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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.

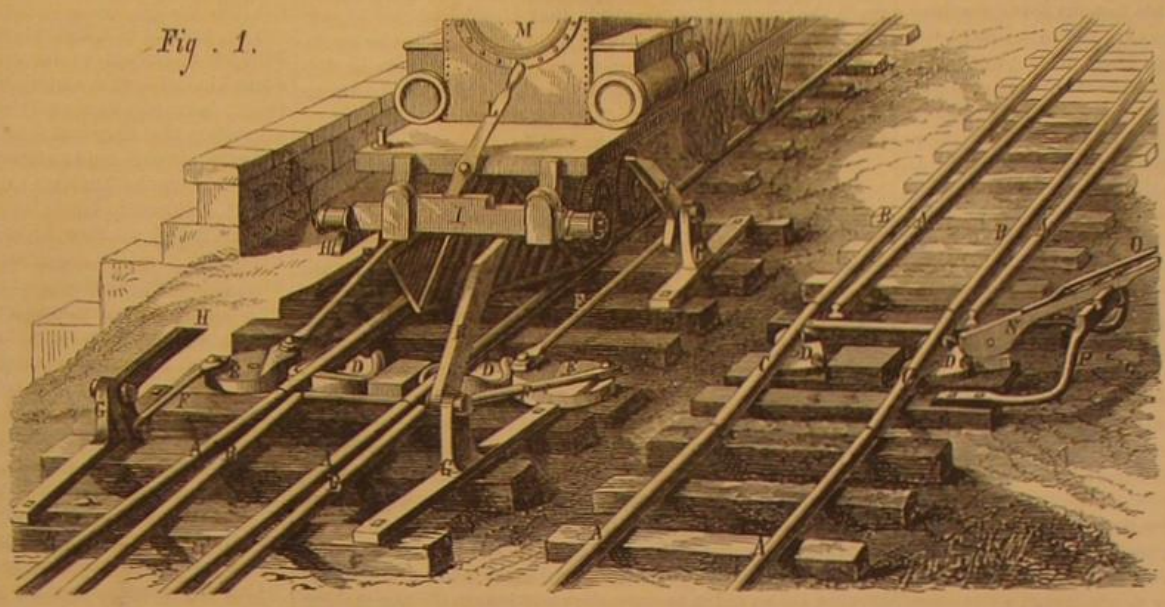
The London *Grocer* gives the following statistics:—The number of manufactories at present engaged in the manufacture of this article is on the increase in Central Europe. It appears that there are no less than 1663, which are divided as follows: "Great Britain and Italy have each 1 manufactory; Sweden, 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.

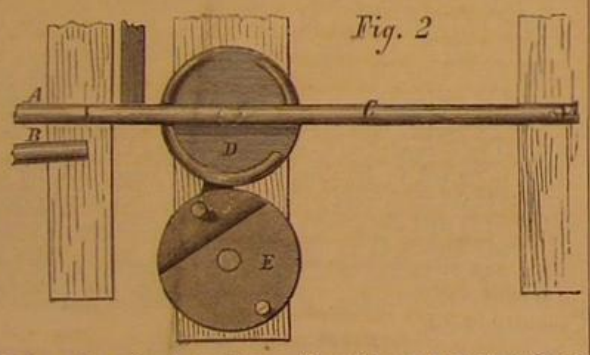
The object of the steam switch is to use the locomotive as a general switchman on railroads. The hand and steam switch are both constructed and operated on the same plan of turntables. The turntables, D, are vibrating tables placed under the rails of the switching track, so as to move them either way 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.

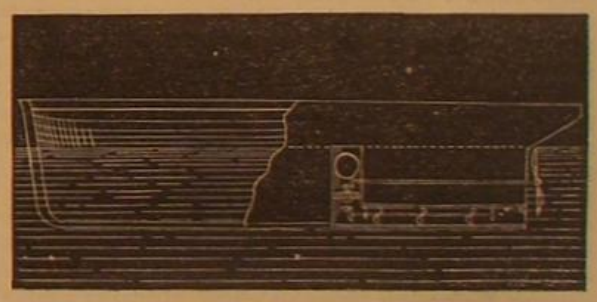
A SELF-MOVING SHIP.

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 looked 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.

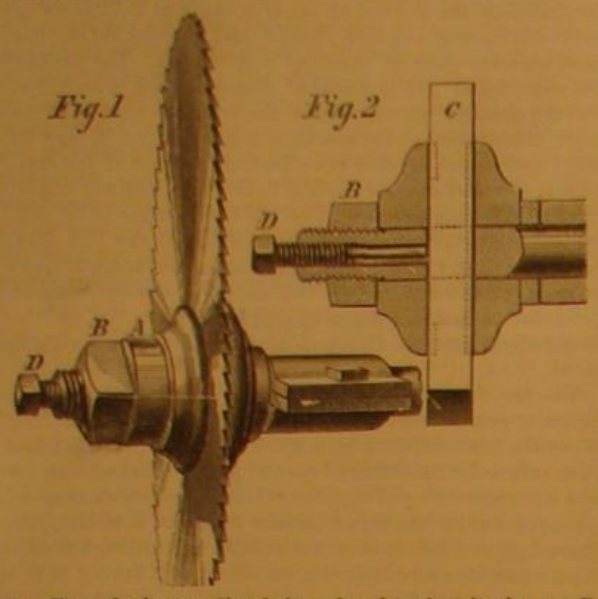
HOW TO BRIGHTEN STRAW MATTING AND OILCLOTH.—Tell your readers, writes Mrs. G. E., that if they wish their straw matting to keep new looking and bright, they must wash it twice during the summer with salt and water, say about a pint of salt, dissolved in half a pailful of warm, soft water, drying the 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.

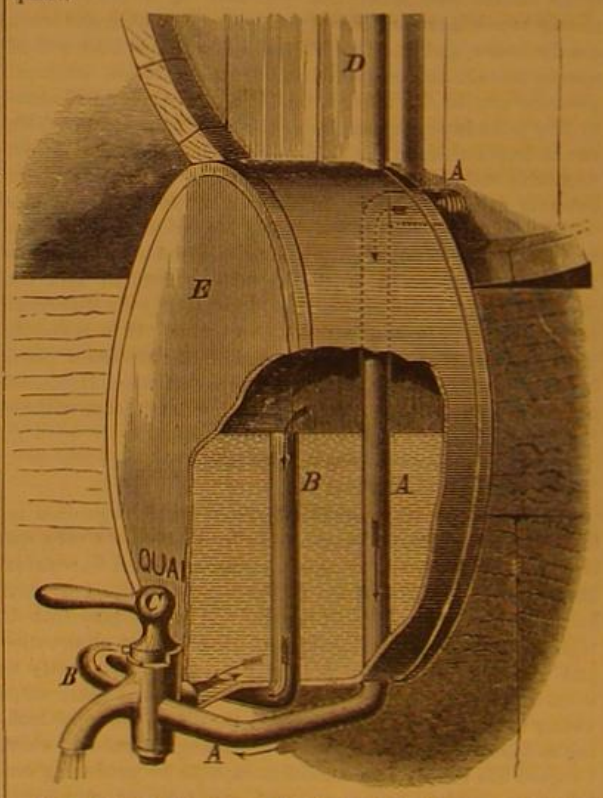
Many attempts have been made to introduce the general use of measuring faucets. These instruments have, however, so often lacked the essential elements of simplicity, cheapness, and durability, that few have achieved even partial success.

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.



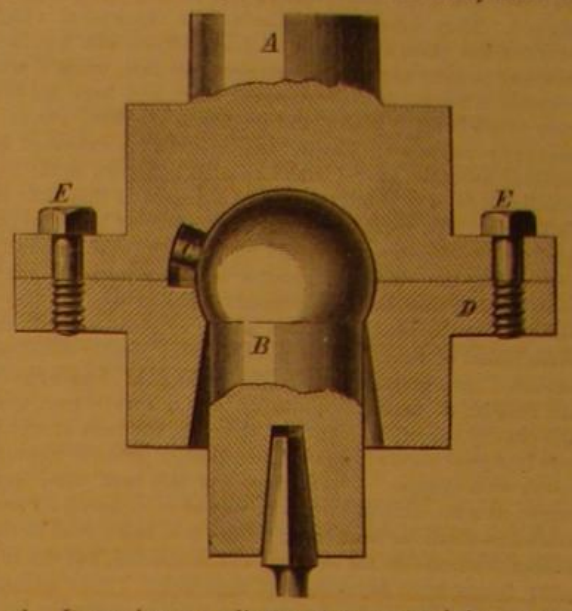
The plug of the faucet is of the kind known as "three-way," its ports being so formed that when the handle is turned to the extreme right, the flow will be from the barrel into the chamber. When turned to the middle position, as shown in the engraving, the flow from the barrel will be stopped, and the 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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NEW YORK, SATURDAY, JULY 1, 1871.

Contents:

(Illustrated articles are marked with an asterisk.)

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.

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 pencilling 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.

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.

Official List of Patents.

ISSUED BY THE U. S. PATENT OFFICE.

FOR THE WEEK ENDING JUNE 20, 1871.

Reported Officially for the Scientific American.

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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
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REISSUES.

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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.

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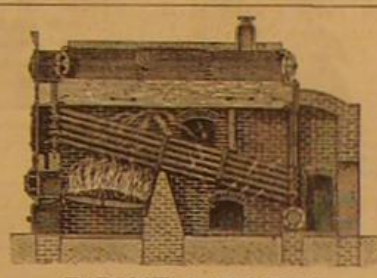

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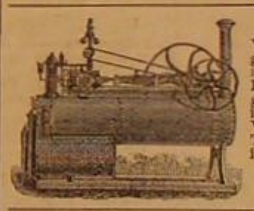

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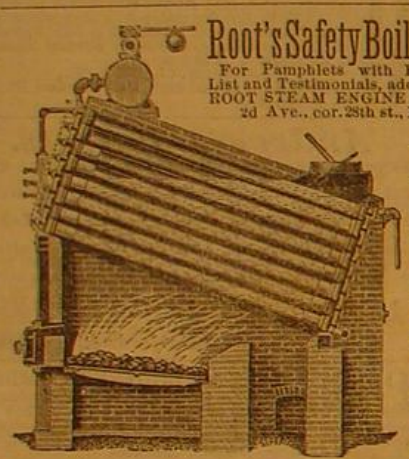

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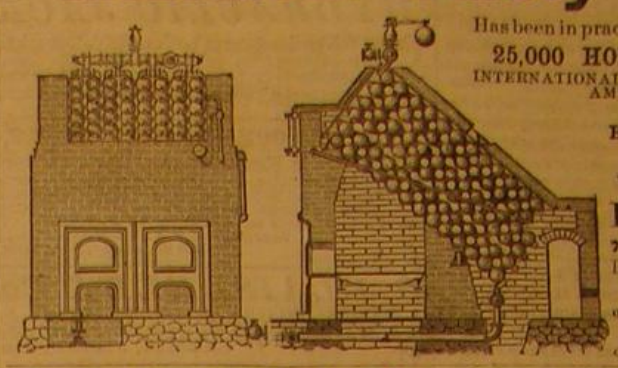

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