the room above, the volume of the sound being increased by placing a guitar on the upper end of the rod.

The experiment is exceedingly interesting and striking. Although the interval between the notes is perfectly preserved, their intensity and quality are changed very decidedly, the effect being similar to that produced by ventriloquism. As the position of the rod is immaterial, striking effects can be produced as though by ventriloquism. A small figure, placed on the end of the rod or on the sounding box, adds greatly to the effect. A song is transmitted in a very amusing manner. As it is preferable to have the sounding box held so that the pulses should impinge in the direction of the length of the rod, the experimenter in the room beneath rested, for convenience, on a settee. This mode of transmission of sound does not, of course, give as good results as by means of hollow tubes, as the transmitted sound cannot be heard at as great a distance. It is, interesting, however, from its novelty.—*By Prof. Edwin J. Houston, in the Journal of the Franklin Institute.*

CLEAN stoves, when cold, with black lead; mix with strong alum water.

The Value of the Calculus as a Study.

It is admitted by all metaphysicians and educators, says the *Technologist*, that the calculus brings into play more faculties of the mind than any other branch of learning. Recognizing this fact, the professors of a scientific school should consider their institution not only as a place for obtaining technical information, but a mental gymnasium; and when this idea is fully comprehended by one commencing the study of the calculus, he will be able to decide, at the first recitation, for what purpose it was put in the course of study. A young engineer desires to have enough mathematical knowledge, not only to understand all demonstrated facts in natural philosophy, all discussions on the division of land and the strength of materials, but also to have a mind which will work smoothly and logically, able to stand the worry and wear of business life, and grasp a knotty subject in all its bearings. Such intellectual power depends, to a great extent on the amount of talent originally implanted by the Creator; and it is also the result of education, which brings out the latent forces, gives the mind systematic exercise, and enables it to perform its highest destiny. We advance to our conception of the abstract through the concrete; and when once the former is easy of comprehension, the latter requiring a less amount of mental effort, is included. Herein, then is the value of the calculus, and indeed of all other branches of pure mathematics, that by dealing in abstract ideas, they prepare the mind which thoroughly understands them, to apply itself vigorously to profound or complicated subjects more intimately connected with the realities of life. By solving problems in the calculus, the novice is compelled to exercise every faculty of the mind, especially when a new one is given him in the recitation room. All rules previously learned come up before him, memory is often taxed to the utmost, and, when finally the right method is hit upon, what foresight and care are necessary that the long distant final equation may give the wished for result! Such practice is very beneficial; and, if the student will compare his mental powers then with what they were before the study of the calculus was commenced, he will, perceive his improvement. Let those young engineers, therefore, who have an opportunity to study the calculus under good instructors, take it up with the determination of making it as valuable to themselves as possible; believing that every powerful mind will in time find full scope to exercise itself, and command a proper remuneration for its efforts.

The Traveller's Tree.

This is the name given to a tree which grows in Madagascar, so called because the lower parts of its stems contain pockets or receptacles, which in the driest seasons are filled with pure water. The weary traveller is sure to find refreshment by puncturing these pockets with a spear. The botanical name of the tree is *Urania speciosa*. From a solid trunk varying in hight from ten feet upward, and similar in appearance, though not in nature, to that of the southern palmetto, springs up a bunch of stems, each about six or eight feet long, and each supporting a leaf of the same length and some ten or twenty inches wide. The leaves, when dried, form the the thatch of all the houses on the eastern side of the island, making a perfectly waterproof covering, while the stems are used for partitions and sides. The bark of the tree is very hard, and, unlike that of the palmetto, is easily stripped off from the interior soft parts. For large houses this bark is cut in pieces of twenty or thirty feet long and twelve to eighteen inches wide, and the entire floor covered with the same, as well joined as ordinary timber. The green leaves are used by traders in place of waterproof wrapping paper for packages; by the women, for table cloths, and the heavy pieces cut out of them for plates at meals, while certain portions are even formed into drinking vessels and spoons. But the chief peculiarity of this remarkable tree is that, while standing in the forest, the stems always contain a large quantity of pure fresh water, of which travellers and natives make use in the arid seasons, when the wells and streams are dry. To obtain it, a spear is driven a few inches deep in the thick end of the stalk, at its junction with the trunk, and then withdrawn, when the water flows out abundantly, As every one of the twenty, thirty, forty, or more stalks can give from a pint to a quart of water, a large amount is contained in each tree.

American Beet Sugar.

The experiment of making beet sugar in this country has been thoroughly tried by the Germania Company, at Chatsworth, Ill., and the result is not very encouraging. The company owns 2,400 acres of land, and is provided with all the appliances for the manufacture of the commodity, the mechanism having been for the most part imported from Germany.

It is believed that in proper localities this important industry may be made to thrive, and yield handsome returns upon the capital invested. But it appears to be tolerably evident that some other soil than that of Illinois will have to be selected.

Underlying the State of Illinois is an immense deposit of saltpeter, which shows itself in any of the crops, but especially in the sugar beet. In some of the fourth products sent to St. Louis, boiled from molasses, which had been kept from the end of one season to the beginning of the next, no less than ten per cent of niter was found by their chemist. In fact, the fine needle crystals of niter were mixed with those of the sugar, so that they could be scraped off the surface of the mold. This peculiarity of the soils of the prairies renders them unfit for raising beets for sugar making. The lack of good water is another serious difficulty.

In California, the juice of the beet yields from one to four per cent more of saccharine matter than in Illinois.

Quantity Determined by the Spectroscope.

The use of the spectroscope to detect traces of substances has been the most glorious achievement of the chemistry of the last decade; perhaps its employment to determine minute quantities may be the great exploit of the next. As an essay in this direction, may be noticed the interesting contrivance of K. Vierordt, who divides the movable plate of the slit of the spectroscope into an upper and lower half. Each half is provided with a micrometer screw, by which the width of the corresponding slit can be accurately measured. If the upper and lower slit are of the same width, the spectra are of equal strength. If, however, a colored medium be brought before the upper slit, for example, a tinted glass or a solution of a colored substance in a tank with parallel sides, we have two spectra of different intensities. The other slit is now diminished by the motion of the screw until the spectra are made equal in strength, and by comparison the amount of this motion is made to give the amount of coloring matter present.—*Journal of the Franklin Institute.*

Screw Threads, Bolt Heads, and Nuts.

The following standard for screw threads, bolt heads, and nuts, was adopted by the United American Railway Master Car Builders' Association, at their recent meeting in Richmond:

Diameter of Bolt.	Number of Threads per inch.	Diameter of Bolt.	Number of Threads per inch.
1-4	20	2	4½
5-16	18	2¼	4½
2-8	16	2½	4
7-16	14	2¾	4
1-2	13	3	3½
9-16	12	3¼	3½
5-6	11	3½	3½
3 4	10	3¾	3
7-8	9	4	3
1	8	4¼	2½
1⅛	7	4½	2½
1¼	7	4¾	2⅝
1⅜	6	5	2½
1½	6	5¼	2½
1⅝	5½	5½	2⅝
1¾	5	5¾	2⅝
1⅞	5	6	2¼

The distance between the parallel sides, of a bolt head and a nut for a rough bolt, shall be equal to one and a half diameters of the bolt, plus one eighth of an inch.

The thickness of the heads for rough bolts shall be equal to one half the distance between their parallel sides.

The thickness of the nut shall be equal to the diameter of the bolt. The thickness of the head for a finished bolt shall be equal to the thickness of the nut.

The distance between the parallel sides of a bolt head and nut, and the thickness of the nut, shall be one sixteenth of an inch less for finished work than for rough.

Too Safe a Safe.

From across the ocean, in the London *Builder*, we hear, for the first time, the following: A mechanic in New Orleans constructed a safe which he declared to be burglar-proof. To convince the incredulous of the fact, he placed a one thousand dollar bill in his pocket, had himself locked in the safe, and declared that he would give the money to the man that unfastened the door. All the blacksmiths and burglars in the State have been boring and beating at that safe for a week, and the man is in there yet! He has whispered through the key-hole that he will make the reward ten thousand dollars if somebody will only let him out. Fears are entertained that the whole concern will have to be melted down in a blast furnace before he is released, and efforts are to be made to pass in through the keyhole a fire proof jacket, to protect the inventor while the iron is melting. The inventor swears if he once gets out, that he will in future always try the experiment with a rival patentee inside. He says he never thought he should wish, as he does now, that some one would find a weak place in his armour.

Benefits of Laughter.

Probably there is not the remotest corner or little inlet of the minute blood vessels of the body that does not feel some wavelet from the great convulsion produced by hearty laughter shaking the central man. The blood moves more lively —probably its chemical, electric or vital condition is distinctly modified—it conveys a different impression to all the organs of the body, as it visits them on that particular mystic journey, when the man is laughing, from what it does at other times. And thus it is that a good laugh lengthens a man's life by conveying a distinct and additional stimulus to the vital forces. The time may come when physicians, attending more closely than they do now to the innumerable subtle influences which the soul exerts upon its tenement of clay, shall prescribe to a torpid patient, "so many peals of laughter, to be undergone at such and such a time," just as they do that far more objectionable prescription—a pill or an electric or galvanic shock.

THE Kansas correspondent of the Cincinnati *Times* says: "Pictures in the old geographies used to represent the Indian solitary and in a melancholy attitude on a rock, gazing in a sad reflective way upon a train of cars speeding along in the valley below. He seemed weeping to see the steam horse invading his hunting grounds, and overcome with gloomy forebodings as to his future. I saw the lonely Indian at the railroad depot this morning. He was grumbling because the train was a few minutes behind time, and cursed the depot agent in good missionary English because he did not hurry up and check his carpet bag. He looked delighted when he saw the train coming, shook hands with the conconductor when it arrived, borrowed a 'chaw terbacker' of a brakesman; and, as the train moved away, I saw him comfortably stretched out on two seats, eating peanuts."

NO LIST OF PATENTEES.

At the time of going to press, the official list of patents for the week ending July 11th had not been received at this office.

It is the first time for many months that the Patent Office has failed to furnish copies, and we hope it will be the last for as many months to come.

That class of our readers who watch for the patentees' column with so much interest will be disappointed this week, but the deficiency will be made up next week, and we shall try to provide against a like disappointment in the future. A description of some of the more useful inventions recently patented will be found in the columns usually devoted to such matters.

Out of Print.

New subscribers have poured in upon us since the commencement of our new volume so much faster than was anticipated that, before we were aware of the fact, Number 1, July 1st, was out of print.

Subscribers who do not preserve their numbers for binding will oblige the publishers by sending to this office any copies of July 1st they can spare, to enable us to supply the missing copy to those who keep their numbers for binding.

EDITORIAL SUMMARY.

R. D. MUNSON is a persistent Yankee, a native of Williston Vermont, who has devoted ten of his four score years to the achievement of making a clock that is more complicatedly ingenious than the Strasbourg time-piece, and vastly more serviceable. It runs eight days, and the dial marks the second, minute, hour, and day, the week, month and year; a thermometer rests against its pendulum, giving the state of temperature; the ball of the pendulum contains a miniature timepiece, which derives its motive power solely from its vibrating position, and keeps accurate time; with this there is a delightful musical apparatus, which plays an air at the end of each hour, and it is piously precontrived so as to play only sacred tunes on Sunday, beginning and ending with the "Doxology." On national holidays, the airs are diversified patriotically with "Yankee Doodle," etc. This wonderful timepiece presents a black walnut front ten feet high, twenty inches wide, and ten deep, and is embellished with profuse scroll work and national designs.

NEAR Springfield, Ill., some days ago, a cyclone, beside doing serious mischief, presented a series of wonderful changes. To the eyes of the spectator it first appeared as a mighty whirlwind, the lower stratum of the air seeming to stand perfectly still. Then there succeeded a circular motion, which every instant increased in velocity, whirling up everything it swooped upon like bits of paper. A cylindrical column of dust took shape, reaching like a gigantic pillar to the sky, and through this immense funnel a stream of smoky cloud appeared to descend. Fence rails were picked up like straws and sent flying through the air. At times a river of fire seemed to empty itself from the moving column, to the unspeakable dismay of those who witnessed it. Several good people very nearly suffered translation after the fashion of Elijah, and saved themselves only by falling prostrate and clinging strongly to permanent support. Curiously enough, the actual damage was quite small, as the pillar of destruction traversed only a short distance.

CARPETS, DUST, AND DISEASE.—*Home and Health* says: An atmosphere impregnated with the dust which has been gathered in carpets and remained there for a considerable length of time is positively unhealthy. The dust after being stagnant for some time, especially in warm weather, presents myriads of animalculæ. To prevent the evil the carpets should be cleaned often. The dust should be thoroughly removed every month. The trouble of taking up, shaking and replacing will be amply repaid, first, in the matter of health, and, secondly, in preserving the carpet. We advise the good housewives—there are many—to make a note of this.

IT is reported that the Cuban rebels are using leather guns, a species of artillery used by Gustavus Adolphus and other European commanders in days gone by. The leather while wet is tightly stretched round a wooden core or mold, in successive jackets, the under one being allowed to dry before the next is put on. A close and tight coil of good rope or cord completes the tube, the breech being made of hard wood lined with tin. Such guns will fire some twenty rounds before giving way, and they are so light that a man can carry a couple of four inch bore of the principle. They are usually fired from the ground, or from a cart.

THE newest wonder at the West is a soda lake near Rawlings, on the Union Pacific Railroad, several miles in circumference, and capable of supplying 65,000 tuns of soda a year. This genial body of water is fed from countless springs bubbling from a species of granite rocks which includes in its composition a soda feldspar.

A MAN who is lost to honor, and has a corrupt and festering heart, never finds anything worthy in the conduct of his associates; he looks upon every one with a constant peering suspicion.

A BED of green mottled granite, the first ever found in this country, has been discovered on the line of the Adirondack Railroad, New York.

FOR FRUIT STAINS ON NAPKINS, TABLE CLOTHS, ETC.—Pour hot water on the spots; rub in hartshorn, or oxalic acid dissolved in water.

What a Fence should be.

In the excellent work on "Suburban Home Grounds," lately issued, and written by J. F. Scott, appear the following valuable suggestions regarding fence construction, something, the importance of which, in adding to the completeness and general good effect of home surroundings, is generally under-estimated:

We are at a loss how to convey the just ideas of the choice that should be made among the infinite variety of fences in our country without writing an illustrated essay. For country or large suburban grounds it is safe to say, except where hedges are maintained, that that kind of fence is best which is least seen, and best seen through. But in towns our fences must harmonize with the architecture and more elegant finish of the street, and therefore be sufficiently well designed and constructed to be in themselves pleasing objects to the passer by. The great desideratum is to answer this requirement, and at the same time to adopt some design that will least conceal the lawn and other beauties beyond or behind it. Our fences should be, to speak figuratively, transparent. Now what will make a transparent fence is a matter much more difficult to decide than the reader will suppose. Where iron fences can be afforded, it is easy to effect the desired result; but they are so expensive that wood will long coutinue to be the main fence material even in towns. Where something really elegant can be afforded, an architect's services should be called into requisition as much as for the residence design. A fence may be as fine a work of art as any other construction, but the architect ought to bear in mind that it should not unnecessarily conceal the beauty it incloses. Among the less expensive kind of fencing, we will mention a few of the forms generally used. First, and most common of all fences claiming to be ornamental, is the plain picket fence, made of strips set vertically the whole hight of the fence, and from one and a half inches to one inch by three. All picket fences shut out a view of the ground behind them, until one is nearly opposite the pickets, as completely as a tight board fence of the same hight. An old and ornamental form of picket fence is that composed of three horizontal rails, with two equal spaces between; one set of pickets being short, and terminated in points above the middle rail, while every other one rises through the top rail in the same way. This gives double the space between the pickets on the upper half of the fence, where a transparent fence is indispensable. It is the best, and also one of the most expensive of the old forms of wooden fences, and the only kind of fencing that should be tolerated for enclosing ornamental grounds.

Fences formed of horizontal rather than vertical pieces are preferable; and the openings between the bars should be as wide as insurance against animals will permit. A substitute for the old style of picket fences, now much used, is composed of boards sawn so that their openings form ornamental designs. These are adopted from German designs for cheap balconies and veranda guards, for which purpose they are well adapted and beautiful; but for front fences they are even more objectionable than pickets, because they bar more completely the view of what is behind. To unite strength, beauty and "transparency," is the object to be gained. What wooden fences will best do this we must leave to the reader's ingenuity and good sense to decide. Those who build most expensively do not necessarily secure the most tasteful places, and in fencing there is much opportunity to let thought balance money. Some very pretty rod iron fences are made, both vertical and horizontal, which are much cheaper than woven wire or cast iron; but both of the latter, being always at hand or ready made for those who have the means to use them, will probably continue to increase in use. The tasteful forms in which iron fences are generally made, together with their indestructible character, will continue to make them more and more desirable. Were it not for the shameful freedom given to the animals in many town and village streets, such fences might be made so much lower and more open than now, as materially to lessen their cost.

Answers to Correspondents.

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 must be by volume and page.

VALUE OF COAL AS FUEL.—An experiment lately tried in this vicinity on bituminous and anthracite coal gave a result 5½ per cent in favor of the former; that is, a pound of bituminous coal evaporated 5½ per cent more water than a pound of anthracite coal. I cannot say for a certainty which kind would be most injurious to a boiler, but if the welding of iron by each kind be a criterion to judge by, then I should conclude that anthracite would be the most injurious.—P. Q.

COPYING INK.—If querist No. 9, in issue of July 1st, will take any good bodied ink, (not writing fluid), and add to it one fourth of its bulk of glycerin, he will have the article he calls for. The glycerin prevents the drying of the ink, and when he has written a page he can take a copy in the way described. After taking copy, take up any remaining ink with a common blotter, turn over the leaf and go on writing, copying each page as he proceeds. The writer has copied in this way for years with perfect satisfaction. If the ink dries too quick, add more glycerin; if too slowly, use less. It is desirable to write an even hand with no very fine or very heavy strokes, as the fine ones may dry too quick, and the heavy ones may blot in copying.—G. P. A.

BALLOON VARNISH.—Answer to H. W., query 2, July 1st.—Melt india-rubber in small pieces, with its weight of boiled linseed oil, and thin it with oil of turpentine.—G. S. R., of Ind.

TO KEEP FLIES FROM HORSES.—Take of green leaves of the shagbark hickory (*Carya Alba*) *quantum suff.*; bruise in hot water, let cool, and strain, and sponge the most exposed parts before the horse leaves the stable. I have found this perfectly effectual in preventing horse flies, common flies, greenheads, and mosquitoes from troubling horses, for three or four hours after application.—J. M. H.

POUNDING OF PISTON.—I was troubled with the noise referred to, and took the piston out, when I found I had keyed the crank wrist box ahead, so that the follower head just touched the cylinder head at one end. I suspect that is the trouble with your querist.—C. E. G., of Conn.

T. J. L., of Mass.—We have given all the information yet received by us, in regard to the saccharate of mercury process for extracting gold. Should anything else of importance be published or communicated, we shall notice it in due order.

J. B., Jr., of Ohio, wants an arrangement of lenses, mirrors, etc., whereby he can see customers coming into the front room, without rising from his seat in the back room. There is a window looking from the back room into the front room, but to reach this, he has to rise and walk across the room. Judging from his description, two small mirrors, set at the proper angles, will effect his purpose. A little experiment will enable him to adjust them.

C. E. G., of Mich.—For what purpose do you wish to put kerosene in your boiler? We are at loss to conceive any reasonable purpose for so doing. As to the question of danger, we believe there is always danger in the use of highly inflammable materials about fire. Be advised—don't do it.

E. W., of L. C.—All things else being equal, two wheels of different weights will roll down the same inclined plane in equal times. No matter how the weight is distributed, provided the wheels are balanced, and not taking into account the resistance of the air.

Y. A. S. C., of Mass.—Bathing in fresh cold water may not only be done every day by persons in good health without injury, but with benefit, provided it is done very quickly and care is taken not to produce a chill. To go in daily for the purpose of swimming, and to remain indefinitely in cold water, regardless of the state of the system, and to incur fatigue in so doing is, in our opinion, a dangerous practice.

C. D., of Ohio.—The shining particles in the minerals you send, appear to be mica, not gold.

Examples for the Ladies.

Miss Kate Flynn, New York, earned, with a Wheeler & Wilson Machine, $1,541.77 in 876¼ days, of 9 hours.

Messrs. Geo. P. Rowell & Co.,
Advertising Agents, No. 40 Park Row, New York, are authorized to receive advertisements for this paper at our lowest prices.

Rose Cold, Hay Fever, are conquered by Whitcomb's Asthma Remedy.

The Universal Wringer has been in use in our family for years, giving entire satisfaction. We speak whereof we know when we say it is one of the best labor-saving machines ever invented, having several points of superiority over any Wringer we have examined.—*New York Liberal Christian, April 2, 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 17c. a line.

For best Lubricating Oil, Chard & Howe, 134 Maiden Lane, N.Y.

Copper and Brass Seamless Tubes (from 3-8 to 5 in. outside diameter. Merchant & Co., 507 Market st., Philadelphia.

The Baxter Steam Engine Co., 18 Park Place, New York, have the most economical engine in the world. Sizes 2 to 10 H.P. Send for Circular.

For the best Galvanized Iron Cornice Machine in the United States, address Calvin Carr & Co., Cleveland, O. Superiority guaranteed.

Parties contemplating the adoption of a new Motive Power for Sewing Machines, would do well to address the Case Swinging Treadle Co., Cleveland, O.

The American Standard of Bolts and Nuts. Full-sized drawing. Price $1.00. Address Edward Lyman, C.E., New Haven, Conn.

Wanted to know where "Mechanical Fly Drivers," moved by clock work, intended to be placed on a table, formerly sold in New York for one dollar each, are to be had. J. H. McHenry, Pikesville, Md.

Wanted to purchase, an established business, or an interest in a business. Chemical or manufacturing preferred. Address, by letter, F. C. Beach, 260 Broadway, cor. Warren st., New York city.

For Sale.—Mill Stones, Machinery, Gearings, Conveyors, 4 Page's Mills. 542 West Thirty-third st., New York.

The Greenleaf Grate Bar saves fuel, and lasts much longer than the ordinary bar. Address Greenleaf Machine Works, Indianapolis, Ind.

The "Patent Steam Gongs," in use for Fire Alarms, Fog Signals on steamboats, factories, etc., have a musical tone, and have been heard thirty miles. Manufactured by the Union Water Co., Worcester, Mass.

Steel Castings, as perfect as iron or brass, made to pattern, by Union Steel and Iron Works, Rhinebeck, N.Y. Van Zandt Bros., Agents, 4 Dey st., New York.

The Eccentric Elliptic Geared Power Presses are the best in the world. For Circulars, address Ivens & Brooke, Trenton, N.J.

Mat Trimming Machines wanted by M. Curley, 432 W. 36th st., New York.

$50,000 can be made from Abbe's Patent Bolt Forging Machine in a short time. Best designed in United States. Investigate. Patent for sale. Address John R. Abbe, 119 John st., Providence, R.I.

Wanted.—A first class Mechanical Draftsman; one experienced in wood-working machinery preferred. Address E. Lyon, 470 Grand st., New York.

Two 80 H. Engines, with Boilers, Esler & Co.'s make; good order; ⅓ cost new. Andrews & Bro., 414 Water st., New York.

The Baxter Steam Engine will not explode.

Wanted.—A Fox Lathe and Hand Lathe, with V set-over and back motion. Apply at, or address, Room 9, 91 Liberty st., New York.

Peck's Patent Drop Press. Milo Peck & Co., New Haven, Ct.

Diamond Carbon, of all sizes and shapes furnished for drilling rock, sawing and turning stone, conglomerates, or other hard substances also Glazier's Diamonds, by John Dickinson, 64 Nassau st., New York.

For Centrifugal Pumps, address Morris, Alvord & Co., 70 Canal street, Syracuse, N.Y.

Magic Lanterns and Stereopticons, of every description. Send for Catalogue. W. Mitchell McAlister, 728 Chestnut st., Philadelphia.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

Electrical Instruments, Models, etc., made to order, and Gear Wheels and Pinions cut, by W. Hochhausen, 113 Nassau st., Room 10, N.Y.

Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth st., Brooklyn, manufacture Presses and Dies. Send for Catalogue.

The Bucket-Plunger Steam Pump discharges at both strokes, with only two water valves. Valley Machine Co., Easthampton, Mass.

Lord's Boiler Powder is only 15 cts. per pound by the bbl., and guaranteed to remove any scale that forms in steam boilers. Our Circular with terms and references, will satisfy all. Geo. W. Lord, 107 W. Girard ave., Philadelphia, Pa.

Improved mode of Graining Wood, pat. July 5, '70, by J. J. Callow, Cleveland, O. See illustrated S. A., Dec. 17, '70. Send stamp for circular.

Ford's Portable Tobacco Press for Planters. Will sell Virginia, Maryland, Missouri. Address Ford's Tobacco Warehouse, Evansville, Ind.

The Patent for the best Hydrant, or Fire Plug ever invented, for sale. For descriptions, terms, etc., address Lock Box 256, Lockport, N.Y.

The Baxter Steam Engine pays no extra insurance.

Best Scales.—Fair Prices. Jones, Binghamton, N.Y.

Steam Watch Case Manufactory, J. C. Dueber, Cincinnati, Ohio. Every style of case on hand, and made to special order.

L. & J. W. Feuchtwanger, Chemists, 55 Cedar st., New York, manufacturers of Silicates of Soda and Potash, and Soluble Glass.

For Hydraulic Jacks, Punches, or Presses, write for circular to E. Lyon, 470 Grand st., New York.

Belting that is Belting.—Always send for the Best Philadelphia Oak-Tanned, to C. W. Arny, Manufacturer, 301 Cherry st., Phil'a.

Copper and Brass Seamless Tubes (from 3-8 to 5 in. outside diameter). Merchant & Co., 507 Market st., Philadelphia.

Send your address to Howard & Co., No. 865 Broadway, New York, and by return mail you will receive their Descriptive Price List of Waltham Watches. All prices reduced since February 1st.

Ashcroft's Low Water Detector, $15; thousands in use; can be applied for less than $1. Names of corporations having thirty in use can be given. Send for circular. E. H. Ashcroft, Boston, Mass.

The Baxter Steam Engine is made like the Waltham Watch each part duplicated.

To Cotton Pressers, Storage Men, and Freighters.—35-horse Engine and Boiler, with two Hydraulic Cotton Presses, each capable of pressing 75 bales an hour. Machinery first class. Price extremely low. Wm. D. Andrews & Bro., 414 Water st. New York.

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Improved Foot Lathes, Hand Planers, etc. Many a reader of this paper has one of them. Selling in all parts of the country, Canada Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N.Y.

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

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Glynn's Anti-Incrustator for Steam Boilers—The only reliable preventive. No foaming, and does not attack metals of boilers. Price 25 cents per lb. C. D. Fredricks, 587 Broadway, New York.

The Baxter Steam Engine is manufactured by Colt's Arms Co., Hartford, Ct., and sold by the B. S. E. Co., 18 Park Place, 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.

APPLICATIONS FOR EXTENSION OF PATENTS.

POWER LOOM FOR WEAVING WIRE CLOTH.—Erastus B. Bigelow, of Boston, Mass., has petitioned for an extension of the above patent. Day of hearing, September 20, 1871.

METALLIC SQUARES.—Samuel Darling, of Providence, R.I., has petitioned for an extension of the above patent. Day of hearing, September 20, 1871.

CORN SHELLER.—Arlow M. Cook, of Chicago, Ill., has petitioned for an extension of the above patent. Day of hearing, September 20, 1871.

STEAM PRESSURE GAGE.—E. G. Allen, of Boston, Mass., has petitioned for an extension of the above patent. Day of hearing, October 11, 1871.

MACHINE FOR TURNING WOODEN BOXES.—Alexander S. Newton, of Brandon, Vt., has petitioned for an extension of the above patent. Day of hearing, November 1, 1871.

Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing

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Inventions Patented in England by Americans.

June 22 to 26, 1871.

[Compiled from the Commissioners of Patents' Journal.

FURNITURE CASTOR.—J. B. Sargent, New Haven, Conn.

GLASS BLOWER'S MOLD.—S. R. Bowie, New Bedford, Mass.

MACHINE FOR TRIMING LEATHER.—E. S. Hidden, Millburn, N. J.

MACHINE FOR TURNING CROPS, ETC.—W. W. Wallace, Pittsburgh, Pa., A Giles, Ridgeley, Eng.

ORGAN.—H. Burdett, Chicago, Ill.

PLOW, ETC.—W. S. Pratt, Pittsburgh, Pa., A. Giles, Ridgeley, Eng.

PRINTING ON CLOTH, ETC.—J. Peacock, New York city.

SEED SOWER.—W. G. Comstock, East Hartford, Conn.

SEWING MACHINE TREADLE.—L. W. Sapp, Cleveland, Ohio.

SPARK ARRESTER.—J. Smith, T. W. Worsdell, Altoona, Pa.

STEAM ENGINE.—H. W. Adams, Philadelphia, Pa.

Foreign Patents.

The population of Great Britain is 31,000,000; of France, 37,000,000 Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, while business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & CO., 37 Park Row, New York. Circulars, with full information on foreign patents, furnished free.

Queries.

[We present herewith a series of inquiries embracing a variety o topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—RELATIVE POWER IN BORING AND TURNING.—My query, which you were kind enough to publish, concerning the boring of the sixteen inch cylinder, elicits two answers in your last issue, both of which lose sight of the main question. I want to know why it requires more power to bore a sixteen inch cylinder than it does to turn off a twenty-four inch pulley, the cuts being equal. B. P. G., of Mass., gives me directions for making a tool. I think the tool used equally as good, although not having tried his, I would not assert this positively. I used a boring head 15½ inches diameter, with a cutter placed lengthwise, and sharpened to a point on the combined principle of a side tool and a diamond point. R. H., of Mass., is mistaken in the gear. It was not the feed gear that gave way but the back gear and the fixed gear on the lathe mandrel. I am convinced that there is a principle involved, and that it governs the speed as well as the power. I have found by experience that the speed I run my lathe at, for the turning of a 24 inch pulley is right for the boring of a 10 inch cylinder, and when I get a cylinder over 12 inches in diameter, I have to use a smaller driving pulley on the main shaft. I would like to have these two questions answered: 1st. Why does it require more power to bore a 16 inch cylinder than to turn off a 24 inch pulley, or why will a lathe not bore as large as it will turn—say 24 inches? 2d. Why do we run a lathe as slow to bore a sixteen inch cylinder as to turn off a 24 inch pulley, or why can I not run my lathe as fast on a 24 inch cylinder as a 24 inch pulley?—G. S. R.

2.—CAST STEEL.—What is the best method of decarbonizing cast steel, leaving it soft and tough?—C. B. M.

3.—POLISHING MEERSCHAUM.—Will some one inform me how meerschaum is polished, and what is used to polish it?—A. R.

4.—SEALING FRUIT CANS.—I would like a recipe for a composition or wax for sealing tin fruit cans. The one now in use—beeswax and resin—taints most of the fruits so badly that they have a flavor of soapsuds. The resin utterly spoils blackberries. Our fruit season is now upon us, and anything more suitable than the wax now in use will be thankfully received by all your readers in California.—J. B. H.

5.—TO PREVENT OIL BARRELS FROM LEAKING.—What must we do to prepare barrels in such a manner as to prevent the leaking of oil?—L. & B.

6.—BELTS.—Which is the best side, next to the pulley, to run a leather belt? the flesh side or the hair side?—J. F. M.

7.—ANILINE DYES.—How are aniline dyes prepared? What mordants are used to secure a permanent yellow, blue, brown, pink, or purple? What quantity of albumen is used, and how applied?—W. B.

8.—FINISHING WALNUT WOOD.—Is there any means of filling the pores of walnut wood so as to retain the natural life and luster of that beautiful timber, after being varnished? I find nothing in any work in my possession on the subject which will accomplish it, though I suppose there is something used which will effect the purpose.—H. W. M.

9.—FROST PROOF STORE ROOM.—How can I build a frost proof store room above ground, that will answer all the purposes of a cellar below ground?—W. S. H.

10.—BELTS.—If a belt be placed upon drums, the shaft of one of which is inclined relatively to the other, or as the machinists term it, "out of line," which way will the belt run on the inclined drum, to the higher or lower end?—J. E. G.

11.—MARINE GLUE.—F. L. J., of Ark. (June 24th), tells how to make marine glue, namely, by dissolving shellac and india rubber in ether. I have failed utterly to make marine glue according to his formula. I first tried sulphuric ether, pure, which had been prepared for anæsthetic uses. It acted slightly upon the shellac, but not at all on the rubber. I next tried nitric ether. This dissolved a portion of the shellac, but made no impression upon the rubber. I followed the directions strictly, with the exception of heating the ether, which my druggist said would not do, as the boiling point of ether is only 98°. Will F. L. J. please tell me how to make marine glue?—J. H. P.

12.—H. W. L. wants to know how to deposit copper by the electrotype process upon wood.

13.—STAINING HATS.—How are the best straw hats stained that deep dark color that the manufacturers put on them? How is the stain made?

Recent American and Foreign Patents.

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

INSECT TRAP.—Lyman I. Way, of Annawan, Ill.—A recessed funnel, made of tin or other smooth metal, or material, is provided with a handle, and with a flange or collar, near its bottom or small end. A bag, made of cloth, or other suitable flexible material, has its mouth secured to the funnel above the collar, by tying or otherwise, so that it can readily be removed. A recess in the rim of the funnel receives the stalk of the plant when the trap is applied. In this manner the funnel is made to partly surround a plant infested with insects. Upon slightly jarring the plant, the bugs or insects upon its leaves will fall into the funnel and slide down into the bag. When once in the bag, they cannot get out, as, if they crawl up the side of the bag, they cannot reach the projecting end of the funnel. In this manner the trap may be carried from plant to plant, and applied until the bag becomes full, or nearly full. Boiling water is then poured into the funnel, which destroys the insects. The bag is now removed from the funnel, and its contents discharged, when it is replaced, and is ready for a repetition of the operation. In this manner a potato field may, in a short time, be rid of destroying pests. The trap may be applied to cucumber and other vines, as well as to other plants, when infested with similar vermin. The remedy is cheap and simple, and is claimed to be effective.

MACHINE FOR LAYING OUT SASH.—This invention consists in a pair of rods, carrying adjustable cutters, arranged above a table, on which the bars to be laid off are placed to work reciprocally toward and from each other and the table, by the action of a foot lever and a spring, for cutting or marking both sides at once, by pinching the bar between them. The sash bars to be laid out are placed on a table, with one end against a gage, by which they are held in the right position relatively to the cutters in the lengthwise direction, and the cutters, being also adjusted properly from the end of the bar and from each other, are brought up against the sides simultaneously, marking both at once. The treadle is raised, and the bars moved back by a coiled spring. John F. Kikendall, Jr., of Virginia, Ill., is the inventor.

FRAMING JOINTS.—Jonah Newton, of New York city.—This invention relates to a new and improved arrangement of mortises and tenons for framing door sash and other like frames and cabinet work together; and it consists in a semi-circular, or nearly semi-circular mortise and corresponding tenon, the latter made on a greater circle, so as not to fit the curved wall of the mortise in the bottom closely, the mortise being made by a circular tool, against which the piece to be mortised is moved in a right line, or the tool moved to the piece; or the said mortise, being first made in this form by a circular tool, may be modified by cutting the ends down for about half, more or less, of the depth of the mortise, on a straight, oblique line, and fitting the tenon thereto. The invention also consists in providing the mortise on the curved wall, or the partly curved and partly oblique walls, with a tongue, and the tenons with a corresponding groove to receive the tongues. The object of the first part of the invention is to simplify and cheapen the making of the mortise, and to provide an arrangement which will prevent the sagging of the doors when the stiles shrink in width; also, to keep the joints tight at the shoulders of the tenons; and the object of the second part is to provide an arrangement whereby the adhesion of the parts, when locked together, will be greater, and a greater surface and better condition for the adhesion of the glue will be provided in the parts to be glued.

MUSIC LEAF HOLDER.—Achille Extein and Jesse C. Mills, Inventors.—This consists of a wire bent to form a blunt loop for insertion between the leaves of the book, and also a spring by which a large number of leaves are bound together, so that the leaves cannot turn and perplex the player. The instrument is provided with a neat handle. We need not say it is also applicable to other than music books.

CORN PLANTER.—This is a new and very practical combination of well known devices, whereby a very compact and, we judge, efficient machine has been secured. It is the invention of Samuel J. Rye, of Bluff Point, Ind., assignor to himself and William C. Rye, of the same place.

HASP LOCK FOR TRUNKS, ETC.—A revolving concentrically slotted locking disk in combination with a cap attached to the hasp plate and a headed pin attached to the stationary plate, are the claims for improvements in the patent of Jacob Fisler and George Crompton, of Jersey City, N. J., by which the inventors secure a very simple, strong, and elegant lock for trunks, etc.

SUPPORT FOR MIRRORS AND PICTURE FRAMES.—Dominikus Hartmann, of Mansfield, Ohio, has invented an improved support for mirrors and pictures, which consists of a bracket provided with two or more movable arms, from which arise yokes, between the arms of which are pivoted the articles to be supported. In this way he is able to support more than one object by a single bracket, and at the same time to attain considerable beauty of design in the support itself.

FEATHER RENOVATOR.—This is an apparatus for first steaming and cleansing feathers, and then drying them by the introduction of hot air, the feathers being all the while beaten and stirred by revolving arms in a closed chamber. By the use of this machine the feathers are taken from the sack or bed tick, cleansed, dried, and delivered back into the sack or tick without being handled by hand or exposed to the atmosphere, the operation being, it is claimed, performed in the most expeditious and perfect manner. The inventors are Charles E. Barber and William Dean, of Central Village, Conn., assignees to themselves and George Loring, of the same place.

HAY ELEVATOR.—William T. Nell, of Greensborough, Pa.—This is an arrangement of rope pulleys and self locking and unlocking car and car pulley running upon a horizontal rod whereby part of the load is sustained by the rope which effects the propulsion of the car, thus relieving other parts of strain usually sustained by them.

GRIPERS FOR CYLINDER PRINTING PRESSES.—Victor E. Mauger, of New York city.—The cylinders of printing presses are provided with gripers for holding the paper during the process of printing. Where one cylinder receives the sheets of paper alternately from opposite sides to carry them in opposite directions over the printing bed, it must be provided with two sets of gripers. The object of the present invention is to provide the cylinders of such two feeder presses with adjustable gripers, so that sheets of suitable lengths can be held therein. The invention consists in the use of radial spring gripers guided in movable tubes, which can be set in the perforated cylinder, so that one set will be a suitable distance from the other set of gripers. A set of cams on the stationary central shaft serves to move the radial gripers for opening and closing the same. By this invention two feeder cylinder presses can be adapted for use on sheets of suitable sizes, whereby the scope of their usefulness and their consequent value will be greatly increased.

CANAL LOCKS.—John W. Gentry and George W. Barcus, of Peytona, West Virginia.—This invention consists in an arrangement of snubbing posts or rods in recesses of the walls of the locks, whereby the snubbing ropes may rise and fall on them with the boat in a manner by which the boat may be controlled much better, and the wear of the ropes will be less, than in the use of the snubbing posts arranged on the top of the wall, as in the common way. Long rods or posts are used for the snubbing ropes, so that they may rise and fall on the said posts or rods with the boat, and thereby avoid the tilting and swinging necessarily due to the irregular action of the snubbing rope when working over the upper edge of the wall upon posts at the top, which has a tendency to tilt the boat when lowering, and prevents, by the friction of the rope on the wall, the tightening up of the ropes sufficiently when rising, and in either case wears the ropes away very fast. The rods are supported at the ends in metal plates, or in any other suitable supports, and extend either to the bottom of the lock or to low water mark, or thereabout, as may be preferred.

DOOR FASTENER.—J. A. Morris, of Greenbush, N. Y.—The object of this invention is to provide simple and efficient means for fastening doors on the inside, and which shall be a safeguard to travelers and others in rooms where locks are lacking or out of order. It consists in a jointed plate with spurs for entering the door casing, and with a head and thumb screw for securing the door, which may be carried in the pocket, and which is claimed to be especially valuable for travellers in all circumstances, as ordinary locks are, at best but a poor protection to the lodger.

METHOD OF DRAWING PATTERNS FOR FLARING VESSELS.—Orlando B. Vandenburg, of Findlay, Ohio, has invented a new method of drawing patterns for cutting sheet metal, the object of which is to provide a convenient and reliable system of laying out on sheet metal the necessary lines, so that the metal may be cut to be bent into truncated cones. A diagram only can give a proper conception of the method employed, which is simple and easily applied.

DEVICE FOR FASTENING HANDLES TO SATCHELS, ETC.—Morris Schwerin, Newark, N. J.—This invention relates to a new and useful device for fastening the handles of satchels and travelling bags, valises, trunks, etc. It consists in a flanged cup and flanged tube riveted together, and in a spring clasp around the cup, which clasp is fastened to the bag, trunk, or other article. The fastening thus consists of three pieces, each of which is struck up from a single piece of sheet metal. This fastening is strong and durable, and, it is claimed, costs much less than those now in use. The common fastening for this purpose is made from solid cast metal, and the flanges are made by turning in a lathe and by a screw at the end of the cup. The handle is fastened in the cup by a rivet, the same as in the present device. This fastening is very objectionable, as the screw is very liable to work out, thus rendering it useless.

BREECH LOADING FIREARMS.—This invention consists in a novel and simple arrangement of a locking bar and connecting link with the breech pin and actuating lever for locking the breech pin and working it; also in a novel ejecting apparatus for throwing out the cartridge shell when the breech pin is moved back, said apparatus being set in motion by the breech pin in its backward movement. It also consists in the arrangement of a cover and spring, in connection with an aperture in the side of the stock, whereby the cover is caused to close after the first cartridge has been put in by the said cartridge being forced against it by the magazine spring. George R. Stetson, of New Haven, Conn., is the inventor.

BOOT AND SHOE TAPS.—John C. Hancock, of Charlestown, and Josiah C. Richardson and Edward P. Richardson, of Somerville, Mass.—The inventors employ a thin plate of metal between two plates of india rubber, securing it by making the rubber pieces broader than the metal and uniting the over lapping margins. The bottom plate of rubber will be thicker than the upper one, as it is subjected to the greatest wear. The metal plate will preferably have numerous large perforations in the central part, so that the two plates of rubber may be connected through them, for uniting them more permanently and preventing any looseness of the rubber on the metal between the margins. These metal plates are provided with a row of screw holes, near the edges, for fastening the taps to the soles, and they are intended mainly for holding the screw heads better than the rubber, which is liable to tear and stretch and become loose. Both sole and heel taps are made in this way. These taps possess the principal advantages of india rubber shoes, without being so heavy or clumsy, or interfering with the circulation by cramping and binding the feet. They keep the feet warm and dry, prevent slipping on the ice, are noiseless, easy, light, elastic, and do not detract from the dressy appearance of the boot or shoe.

Practical Hints to Inventors.

MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, have devoted the past twenty-five years to the procuring of Letters Patent in this and foreign countries. More than 50,000 inventors have availed themselves of their services in procuring patents, and many millions of dollars have accrued to the patentees, whose specifications and claims they have prepared. No discrimination against foreigners; subjects of all countries obtain patents on the same terms as citizens.

How Can I Obtain a Patent?

Is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them: they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows and correct:

Construct a neat model, not over a foot in any dimension—smaller, if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row, New York, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible, and send by mail. An answer as to the prospect of a patent will be received, usually, by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

Caveats.

Persons desiring to file a caveat can have the papers prepared in the shortest time, by sending a sketch and description of the invention. The Government fee for a caveat is $10. A pamphlet of advice regarding applications for patents and caveats is furnished gratis, on application by mail. Address MUNN & Co., 37 Park Row, New York.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention, if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

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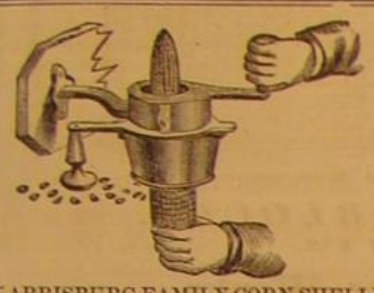
The value of the SCIENTIFIC AMERICAN *as an advertising medium cannot be over-estimated. Its circulation is ten times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading-rooms of the world. We invite the attention of those who wish to make their business known to the annexed rates. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. If it is worth 25 cents per line to advertise in a paper of three thousand circulation, it is worth $2.50 per line to advertise in one of thirty thousand.*

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HARRISBURG FAMILY CORN SHELLER CO. want an Agent in every City and County in the United States, to sell their Family Corn Sheller. The simplest and best invention of the kind. Agents can make large profits. Send for Circular to
EUGENE SNYDER, Treasurer,
Lock Box 9, Harrisburg, Pa.



THE CELEBRATED COLLINS GOLD METAL WATCHES.—CAUTION TO THE PUBLIC.—Worthless Brass Watches are being sold all over the country, by parties representing themselves as our agents. These parties are all imposters, as WE HAVE NO AGENTS, and our genuine goods can only be obtained by ordering from us direct, and having goods sent C. O. D. by express. Prices of Watches, $15, $20, and $25. Equaling, for time and appearance, gold watches, costing ten times these sums. Chains, $2 to $10, according to style and weight. Also, Jewelry of every kind.
C. E. COLLINS & Co., 335 Broadway, New York.



We make only one style, and have but one price for our Pianos, which are all made from thoroughly seasoned and kiln-dried materials, and have seven octaves—rosewood case—carved legs and lyre—large square grand overstrung scale—front round corners—serpentine bottom—iron plate—French action—and are all warranted five years. We have no agents, and allow no commissions or discounts to any one. This explains how we can sell a good Piano for $290, which is about the price Piano dealers pay to manufacturers for instruments similar to ours. Piano dealers are allowed by all manufacturers, except ourselves, to add 100 per cent., and upward, profit to all sales. This the public can prove by investigation to be strictly true. Piano dealers, teachers, professors, and everybody else, are excluded from any and every possibility of a single cent of commission on our Pianos. If you wish a Piano sent for trial, you must make the matter of reference and payment unquestionable; and if the instrument is in any respect inferior to any Piano made in the known world at any price, you may send it back to us at the end of ten days' trial, instead of paying for it. If you order a Piano sent, we have one request to make; and that is, that the trial shall be made by parties who are not interested in other Pianos. Please send for our Circulars containing full particulars and references to bankers, merchants, and families, in thirty-five States and Territories, who are using our Pianos. Address or apply to the
UNITED STATES PIANO CO., 645 Broadway, N. Y.

PURCHASE Machinery of every description of A. S. & J. GEAR & Co., 56, 58, 60 and 62 Sudbury st., Boston, Mass., where Machinery can be seen running.

A. S. & J. GEAR & CO., 56, 58, 60 and 62 Sudbury st., Boston, Mass., have the largest Machinery Depot in the United States, where they show machinery running.

SHINGLE AND BARREL MACHINERY.—Improved Law's Patent Shingle and Heading Machine, simplest and best in use. Also, Shingle Heading and Stave Jointers, Stave Equalizers, Heading Planers, Turners, etc. Address TREVOR & Co., Lockport, N.Y.

CINCINNATI INDUSTRIAL

Exposition!

1871.

The Second Grand Exhibition of

Manufactures, Products, and Arts,

Under the auspices of the

BOARD OF TRADE,
OHIO MECHANICS' INSTITUTE,
AND CHAMBER OF COMMERCE,

Will be held in

CINCINNATI,

From September 6th until October 7th, 1871.

IN extensive buildings specially erected for the purpose, on a scale FAR SURPASSING the Great Exposition of last year.
Space can now be secured.
Circulars, Rules, Blank Applications, etc., can be had on application, or by post.
Many were disappointed last year by delaying their applications until a late date.
Buildings open to receive articles, August 16th, 1871.
Address
H. McCOLLUM, Secretary.

BENT, GOODNOW & CO., Boston, Mass., Publishers of "PATENT STAR," sell Patent Rights and goods of all kinds. Orders solicited. AGENTS WANTED.
☞Send stamp for copy.

FOOT LATHES,
And all kinds of small Tools. Illustrated catalogue free GOODNOW & WIGHTMAN, 23 Cornhill, Boston, Mass.

THE NEW YORK (VIADUCT) RAILWAY COMPANY.

DIRECTORS:

Alexander T. Stewart,	A. Oakey Hall,
William M. Tweed,	John Jacob Astor,
August Belmont,	Peter B. Sweeny,
Charles A. Lamont,	Levi P. Morton,
James F. D. Lanier,	Hugh Smith,
Franklin Osgood,	William T. Blodgett,
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William R. Travers,	Edward B. Wesley,
Joseph Seligman,	Manton Marble,
Richard B. Connolly,	John Taylor Johnston,
Henry Hilton.	

HENRY HILTON,
President.
HUGH SMITH,
Vice-President.
W. BUTLER DUNCAN,
Treasurer.
EDWARD P. BARKER,
Secretary.

By the authority of the Board of Directors of THE NEW YORK RAILWAY COMPANY, and in conformity with the terms of the Act of Incorporation in that respect, the undersigned, Commissioners on Stock Subscriptions, give public notice for and on behalf of the Directors, and of such Company, that Books of Subscription for the Capital Stock thereof, will be opened on WEDNESDAY, THE TWENTY-EIGHTH DAY OF JUNE instant, at the following places in this city, viz:—

At the Banking House of
DUNCAN, SHERMAN & CO.,
No. 11 Nassau street.

At the Banking House of the
BANK OF THE METROPOLIS,
No. 31 Union square.

The Company is authorized to construct two Viaduct Railways, or branches, through the City of New York, on the east and west sides thereof, from a common starting point at or near Chambers street, between Broadway and Chatham street; also, across the Harlem River and through Westchester County; with power to build additional lines of railway, or branches, from time to time, in any part of the City or Westchester County. *The property acquired by the Company is exempted from taxes and assessments during the period allowed for the final completion of the railway in the city.* The Mayor, Aldermen, and Commonalty of New York are authorized and directed, with the approval of the Commissioners of the Sinking Fund, to subscribe for **five millions of dollars** of the stock of the Company, whenever one million of dollars thereof has been subscribed for by private parties. *This conditional amount of stock has been wholly subscribed for and taken by the Directors of the Company.* On the completion of either of the lines of railway to the line of Westchester County, the Supervisors of that County are authorized to issue the bonds of the County to such amount as the Supervisors shall deem expedient, to aid in the construction and extension of the railway in and through that County. For the proper equalization of the interest of shareholders who may subscribe and pay in moneys at different times, the Directors are authorized to issue scrip for interest on such payments, payable out of the earnings.

THE TERMS OF SUBSCRIPTION will be as follows:—
TEN PER CENT of the amount of Stock subscribed for to be paid in cash at the time of subscription. The residue to be paid as called for by the Board of Directors, on a notice of thirty days, but no call at any one time to exceed ten per cent.
Scrip for interest, at the rate of seven per cent per annum, will be issued by the Company, payable out of the first earnings of the Railway, on all installments paid on Stock subscribed for within thirty days after the Subscription Books shall be opened.
The Company reserves the right to close the Subscription Books at any time after the twenty-ninth day of July, 1871.

By order of the Board of Directors.

Alex'r T. Stewart,
John Jacob Astor,
Levi P. Morton,
} Commissioners on behalf of the Company.

NEW YORK, June 16, 1871.

PERFECTION OF SPEED ON WATER WHEELS secured by the Hydraulic Rotary Governor. Returns, after testing, if you can afford to run without it. Address J. S. ROGERS, Tr., 19 John st., Boston.



Reynolds'
TURBINE WATER WHEELS.
The Oldest and Newest. All others only imitations of each other in their strife after complications to confuse the public. We do not boast but quietly excel them all in staunch reliable, economical power. Beautiful pamphlet free. GEO TALLCOT 90 Liberty st., New York.
Gearing, Shafting.

THE PERFECT LUBRICATOR
A sure preventive of and cure for hot journals.
Has ten times the lubricating quality of any oil. 400° F., 50° below zero, acids or gases do not affect or change its wonderful, unique nature. Forms on bearing surfaces a glaze of unequaled smoothness, which economizes power 20 per ct.; reduces friction to a minimum, and prevents heat, wear, strain, and repairs of machinery.
Send for envelope sample and circular to
24 CLIFF NEW YORK
AMERICAN GRAPHITE CO.

WOODBURY'S PATENT
Planing and Matching
and Molding Machines, Gray & Wood's Planers, Self-oiling Saw Arbors, and other wood working machinery.
S. A. WOODS, { 91 Liberty street, N. Y.
Send for Circulars. { 61 Sudbury street, Boston

Andrew's Patents.
Noiseless, Friction Grooved, Portable, and Warehouse Hoisters.
Friction or Geared Mining & Quarry Hoisters.
Smoke-burning Safety Boilers.
Oscillating Engines, Double and Single, 1-2 100-Horse power.
Centrifugal Pumps, 100 to 100,000 Gallons per Minute, Best Pumps in the World, pass Mud, Sand, Gravel, Coal, Grain, etc., without injury.
All Light, Simple, Durable, and Economical.
Send for Circulars.
WM. D. ANDREWS & BRO.,
414 Water street, New York.

1832. SCHENCK'S PATENT. 1871
WOODWORTH PLANERS
And Re-Sawing Machines, Wood and Iron Working Machinery, Engines, Boilers, etc. JOHN B. SCHENCK'S SONS, Matteawan, N. Y., and 118 Liberty st., New York.

PATENT BANDSAW MACHINES



Of the most approved kinds, of various sizes, to saw bevel as well as square, without inclining the table, by FIRST & PRYIBIL, 433 to 456 Tenth ave., New York. Price $250, $275, $350, and $400. At present (Oct. 16), there are in operation, in this city alone, 88 of our machines. Send for circular. Manufacture, also, an improved saw-filing apparatus; price, $30. Have also on hand a large stock of best FRENCH BANDSAW BLADES.

NORWALK IRON WORKS,
SOLE PROPRIETORS and Makers of the Norwalk Engine and Earle Steam Pump, Stationary and Portable Engines, Direct Acting and Balance Wheel Steam Pumps, Air and Vacuum Pumps.
Sales room, 133 Center street, New York.

The New Wilson Under-Feed.



THE BEST & CHEAPEST FIRST CLASS SHUTTLE SEWING MACHINE IN THE WORLD.
Warranted for five years, and the warranty indemnified by a capital of half a million of dollars.
AGENTS WANTED in unoccupied territory.
For particulars address
Wilson Sewing Machine Co.
Cleveland, O.; St. Louis, Mo.; Providence, R. I.; Philadelphia, Pa.; Boston, Mass.; Pittsburg, Pa.
PRICE 45 DOLLARS
Louisville, Ky.; Cincinnati, O.; Indianapolis, Ind.; Memphis, Tenn.; Chicago, Ill.; Milwaukee, Wis.; Toledo, O.; Albany, N. Y.; St. Paul, Minn.; Richmond, Va.; Montgomery, Ala.; New Orleans, La.; Galveston & Houston, Tex.; San Francisco, Cal.; or
No. 707 BROADWAY, NEW YORK

P. BLAISDELL & Co.,
MANUFACTURERS OF FIRST CLASS MACHINISTS' TOOLS. Send for Circulars. Jackson st., Worcester, Mass.



THE AMES IRON WORKS.—Portable Engines, 3 to 40 H. P.; Circular Saw Mills, Vertical and Horizontal Stationary Engines and Boilers, Hoisting Engines, Burr Mills, Wood and Iron Working Tools. Send for valuable information to
EDW'D P. HAMPSON,
38 Cortlandt st., New York.

MACHINISTS.
Illustrated Catalogue and Price List of all kinds of small Tools and Materials sent free to any address. GOODNOW & WIGHTMAN, 23 Cornhill, Boston, Mass.

THE ONLY Machine that will mortise and bore house or car blinds successfully, in all kinds of stock, for fixed or rolling slats, making 50 mortises, or 140 round holes per minute, leaving the mortises free of chips. MARTIN BUCK, Agent, Lebanon, N. H.

DAVIS' PATENT
RECORDING
PRESSURE GAUGES.
THE ONLY instruments that record the TIME of variations in pressure. Send for Circulars to
D. P. DAVIS, 44 Cortlandt st., New York.

CIRCULAR SAW MILLS.
TIMBER MILLS, HAYS & NEWMAN'S PATENT DOUBLE PARALLEL EDGERS, FOSTER'S PATENT LOG AND TIMBER CANTING MACHINES, and Saw Mill Machinery generally, manufactured by the Washington Mowing Machine Company.
Address LEROY MOWRY, Agent, Sandy Hill, Wash'g Co., N. Y.
Send for Illustrated Circulars and Price Lists.

Niagara Steam Pump.
CHAS. B. HARDICK,
Adams st., Brooklyn, N. Y.

EDSON'S
"RECORDING STEAM GAUGES."
Manufactured and sold by the
RECORDING STEAM GAUGE CO., 91 Liberty st., N. Y.

THE CELEBRATED
Cold-rolled Shafting.
THIS Shafting is in every particular superior to any turned Shafting ever made. It is the most ECONOMICAL SHAFTING to buy, being so very much stronger than turned Shafting. Less diameter answers every purpose, causing a great saving in coupling, pulleys and hangers. It is perfectly round, and made to Whitworth Gage. All who give it a trial continue to use it exclusively. We have it in large quantities. Call and examine it, or send for price list.
Address GEORGE PLACE & CO.,
126 and 128 Chambers st., New York.

N. Y. Machinery Depot.
GEORGE PLACE & CO., Manufacturers and Dealers in Wood and Iron Working Machinery, of every description, Stationary and Portable Engines and Boilers, Leather and Rubber Belting, and all articles needful in Machine or Railroad Repair Shops. 126 and 128 Chamber st., New York.

Sturtevant Blowers.
THESE are in every particular the best and most perfect Blower ever made. A full assortment of every size on hand, ready to deliver.
Address GEORGE PLACE & CO.,
126 and 128 Chambers st., New York.

RICHARDSON, MERIAM & CO., Manufacturers of the latest improved Patent Daniels' and Woodworth Planing Machines, Matching, Sash, and molding, Tenoning, Mortising, Boring, Shaping, Vertical, and Circular Re-sawing Machines, Saw Mills, Saw Arbors, Scroll Saws, Railway, Cut-off, and Rip-saw Machines, Spoke and Wood Turning Lathes, and various other kinds of Wood-working Machinery. Catalogues and price lists sent on application. Manufactory, Worcester, Mass. Warehouse, 107 Liberty st. New York. 17 1

OTIS' SAFETY HOISTING Machinery.
OTIS, BROS. & CO.
No. 348 BROADWAY, NEW YORK.

PUMPS.—For Description, Price Lists etc., of the Best Centrifugal Pump ever Invented, with Overwhelming Testimony in its favor, send for new Illustrated pamphlet (40 pp.) to Messrs. HEALD, SISCO & CO., Baldwinsville, N. Y.



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

MACHINISTS' TOOLS, at greatly reduced prices. Also, some Woodworth Planers and Second-hand Tools. 97 to 113 R. R. ave., Newark, N. J.
E. & R. J. GOULD, successors to Gould Macaine Co

CINCINNATI BRASS WORKS.—Engineers and Steam Fitters' Brass Work, Best Quality at very Low Prices. F. LUNKENHEIMER, Prop'r.

Wanted—Agents. $75 TO $250 PER MONTH, everywhere, male and female, to introduce the GENUINE IMPROVED COMMON-SENSE FAMILY SEWING MACHINE. This Machine will stitch, hem, fell, tuck, quilt, cord, bind, braid and embroider in a most superior manner. Price, only $15. Fully licensed and warranted for five years. We will pay $1,000 for any machine that will sew a stronger, more beautiful, or more elastic seam than ours. It makes the "Elastic Lock Stitch." Every second stitch can be cut, and still the cloth cannot be pulled apart without tearing it. We pay Agents from $75 to $250 per month and expenses, or a commission from which that amount can be made. Address
SECOMB & CO.,
Boston, Mass.; Pittsburgh, Pa.; St. Louis, Mo. Chicago, Ill.

BURDON IRON WORKS.—Manufacturers of Pumping Engines for Water Works, High & Low Pressure Engines, Portable Engines and Boilers, of all kinds, Sugar Mills, Screw, Lever, Drop, & Hydraulic Presses, Machinery in general. HUBBARD & WHITTAKER, 10 Front st., Brooklyn.

MACHINERY, NEW and 2d-HAND,—Send for Circular. CHAS. PLACE & CO., 60 Vesey st., New York.

Agents! Read This!
WE WILL PAY AGENTS A SALARY OF **$30 per week** and expenses, or allow a large commission, to sell our new and wonderful inventions.
Address M. WAGNER & CO., Marshall, Mich.

WOOD-WORKING MACHINERY GENERALLY. Specialties, Woodworth Planers and Richardson's Patent Improved Tenon Machines. Nos. 24 and 26 Central, corner Union st., Worcester, Mass.
WITHERBY RUGG & RICHARDSON.

Tanite Emery Wheels
AND GRINDING MACHINES.
S. A. WOODS, General Agent.
Machinery Depot, 91 Liberty st., New York.

$250 A MONTH easily made with Stencil and Key-Check Dies. Secure Circular and Samples, FREE. S. M. SPENCER, Brattleboro, Vt.

ALLCOTT'S LATHES, for Broom, Hoe, and Rake Handles, for sale by
L. W. POND, 98 Liberty st. New York.

THOMSON'S PATENT
ROAD STEAMER.
THE only locomotive that will haul heavily loaded trains on ordinary American roads. Saves 50 per cent over horses, and does not injure the roads. Also adapted for **plowing by direct traction.**
Can be seen in operation near New York. Open for competition with any other Road Engine.
For full particulars, address the Sole Manufacturer in America,
D. D. WILLIAMSON,
P. O. Box 1809, or 32 Broadway, New York city.

BUERK'S WATCHMAN'S TIME DETECTOR.—Important for all large Corporations and Manufacturing concerns—capable of controlling with the utmost accuracy the motion of a watchman or patrolman, as the same reaches different stations of his beat. Send for a Circular. J. E. BUERK,
P. O. Box 1,057 Boston, Mass.
N. B.—This detector is covered by two U. S. Patents. Parties using or selling these instruments without authority from me will be dealt with according to law.

WANTED—AGENTS, $20 PER DAY, TO sell the celebrated HOME SHUTTLE SEWING MACHINE. Has the under-feed, makes the "lock stitch" alike on both sides, and is fully licensed. The best and cheapest Family Sewing Machine in the market. Address
JOHNSON, CLARK & CO.,
Boston, Mass.; Pittsburgh, Pa.; Chicago, Ill. or St. Louis, Mo.

$150 A MONTH! EMPLOYMENT EXTRA INDUCEMENTS!
A premium House and Wagon for Agents. We desire to employ agents for a term of seven years, to sell the Buckeye $30.00 Shuttle Sewing Machine. It makes a stitch alike on both sides, and is the best low-priced licensed machine in the world. W. A. HENDERSON & CO., Cleveland, Ohio, or St. Louis, Mo.

L. & J. W. FEUCHTWANGER, 55 Cedar st., New York, Chemists, Importing and Manufacturing. Silicates of Soda and Potash, Soluble Glass in all forms, Steel and Glass Makers', Potters' and Enamelers' Materials, Pure Metallic Oxides and Metals, Hydrofluoric Acid. All articles of the best quality, and orders promptly attended to. Publishers of Treatises on "Soluble Glass," "Gems," and "Fermented Liquors."

PORTABLE STEAM ENGINES, COMBINING the maximum of efficiency, durability and economy, with the minimum of weight and price. They are widely and favorably known, more than **900** being in use. All warranted satisfactory or no sale. Descriptive circulars sent on application. Address
J. C. HOADLEY & CO Lawrence, Mass.
46 Cortlandt st. New York.

CIRCULAR SAW MILLS, PLANERS POWDER KEG MACHINERY, etc., made by S. HEALD & SONS, Barre, Mass.

THE SELF-SELLING SURFACE AND CLAPBOARD PLANING MACHINE.—In addition to improvements on Woodworth Surface Planer (see cut in SCIENTIFIC AMERICAN, No. 16, p. 248, Oct. 13, 1870), we now offer to the public the greatest improvement of the age. The machine is now so arranged that it can be changed in ten minutes, so as to plane Clapboards as well as any machine especially made for that purpose. The advantage is apparent; it saves the room and expense of one machine. All who think four or five hundred dollars is worth saving, call and examine our machine. When known, it will sell itself.
NEW ENGLAND MACHINE CO., Fitchburgh, Mass.
by J. L. PERKINS.

$10 A DAY, with Stencil Tools. Samples free. Address A. E. GRAHAM, Springfield, Vt.

MODELS, PATTERNS, EXPERIMENTAL, and other machinery. Models for the Patent Office, built to order by HOLSKY MACHINE CO., Nos. 528, 530, and 532 Water st., near Jefferson. Refer to SCIENTIFIC AMERICAN office. 14 tf

HAND SAW MILL.—Do work of 3 men. Rip 3-inch lumber with ease. Thousands in use. Agents wanted everywhere. WM. H. HOAG,
32 Cortlandt st., New York.

Advertisements.

Advertisements will be admitted on this page at the rate of **$1·00** *per line for each insertion. Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.*

Burglars at Work.
HERRING'S SAFE STOPS THEM.

45 SOUTH ST., NEW YORK, July 5, 1871.
MESSRS. HERRING, FARREL & SHERMAN,
No. 231 Broadway:
GENTLEMEN:—On Saturday night week, our offices were entered by burglars. In the outer office, we have a fire proof safe (not burglar proof) for our books, which was the first attacked, and easily broken open. In this was found the key of the safe in the inner office, with which the door was unlocked and opened. This safe we purchased of you a few years since, and within it one of your burglar proof chests, which latter, from its appearance—the combination dial and moldings broken off, certain sledge hammer bruises about it, and a wedge broken off in the joint of the door—it would seem much dexterous effort had been made to break it open. But, we are gratified to say, the effort was not successful; the door was not forced, nor was the machinery of the lock injured. Very respectfully, J. H. BROWER & CO.

Herring's New Patent Champion
Bankers' Safes.
Patent high and low Steel-welded, combined with Patent Franklinite.
Proof against the blowpipe as well as the drill.
WITH PATENT HINGED TONGUE AND GROOVED DOOR, AND PATENT RUBBER-PACKED FLANGE.
Proof against wedges, nitro-glycerin, and gunpowder.
Herring, Farrel & Sherman,
231 Broadway, cor. Murray st., New York.
FARREL, HERRING & CO., Philadelphia.
HERRING & CO., Chicago.
HERRING, FARREL & SHERMAN, New Orleans.



Vertical & Horizontal CORN MILLS.
30-inch grinds 30 bus. per hour, and 20-in. 15. Price $280 and $140.
EDWARD HARRISON,
New Haven, Conn.

BEST PORTLAND CEMENT, for manufacturing artificial stone.
L. JAFFE, 1193 Broadway.

A. S. CAMERON & CO.,
ENGINEERS,



Works, foot of East 23d street, New York city.
Steam Pumps,
Adapted to every possible duty.
Send for a Price List.

IRON STEAMSHIP BUILDERS.
NEAFIE & LEVY,
PENN WORKS,
MARINE ENGINES, BOILERS, ETC.,
PHILADELPHIA, PA.

CURES
Costiveness,
RELIEVES
Headache,
AIDS
Digestion.
TARRANT'S SELTZER APERIENT.
Sold by all Druggists.

GEO. W. READ & CO.,
MANUFACTURERS AND IMPORTERS,
VENEERS,
FANCY WOODS & BOARDS,
Have in store the finest assortment ever seen, particularly
FRENCH VENEERS, HUNGARIAN ASH, ETC.,
to which they invite the particular attention of the trade.
Send for catalogue and price list.
For SALE, one of the best and largest VENEER CUTTING MACHINES in the country.
170 and 172 Centre st., New York.
Factory, 186 to 200 Lewis st.

TRADE MARK.
Union Stone Co.,
Patentees and Manufacturers of
ARTIFICIAL STONE & EMERY WHEELS,
and Artificial Stone and Emery Wheel Machinery and Tools. Send for circular. **32 Pemberton Square, BOSTON, MASS.**

TODD & RAFFERTY, Manufacturers of Steam Engines, Boilers, Flax, Hemp, Tow Bagging Rope and Oakum Machinery. Steam Pumps and Governors always on hand. Also Agents for the New Haven Manufacturing Co.'s Machinists' Tools. ☞ We invite especial attention to our new, improved, Portable Steam Engines. Warerooms, 10 Barclay st.; Works, Paterson, N.J.

Patent Vertical Portable Engine.



Our guarantee is—more steam, less fuel, stronger in running, safer to run, less friction, and more durable, than any Old Style Portable, with Engine on Boiler, of same dimensions. Our Saw Mills are strong and well made—Lever Head Blocks, with Patent Roller set; quick setting, and correct when sawing. Stationary Engines and Boilers. Address GRIFFITH & WEDGE, Zanesville, Ohio.

STEEL CASTINGS
TO PATTERN; tensile strength equal to wrought iron; will rivet over, bend, or case harden. Heavy work at low prices. PHILIP S. JUSTICE, 14 North 5th st., Phila.; 42 Cliff st., New York.

FOR SALE.—One new Boring Mill, with counter shaft and hangers; table swings 48 inches. Inquire of A. B. MANCHESTER, Jr., Prov. Brass Foundery, Providence, R.I.

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

Canadian Inventors,
Under the new Patent Law, can obtain patents on the same terms as citizens.
For full particulars address
MUNN & CO.,
37 Park Row, New York.



Pratt's Astral Oil.
First Premium and Diploma at American Institute Fair, 1869 and 1870, for **SAFEST and BEST** ILLUMINATING OIL. Oil House of **CHAS. PRATT, N. Y.** **Established 1770.**

SAFES. MARVIN & CO.'S ARE THE *BEST.*
265 BROADWAY.

CEMENTS.
ENGLISH, Portland, and Roman Cement, for sale by LAWRENCE & EDMANDS, 214 Pearl st., N.Y.

STEAM ENGINES & BOILERS

From 4 to 500 horse power including Corliss Engines, Slide Valve Stationary Engines, Portable Engines, etc. Also, Circular Saw Mills, Shafting, Pulleys, etc. Wheat and Corn Mills, Circular Saws, etc.
Send or Price List.
WOOD & MANN
Steam Engine Company
WORKS—UTICA, N.Y.
PRINCIPAL OFFICE—**42 Cortlandt st., New York.**

UNION
Spoke Works.
SPOKES, RIMS, AND PLOW HANDLES. All goods warranted seasoned, and of the best quality. JOHN G. DAVIS & SON,
Southwest cor. of Leonard and Otter sts., Philadelphia.

JAMES W. QUEEN & CO.,
924 Chestnut st., Philadelphia;
535 Broadway, New York.
Opticians, Mathematical and Philosophical Instrument Makers, and Importers.
Spectacles, Microscopes, Opera Glasses, Drawing Instruments, Transits, Levels, Tape Measures, Thermometers, Barometers, Magic Lanterns, etc., etc.
Manuals, as follows, sent for 10 cents each:
Part 1st, Mathematical Instruments.....155 pages.
" 2d, Optical Instruments.....100 "
" 3d, Magic Lanterns and Stereopticons... 88 "
4th, Philosophical Instruments..... 66 "

RUMPFF & LUTZ,
IMPORTERS and Manufacturers of Aniline Colors and Dyestuffs, Colors for Paperhangers and Stainers. Reliable recipes for Dyeing and Printing on Silk, Wool, and Cotton. All new improvements in the art of Dyeing, and new Colors are transmitted to us by our friends in Europe, as soon as they appear.
42 Beaver street, New York.

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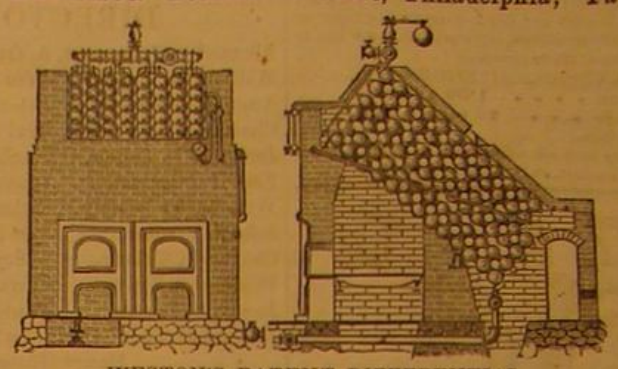
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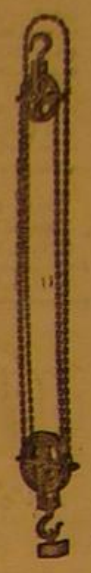
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