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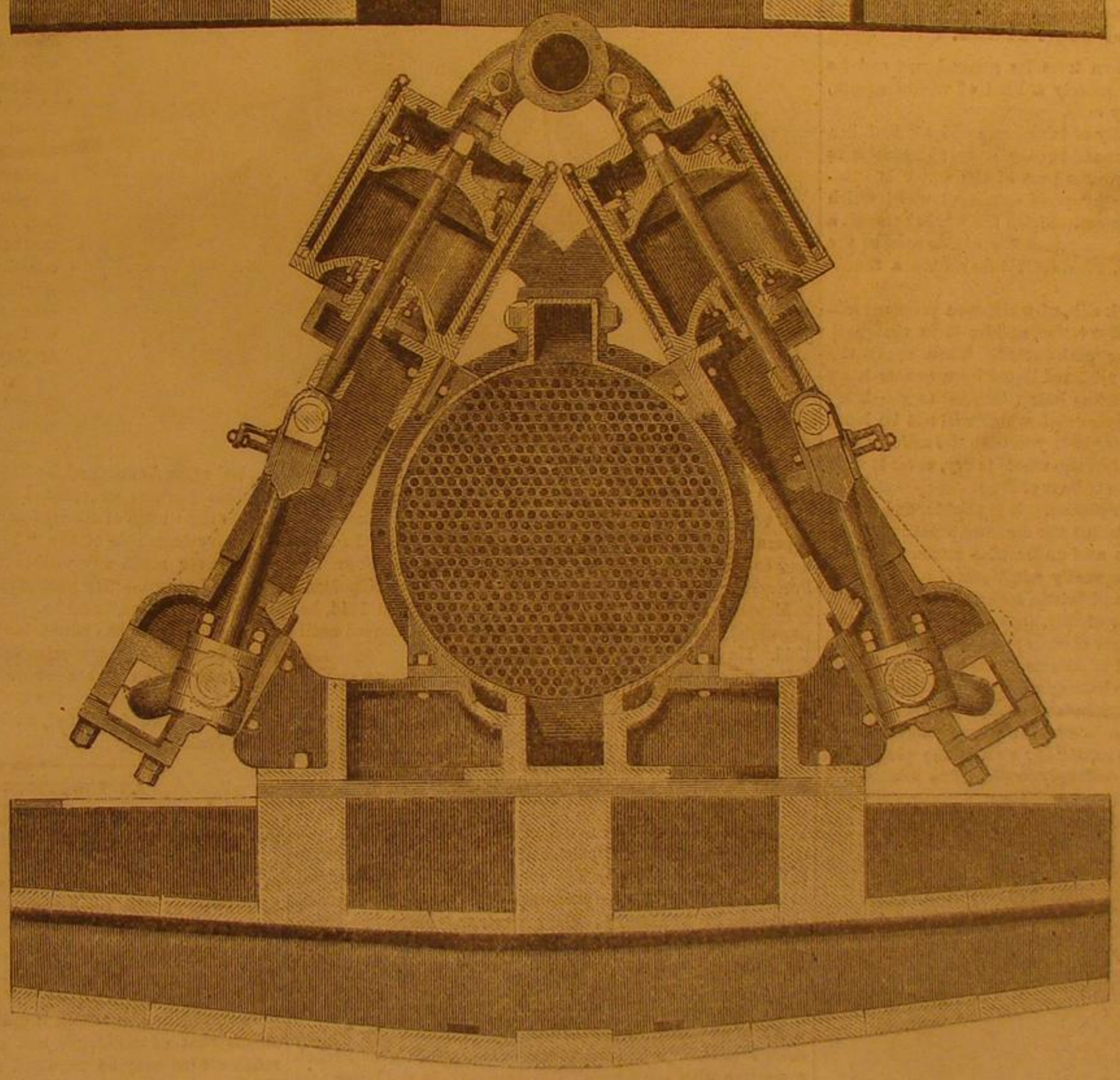
Engines of the Spanish Gunboats.

In our description of these boats in No. 25, Vol. XXI., special mention was made of the compactness of the engines.

It has frequently been urged as an objection against the twin screw system that the double set of engines, four steam cylinders with duplicates of all the working parts called for on this system, render the whole too complicated and heavy for small vessels, preventing, at the same time, the application of surface condensation. In the engines of the Spanish gunboats, of which we annex an illustration from *Engineering*, the designer, Captain Ericsson, has overcome these objections by introducing a surface condenser, which, while it performs the function of condensing the steam to be returned to the boiler in the form of fresh water, serves as the principal support of the engines, dispensing entirely with the usual framework. Besides this expedient, each pair of cylinders have their slide frames for guiding the movements of the piston rods cast in one piece. Altogether the combination is such that the total weight and space occupied by these novel twin screw engines do not exceed the ordinary single screw engines of equal power. Several improvements connected with the working gear have been introduced.

The outer bearings of the propeller shafts, always difficult to regulate and keep in order on the twin screw system, are self-adjusting and accommodate themselves to every change of the direction of the shafts. This is effected by their being spherical externally, and resting in corresponding cavities in the stern braces or hangers. The spring bearings for supporting the middle of the shafts are also arranged on a similar self-adjusting principle.

The thrust bearing is of peculiar construction, the arrangement being such that the bearing surfaces remain in perfect contact however much the shaft may be out of line. The reversing gear likewise is quite peculiar, insuring complete control over the movement of the two propellers under all circumstances. It is claimed that these engines are the lightest and most compact yet constructed for twin screw vessels.



ENGINES OF THE TWIN SCREW SPANISH GUNBOATS.

The Torpedo Boat Problem.

The *Army and Navy Journal* thinks the problem of a torpedo boat capable of firing rapidly and with certainty, has at length reached a satisfactory solution. It says:

"A boat has been completed which is proved by experiment to be faultless in machinery and arrangement. On the 2d of December, Secretary Robeson, Vice-Admiral Porter, and Commodore Case, Chief of the Bureau of Ordnance, went to the Navy Yard at Washington, to witness the experiment with this new engine of destruction. After examining the workings of the machinery, and the manner of firing, one of the destructives was put in the frame and the party proceeded to the shore to witness the result. A torpedo of only thirty-six pounds was first run out with rapidity and fired; but the result showed that this small amount of powder, even, would have been sufficient to destroy any ship, by lifting her out of the water and breaking her back, even if her bottom was not knocked out altogether. Mud and water were thrown up together, and the concussion was felt far up in the Navy Yard, the ground being shaken by the shock of the powder against the bed of the river. The concussion felt on board the torpedo-boat was not more than that caused by a wave striking a vessel at sea.

"Several torpedoes were fired from the vessel, the explosion of which the party witnessed on board, as they desired to ascertain for themselves the effect of the shock. The result seemed satisfactory, as no change whatever is contemplated in the machinery, which is very simple, and 'works to a charm.' The torpedo vessel is the *Nina*, a very strong iron boat of three hundred and fifty tuns burden, capable of crossing the ocean, and having a speed of seventeen knots an hour. She is not impervious to heavy shot, but can be made so, and is capable of resisting any ordinary projectile that could be brought to bear on her from the decks of a ship of war. Her decks will be made torpedo and shot-proof, and several arrangements will be applied, now that it is known that the torpedo system is a success. Such a vessel as the *Nina*, attacking an enemy's squadron on our coast some dark night, or entering an enemy's port, could destroy half the vessels in the harbor, and easily escape, as few vessels could overtake her. Such a vessel could, for instance, enter the harbor of Havana, and destroy every vessel of war in the port, under cover of darkness. A squadron supplied with such boats to be used to attack, after the fight began, and the ships were enveloped in smoke, would have a most decided advantage against an enemy not thus armed for torpedo warfare. It is reported that our torpedo navy will consist of twenty vessels, none of which will have a less speed than twelve knots, and the fastest of them will go seventeen knots."

SUGAR MAKING IN LOUISIANA.

The New Orleans *Times* contains, in a late number, an account of the manufacture of sugar as conducted on the Poychus estate, from which we extract portions containing the essential particulars of cane sugar making as conducted in the southern portions of the United States.

"Reaching the cane shed, the crop, dumped into piles, is received by a crowd of feeders, who place it (eight or ten stalks at a time) on the cane carrier. This is an elevator, on an endless band of wood and iron, which carries them to the second story, where the stalks drop between the rollers. An immense iron tank below, called a juice box, receives the liquid portion, and another elevator bears the bruised and broken fragments to the opposite side of the building, where they are dropped into the bagasse burner.

"This invention, at its introduction, caused more scientific inquiry and dispute, probably, than any other of the age, and settled beyond question the possibility of combustion, without the use of atmospheric air. The process consists in dropping the wet, spongy mass into a fire of wood or coal, and closing the furnace doors. The steam arising from the drying matter passes to a chamber in the rear, where, by the intense heat, it is decomposed. Oxygen and hydrogen (both strong combustibles) unite with the carbon, reaching there in the form of smoke, and a white heat is the result.

"Cane juice, as it escapes from the mill, could scarcely be considered inviting to either palate or vision. The sweet, slimy mass of fluid, covered with foam, and filled with sticks, has more the appearance of the water in a brewer's vat than anything which now suggests itself. A small furnace, containing a quantity of burning sulphur, sends through a tube a volume of its stifling fumes, and these, caught by jets of steam, thoroughly impregnate the contents of the juice box. Having received its first lesson in cleanliness, the liquid now rises through a tube to the series of clarifiers on the second floor. They are heated by a chain of steam pipes running along the bottom, and being filled, the juice slowly simmers. Much of the foreign substance rises in a scum to the surface and is skimmed off by the sugar maker. It is further purified by the addition of Thomaston or what is called sugar lime. About half a peck is considered sufficient for seven hundred and fifty gallons of juice, but much depends upon the quantity of saccharine matter it contains. Another set of pipes now permit the liquor to run into the evaporators, in the boiling room below. These are also heated by circles of steam pipes, and the liquid is first gently simmered, to enable any additional foreign substance to rise to the surface and be skimmed off.

"After that the steam is turned on fully, and the juice boils until it reaches the solidity of twenty-five degrees, as measured by the saccharometer. This point attained, more pipes conduct it to a series of square iron tanks called filterers. Each is provided with a false bottom, covered with thick woolen blankets, and through these the juice slowly drips into an immense iron vessel called a sirup tank.

"The process of cleaning has now been completed, and the

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sirup is pumped into the covered vessel previously alluded to, called the vacuum pan.

"This is also heated by layers of steam pipes, and here the liquor boils until the process of crystallization is completed. This end achieved, another conductor permits the substance to slowly descend to a large square iron tank, called a strike-pan. The process of emptying the vacuum pan is technically called a "strike." We now find a reddish brown substance, having somewhat the appearance of soft mortar.

"Men are at hand with square wooden boxes, and while the sugar is still warm, it is placed in rotary cylinders, protected on the inside by wire guards, called centrifugals.

"Placed on a horizontal, they revolve with a velocity which frequently reaches 1200 a minute. The damp, dingy looking pile instantly spreads, a broad circle of yellow is first visible on the inner rim of the machine, and this slowly whitening finally becomes a shining ring of snowy sugar. To effect this result requires the aid of nine steam boilers, three steam engines, a vacuum pan, three large evaporators, five clarifiers, five filters, an immense sirup tank, the juice box, mill, bagasse furnace, and fifteen coolers.

"With the engineers, sugar makers, firemen, and laborers, thirty-eight persons are constantly on duty in this sugar-house.

"Doubling this number, to give each the necessary rest, swells the gathering to seventy-six souls, who, during the grinding season, find employment at the sugar-house alone. This of course does not include the laborers employed in gathering and bringing in the crop, and the great number occupied in odd jobs and the extensive repairs which are constantly going on."

Sticking, or Court Plaster.

This plaster is well known from its general use and its healing properties. It is merely a kind of varnished silk, and its manufacture is very easy.

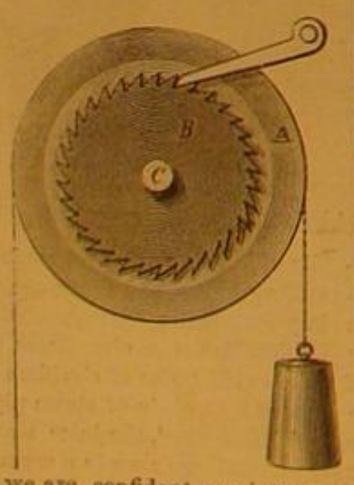
Bruise a sufficient quantity of isinglass, and let it soak in a little warm water for four-and-twenty hours; expose it to heat over the fire till the greater part of the water is dissipated, and supply its place by proof spirits of wine, which will combine with the isinglass. Strain the whole through a piece of open linen, taking care that the consistence of the mixture shall be such that, when cool, it may form a trembling jelly.

Extend the piece of black silk, of which you propose making your plaster, on a wooden frame, and fix it in that position by means of tacks or pack-thread. Then apply the isinglass (after it has been rendered liquid by a gentle heat) to the silk with a brush of fine hair (badgers' is the best). As soon as this first coating is dried, which will not be long, apply a second; and afterwards, if you wish the article to be very superior, a third. When the whole is dry, cover it with two or three coatings of the balsam of Peru.

This is the genuine court plaster. It is pliable, and never breaks, which is far from being the case with many of the spurious articles which are sold under that name. Indeed, this commodity is very frequently adulterated. A kind of plaster, with a very thick and brittle covering, is often sold for it. The manufacturers of this, instead of isinglass, use common glue, which is much cheaper; and cover the whole with spirit varnish, instead of balsam of Peru. This plaster cracks, and has none of the balsamic smell by which the genuine court plaster is distinguished. Another method of detecting the adulteration is to moisten it with your tongue *on the side opposite to that which is varnished;* and, if the plaster be genuine, it will adhere exceedingly well. The adulterated plaster is too hard for this; it will not stick, unless you moisten it on the varnished side.—*The Painter, Gilder, and Varnisher's Companion.*

AN IMPROVED HOISTING PULLEY WANTED.

A gentleman of this city has sent us the accompanying diagram of an improved hoisting pulley, for which he says he would be willing to pay any reasonable price provided he knew where to obtain it—the wheel, not the price. It is a pulley within a pulley, the friction of the outer one upon the inner one—the latter being held by a ratchet and pawl—acting as a brake in lowering weights, while both would turn together in elevating weights. The idea is rather an ingenious one, but we are confident our inventor can attain a like object by simpler means.



THE VACUUM METHOD OF MAKING ICE.—An ice and cold producing machine has been invented by Herr Franz Windhausen, Brunswick. The action of the machine is based on the principle of producing cold by the expansion of atmospheric air, which is accomplished by means of mechanical power. The machines require no chemicals, nothing being used in them but water and atmospheric air. They may be wrought by steam, water, or wind, and they produce from 100 to 1,000 lbs. of ice per hour, according to size, at a cost of from 2d. to 5d. per 100 lbs., this difference resulting from the varying prices of fuel and the mode of working chosen. One of their uses is to cool rooms, cellars, theaters, hospitals, compartments of ships, etc.—*Builder.*

FERDINAND DE LESSEPS---CHIEF PROMOTER OF THE SUEZ CANAL.

[From the Phrenological Journal.]

The scheme of re-opening the canal of the Pharaohs between the Mediterranean and Red seas, and thus connecting by a short cut across the Isthmus of Suez the commerce of Europe and Asia, though long entertained by the first Napoleon, may fairly be claimed for M. de Lesseps. His attention was doubtless first drawn to it by reading the memorable report of M. la Père, who was employed by Bonaparte to make a survey in 1798. The credit of designing and executing the great work belongs alike to him. With the general plan, progress, and purpose of the Canal, the American reader has, during the past few months, been made tolerably familiar.

He is the son of Jean Baptiste Barthelemi, Baron de Lesseps, who was born at Cette, a French port on the Mediterranean, in 1765. Jean Baptiste was for five years French Vice-Consul at St. Petersburg. In 1785 he accompanied La Perouse on a voyage to Kamtchatka, whence he brought by land the papers containing a description of the expedition. In 1788 he was Consul at Kronstadt and St. Petersburg. From St. Petersburg he was called, in 1812, by the Emperor Napoleon, to Moscow, as *intendant*. From the latter city, in 1814, he proceeded to Lisbon, and was stationed there as Consul until 1823. He died at Paris, May 6, 1834.



Ferdinand, the subject of this sketch, was born at Versailles in 1805, and is consequently in his sixty-fourth year, though his appearance is that of a man little past the meridian of life. Early in life he evinced peculiar aptitude for the diplomatic career in which he has since distinguished himself—a career as varied and romantic as it is brilliant. In 1825 he was appointed *attaché* to the French Consulate at Lisbon. Two years later found him engaged in the Commercial Department of the Minister of Foreign Affairs. During the latter part of 1828 he was *attaché* to the Consul-General at Tunis; and in 1831 he was dispatched by his Government as Consul to Alexandria. Hard work and rapid promotion for *le jeune diplomat!* But the most eventful period of his long and wonderfully active career lay yet before him.

Seven years subsequent to his appointment at Alexandria, and consequently when he was in his thirty-fifth year, he was sent as Consul to Rotterdam. From Rotterdam he proceeded to Malaga in 1839, to negotiate in behalf of French commerce with the Spanish Government. In the latter part of the same year he was transferred to the Consulate at Barcelona, where during the two subsequent years he was especially active, and signally distinguished himself against the reign of Espartero. In 1844 we again find him in Alexandria, whither he was sent to take the place of Lavalette. But the time for the development of his great project had not yet come. He did not long remain in the Egyptian capital. Returning to his former position in Barcelona he was witness to some of the scenes of the revolution of February. In 1848 he was appointed French Minister at the court of Madrid. Remaining in the Spanish capital about a year, he returned to Paris immediately after the revolution of '48, and in May of the following year was dispatched as Envoy of the French Republic to the Republican Government of Mazzini at Rome, where he took a leading part in the abortive negotiations which preceded the restoration of the Pope by a French army.

In 1854 he received a commission from the *Société d'études du Canal de Suez* at Paris to negotiate with Sâid Pacha for the construction of the canal projected in 1816. Accordingly, toward the close of that year, we again find him on the Isthmus, preparing for his great work. This time he came to conquer. His mission was crowned with success, and the necessary concession made in November of that year. A palace and a retinue of servants were assigned to his use, and he was treated, as a guest of the Viceroy, with the utmost respect. Great opposition followed, especially from England; and it was not till January, 1856, that the second and fuller concession was granted by Sâid Pacha, and a *Compagnie International* fully organized.

In 1858 M. Lesseps succeeded in raising two hundred millions of francs in France, and in 1859 he proceeded to Egypt and planted the Egyptian flag in the harbor of the ancient Pelusium, the great sea-port of Egypt thirty centuries ago, where Port Sâid now stands. He laid, at the same time, the foundation of a lighthouse, and proudly proclaimed the work commenced. Fresh difficulties—chiefly of a political nature—interposed, but the indefatigable Lesseps never despaired. In 1859 he had the satisfaction of seeing his company and work placed upon a firm footing, though the final decision of the French Emperor was not given till July, 1864. From that time to the present hour the Canal has steadily progressed toward completion.

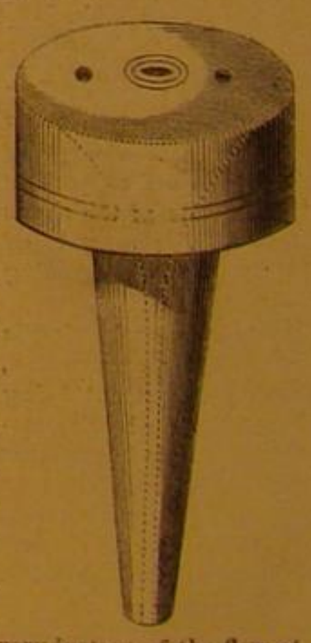
The personal appearance of M. de Lesseps is very striking. Though long past middle age, he has a fresh and even youthful appearance. Both face and figure are well preserved; his slightly curling gray hair sets off in pleasing contrast his bronzed yet clear complexion, his bright eye, and genial smile. He is somewhat over the medium stature, possessed of a compact and well-knit frame, carries his head erect, and moves about with a buoyancy and animation perfectly marvelous in one of his years and experience. His address is that of the well-bred, well-educated French gentleman that he is. His manner is winning, his voice clear and under most excellent control, as all those who have listened to his admirable lectures on the Canal at the late Paris Exposition cannot fail to remember. What is perhaps most remarkable in a man so bred and constituted, is that with great gentleness of speech and suavity of manner he combines a strength of will and fixity of purpose worthy of Napoleon or Cæsar himself. Beneath that calm exterior lay a power which needed but the stimulus of a great idea to develop.

Though beset by difficulties, laughed at, and maligned, he has never for a moment swerved from his purpose or relaxed his efforts to accomplish it. Neither the sneers of Stevenson and his associate engineers, the heavy broadside of the "Thunderer," or the squibs of *Punch*, ever made any visible impression on the purpose or action of Lesseps.—"My purpose from the commencement was to have confidence," said he.

How bravely he has maintained his principle and redeemed his pledge let the ceremonies which marked the completion and inauguration of his great work tell—when sea sent greeting to sea; and let the keels of richly laden argosies from Cathay and from Ind, which plow the waters of the Canal, declare.

AN INGENIOUS VENT PEG.

The engraving illustrates an English invention of value in that it provides a means of giving vent to casks from which liquids are to be drawn, at the same time excluding the air when the drawing is discontinued, and thus preventing deterioration in the liquid by undue exposure to air.



The principle on which it operates is that of admitting just so much air as may be required to fill the vacant space produced by the withdrawal of the liquor from time to time, and affording this air no egress, thus hermetically sealing the barrel. This is effected by means of a valve opening inward, at the upper portion of the peg, so long as the density of the exterior air is in excess of that within. This action takes place at the very instant of the flow of the liquid, and ceases with it; for at that instant all further supply is shut off, there being no further pressure.

THE LARGE TREES OF TEXAS.—The large court-house of Navarro county is said to have been covered with shingles made from a single cedar tree. The oaks, pecans, and cedars of that section of the country attain an immense size. A pecan tree in Navarro county, on the banks of the Trinity, measured twenty-three feet in circumference. The cedars are often more than 100 feet high.

ELECTRIC MESSAGES.—Although it may require an hour, or two or three hours, to transmit a telegraphic message to a distant city, yet it is the mechanical adjustment by the sender and receiver which really absorbs this time; the actual transit is practically instantaneous, and so it would be from here to China, so far as the current itself is concerned.

A New English Patent Pulley Block.

The following description of a new pulley block, which we take from the *Ironmonger*, does not give as clear an idea of the invention as could be desired, but it shows that invention in this field has not yet exhausted itself:

"The block is made on the differential principle. The lifting chain is passed over two sheaves, each of which is geared internally, the one having one or more teeth in excess of the other. Revolving around these internal teeth is a pinion, actuated by an eccentric, which is keyed on to a shaft passing through the center of the block, with a bearing at each end in the outside frame of the block. At one end of this shaft is a wheel with an endless hand chain passing over it; this gives the motion to the eccentric shaft. The teeth of the internal pinion are broad enough to gear into the teeth of both the sheaves, but as there is more teeth in one than in the other, they (the teeth) are not exactly opposite each other, and therefore will not admit the teeth of the revolving pinion without moving; but the tooth of the pinion, acting as a wedge, and entering with great power, pushes the one tooth forward and the other tooth back; and this continually occurring, a continual rotary motion is given to the sheaves, in opposite directions, with a power which is proportioned to the number of the teeth, the throw of eccentric, and the leverage gained by the diameter of the hand wheel. The lifting chain is passed over the one sheave, then down, and up over the other, the two ends being attached to a powerful cross bar, to which is connected the lifting hook. By this means the weight is distributed over the two sheaves and the two parts of the chain, increasing the safety and diminishing the friction of the block.



"The blocks are very simple in construction, and are not at all liable to get out of order; the construction being such that the weight cannot run down, though the men lifting let go the chain. They hang quite plumb when in action, and the men are able to stand clear away from under the load, as the hand-wheel chain can be worked at any angle."

Plants in Sleeping Rooms.

The following from the able pen of Dr. J. C. Draper, in the January number of the *Galaxy*, will answer some inquiries lately received on the subject, and is a brief, but clear exposition of the injurious effects of plants in sleeping apartments:

"Though the air is dependent for the renewal of its oxygen on the action of the green leaves of plants, it must not be forgotten that it is only in the presence and under the stimulus of light that these organisms decompose carbonic acid. All plants, irrespective of their kind or nature, absorb oxygen and exhale carbonic acid in the dark. The quantity of noxious gas thus eliminated is, however, exceedingly small when compared with the oxygen thrown out during the day. When they are flowering, plants exhale carbonic acid in considerable quantity, and at the same time evolve heat. In this condition, therefore, they resemble animals as regards their relation to the air; and a number of plants placed in a room would, under these circumstances, tend to vitiate the air.

"While the phanerogamia, or flowering plants, depend on the air almost entirely for their supply of carbon, and are busy during the day in restoring to it the oxygen that has been removed by animals, many of the inferior cryptogamia, as the fungi and parasitic plants, obtain their nourishment from material that has already been organized. They do not absorb carbonic acid, but, on the contrary, they act like animals, absorbing oxygen and exhaling carbonic acid at all times. It is, therefore, evident that their presence in a room cannot be productive of good results.

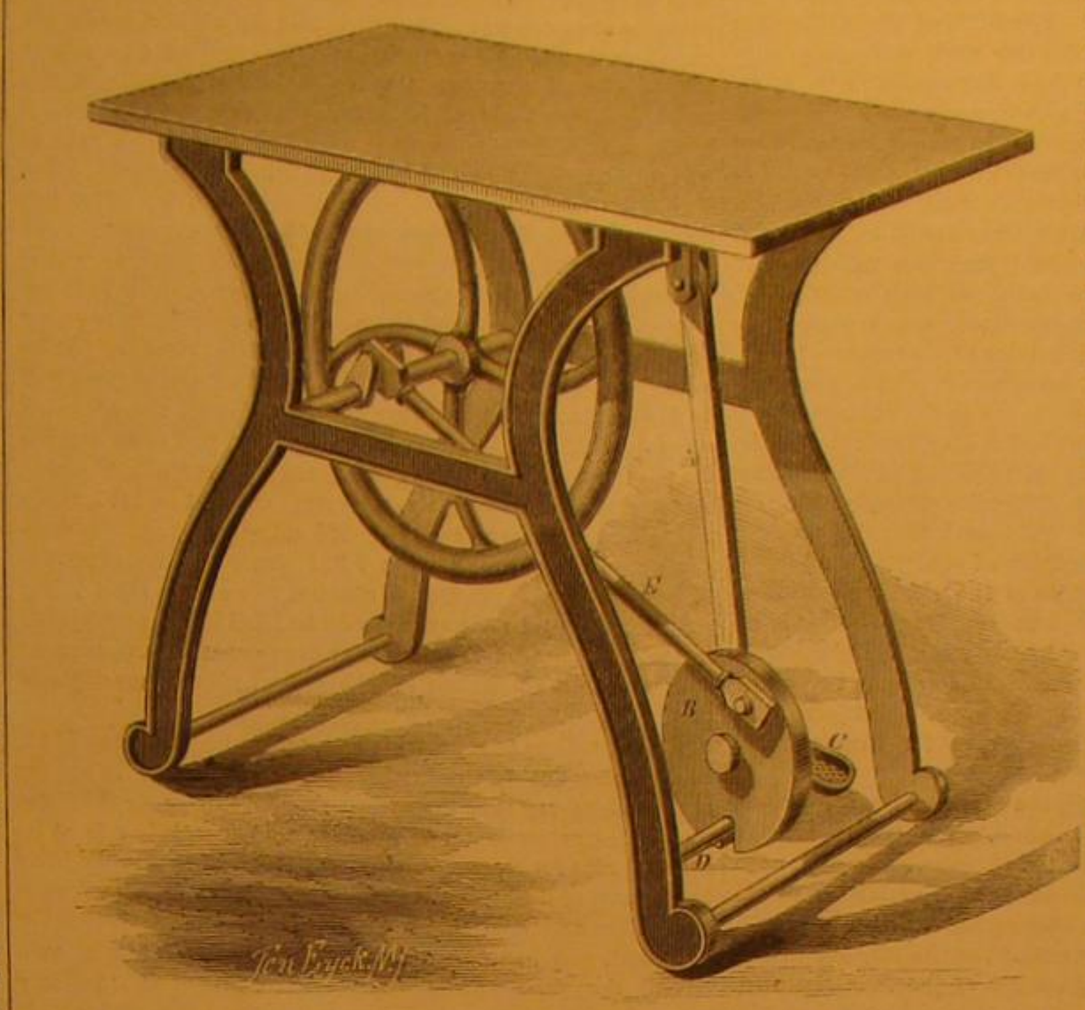
"Aside from the highly deleterious action that plants may exert on the atmosphere of a sleeping room, by increasing the proportion of carbonic acid during the night, there is another and more important objection to be urged against their presence in such apartments. Like animals, they exhale peculiar volatile organic principles, which in many instances render the air unfit for the purposes of respiration. Even in the days of Andronicus this fact was recognized, for he says, in speaking of Arabia Felix, that 'by reason of myrrh, frankincense, and hot spices there growing, the air was so obnoxious to their brains, that the very inhabitants at some times cannot avoid its influence.' What the influence on the brains of the inhabitants may have been does not at present interest us: we have only quoted the statement to show that long ago the emanations from plants were regarded as having an influence on the condition of the air; and, in view of our present ignorance, it would be wise to banish them from our sleeping apartments, at least until we are better informed regarding their true properties."

PATENT OFFICE ILLUSTRATIONS.—We are indebted to Messrs. Jewett & Chandler, of Buffalo, N. Y., for advance sheets of the illustrations designed to accompany the Report of the Commissioner of Patents for the year 1868. We have frequently had occasion to commend the skill and fidelity of these illustrations. They are most admirably done, and the value of our Patent Office Reports is much enhanced thereby. In fact without these illustrations the reports would be of little value.

Improved Treadle Motion.

It is well known that the ordinary means employed to propel light machinery by the foot are fatiguing in the extreme; and although the best of these is the rock shaft with foot pieces, employed almost universally in modern sewing machines, this requires the operator to sit bolt upright, a position very trying to the back, and one which has been shown to be productive of weakness and even permanent disease.

The device shown in the engraving employs only the swinging motion of the leg to generate the required power.



GOODES' IMPROVED TREADLE MOTION.

A pendulum, A, is pivoted to the underside of the table and carries a heavy disk, B. To the central pivot of B is attached a foot piece, C. The bottom of B is slotted, and through the slot passes a stationary rod, D, which holds the bottom of the disk from vibrating while it causes the upper part to reciprocate with the swinging of A.

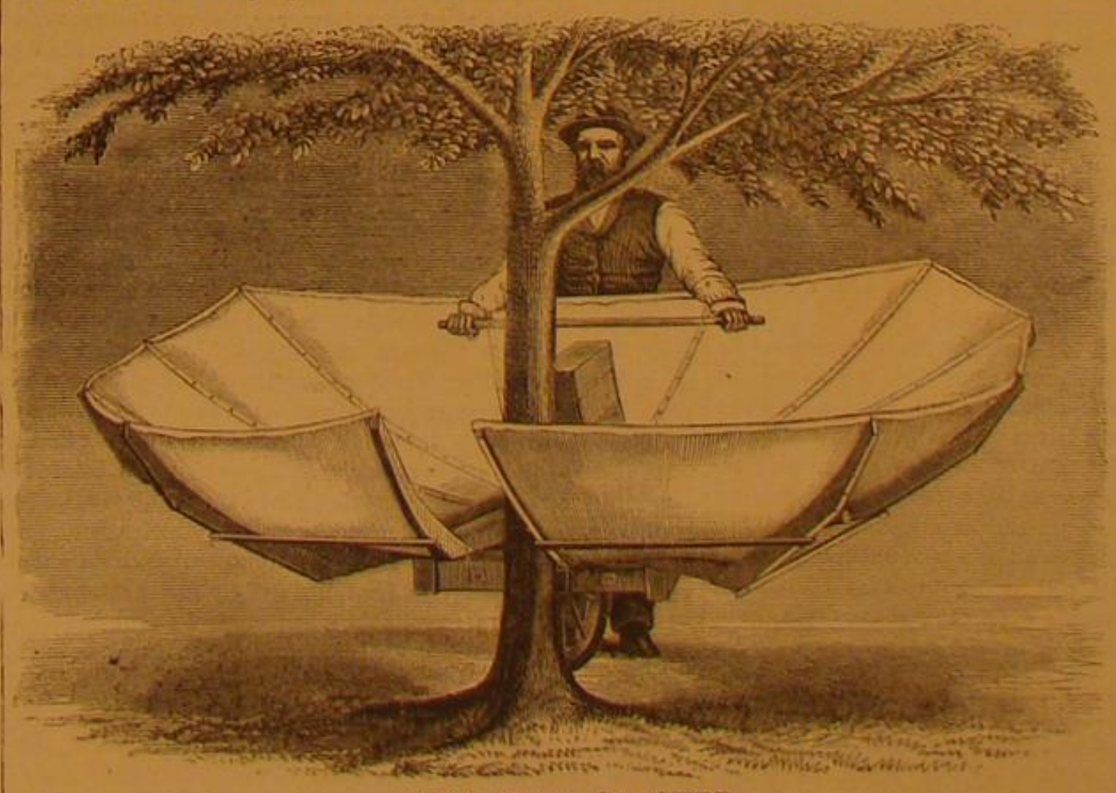
To the upper part of B is pivoted a pitman which actuates the crank as shown.

In operation the foot is placed upon the foot piece, and a swinging motion is imparted by it to the pendulum, which is ultimately converted into rotary motion by the crank as described. The heavy disk, B, gives steadiness to the motion, and acts in concert with the fly wheel on the crank shaft for this purpose; but it is not essential that this part of the device should be a disk; any equivalent may be substituted for the same purpose.

Patented, through the Scientific American Patent Agency, Oct, 26, 1869, by E. A. Goodes. For further information address Philadelphia Patent and Novelty Co., 717 Spring Garden street, Philadelphia, Pa.

Improved Method of Catching Curculios.

This is a novel and curious invention, made by Dr. Hull, of Alton, Ill., for the purpose of jarring off and catching the curculio from trees infested by this destructive insect. It is a barrow, with arms and braces covered with cloth, and having on one side a slot, which admits the stem of the tree. The curculio catcher, or machine, is run against the tree three or four times, with sufficient force to impart a jarring motion to all its parts. The operator then backs far enough to bring the machine to the center of the space between the rows, turns round, and in like manner butts the tree in the opposite row. In this way a man may operate on three hundred trees per hour.



CURCULIO CATCHER.

A bag and a broom are carried by the operator by which the insects are swept from the cloth and consigned to destruction.

Remains of a Megatherium in Ohio.

The Columbus *State Journal*, of Dec. 6, says "there is now on exhibition at the rooms of the State Board of Agriculture, or headquarters of the Geological Corps, a section of the femur or thigh bone of an animal of the mastodon species, the fossilized remains of which were recently discovered in Union county. These remains were found in a drift formation about three feet below the surface, and are similar to the remains of the Megatherium found in other parts of the State. Arrangements were made by Mr. Klippart, of the Geological Corps, to have the skeleton or the parts thereof removed with proper care. Before excavations had proceeded far bad weather set in, and work has been abandoned. The section of the femur, upper part, with socket ball, is about twenty inches in length, or about half the length of the thigh bone. This would make the aggregate length of the bones of the leg about ten feet. The ball is twenty-two inches in circumference, and the bone lower down, of course, much larger. From the part of the skeleton secured, it is estimated that the hight of the animal was twelve and a half feet, and the skeleton entire much larger than the specimen now in the British Museum. As this particular species, or remains thereof, have been found only in Ohio, this specimen has been named the *Megatharium Ohiocnsis*. The animals lived, it is supposed, in the period immediately preceding the human period, and were after the elephant type.

Exhuming operations will be resumed in the spring, and if the skeleton is removed in good shape or a good state of preservation, it will be set up in the Echo room at the Capitol, where the fossils collected by the Geolo gical Corps are now being arranged and stored.

Artificial Ivory.

A process for producing artificial ivory has been published in a German journal. The inventor makes a solution of india-rubber in chloroform and passes chlorine gas through it. After this, he heats the solution to drive off any excess of chlorine, and also the solvent, whereupon he has left behind a pasty mass with which it is only necessary to incorporate sufficient precipitated carbonate of lime or sulphate of lead, or, indeed, any other dense white powder, to obtain a material which may be pressed into molds to form whatever articles may be desired. The details of this process are obviously incomplete, and the success of it may be doubted. Only good and well masticated rubber could be employed, and even then a dilute solution must be made, and any earthy impurities allowed to deposit. In the next place, we are doubtful of the bleaching action of chlorine on rubber, and, moreover, chloroform is, under some circumstances, decomposed by chlorine. Lastly, it is clear that, to obtain a hard material at all resembling ivory, it would be necessary to make a "hard cure," for which a considerable proportion of sulphur would be required. The simple purification of india-rubber by means of chloroform, would, however, furnish a mass of a very fair color.

AN iron car made of cylindrical form is now used on the Bengal Railway, for the carriage of cotton and other produce. It is much lighter and safer than the ordinary car. We believe in iron cars.

ONE HUNDRED THOUSAND.—At the rate old subscribers are renewing, and new ones coming in, there is a prospect that our ambition to increase the circulation of this paper to one hundred thousand will be gratified.

AMERICAN AND ENGLISH RAILWAY PRACTICE CONTRASTED.

A paper on "American Locomotives and Rolling Stock," read before the Institution of Civil Engineers, in England, with an abstract on the discussion thereon, has been forwarded to us by the publishers, William Clowes and Sons, Stamford street and Charing Cross, London.

We have seldom met with a pamphlet of greater interest and value. The whole subject of American as contrasted with English railroad practice is reviewed, and the differences which exist, with the necessities for such differences ably discussed. Mr. Colburn shows these differences to be external rather than fundamental, and traces many of the peculiarities of American construction to the "initiative of English engineers." The cause for the adoption and retention of these peculiarities he attributes to "the necessities of a new country and the comparative scarcity of capital," and thinks that but for these causes "American railways and their rolling stock would have doubtless been constructed, as in other countries, upon English models, and worked, in most respects, upon English principles of management.

He reviews the origin and introduction of American features of railway practice, and points out as the distinguishing feature of American locomotives and rolling stock the bogie, or swiveling truck. "Keeping in mind the distinguishing merits of the bogie, the other differences between English and American locomotives are differences more of costume and of toilet than of vital principles of construction."

The author attributes the origin of the greater subdivision of rolling weight and consequent coupling of wheels on American roads to the comparatively weak and imperfect permanent way, estimating the maximum weight per wheel as being for many years four English tuns, while three tuns he considers, as more than the average for each coupled wheel of American locomotives.

To follow the author through the whole of his able paper, and the discussion which it elicited, would occupy more of our space than we can spare for the purpose. We will, however, give in the author's own language, an account of an experiment conducted by him in 1855 on the Erie Railroad.

"In the autumn of 1855, the author, at the request of Mr. (now General) M'Callum, the manager of the Erie Railroad, took charge of an experimental train, which he ran over the whole length of the line and back, a total distance of nearly 900 miles. The same engine was employed throughout the run, occupying in all nearly three weeks, making an average for each week day of about 50 miles. The line is divided into four divisions, varying considerably in respect of gradients, and the utmost load the engine could draw was taken in both directions over each division. The maximum inclinations were 1 in 88. The results of the experiments were so voluminous, that it will be sufficient to detail the particulars of what may be termed crucial tests of adhesion and resistance to traction.

"The engine had four coupled wheels and a bogie, the total weight in working trim being 29½ tuns, of which 17⅞ tuns rested on the coupled wheels available for adhesion. The coupled wheels were 5 feet in diameter; the outside cylinders were 17 inches in diameter, and the stroke 24 inches. The safety valves were set to blow off at 130 lbs., and the steam, as observed by a Bourdon gage, was seldom allowed to exceed that limit. No indicator diagrams were taken, nor was any measure taken of the wood burnt, all that could be consumed by the engine, in maintaining the requisite steam, being supplied. The tender, loaded, weighed 18¼ tuns. The train drawn consisted of eight-wheel wagons fully loaded with deals. The average weight of each wagon was 5 tuns 8 cwt. 3 qrs., and of each wagon with its load 15 tuns 5 cwt. 3 qrs. nearly. The wagons had cast-iron chilled wheels, each 2 feet 6 inches in diameter, with inside journals 3⅞ inches in diameter, and 8 inches long. All the wagons had been put in complete order, and the journals, fitted with oil-tight boxes, were kept well oiled. The gage of the line was 6 feet. The weather was most favorable, clear and dry, with the exception of a single day of heavy rain.

"Upon about one hundred miles of the line, forming a portion of the Susquehanna division, a train of one hundred wagons, weighing, with engine and tender, 1,572 tuns was taken. The train was a few feet more than half a mile in length.

"At one point it was stopped where the line commenced an ascent of 24 feet in four miles, averaging 1 in 880 up for the whole distance. There were also long and easy curves upon this portion. The train was taken up and purposely stopped on the second mile, to be sure of starting again with no aid from momentum. The average speed was 5 miles an hour, and neither was the pressure of steam increased nor sand used except in starting from the stops purposely made. The engine, even were its full boiler pressure of 130 lbs. maintained as effective pressure upon the pistons throughout the whole length of their stroke, could not have exerted a tractive force greater than $\frac{17^2 \times 130 \text{ lbs.} \times 2 \text{ ft.}}{5 \text{ ft.}} = 15{,}028$ lbs.; nor is it at all probable that the effective cylinder pressure could have approached this limit by from 10 lbs. to 15 lbs. per square inch. Supposing, however, for the sake of a *reductio ad absurdum*, that the full boiler pressure had been maintained upon the pistons for the whole length of their strokes, the adhesion of the coupled driving wheels, not deducting the internal resistances of the engine, would have been $\frac{15{,}028}{40{,}050} = \frac{3}{8}$ of the weight upon them. In any case there was a resistance of 4,011 lbs. due to gravity, and if even 120 lbs. mean effective cylinder pressure be assumed, corresponding to a total tractive force of 13,872 lbs., the quotient representing the rolling and other resistances, exclusive of gravity, would be but 6·27 lbs. per tun of the entire train; a resistance including all the internal resistances of the engine, the resistance of the curves, easy although they were, and the loss in accelerating and retarding the train in starting and stopping. This estimate of resistance would correspond, at the observed speed of 5 miles an hour (upwards of ⅓ of an hour having been consumed on the 4 miles), to 185 indicated H. P., which, with the driving wheels, making but 28 revolutions per minute, would be the utmost that an engine with but 1,038 square feet of heating surface could be expected to exert. This was the highest result observed during the three weeks' trial, but one or two others are worthy of mention. On the Delaware division of the same line, the train, of 1,572 tuns' weight, was run over 5 consecutive miles of absolutely level line, at a mean rate of 9·23 miles an hour, and during the same day, over 5 other consecutive miles of level at a mean rate of 9·7 miles per hour. On both levels there were 14½ chain curves of good length, and the speed, from 9 to 12 miles an hour, at which the train entered the respective levels, was not quite regularly maintained throughout the half hour expended in running over them. But if even 7 lbs. per tun of the total weight be taken as the resistance at these speeds, the tractive force will be 11,004 lbs., which is more than one fourth the adhesion weight of 40,050 lbs. On the next day, the same engine drew 30 wagons weighing 466½ tuns, or, including engine and tender, 514 tuns nearly, up a gradient of 1 in 117½, three miles long, at a mean speed of 10¼ miles an hour. The resistance due to gravity was 9,814 lbs., and supposing the other resistance to traction to amount to no more than 7 lbs. per tun, the total resistance would be 13,412 lbs., corresponding to a mean effective cylinder pressure of 117 lbs. per square inch, and to a co-efficient of adhesion of almost exactly one third.

"It is needless to repeat instances of much the same kind, as occurring during the experiment referred to. The author is bound to say that they were, no doubt, influenced by the favorable circumstances of weather, and something is to be allowed also for the great length of train drawn, very long trains having a less tractive resistance per tun on a level than short ones, and something, possibly more than is commonly supposed, may have been due to the use of oil-tight axle boxes, the saponaceous compound known as 'railway grease' being nowhere in use on railways in the States. It could not possibly be used, except in a congealed form, in the severe American winters; and Messrs. Guebhard and Dieudonné's experiments (*vide* "De la résistance des trains et de la puissance des machines." 8vo. Paris, 1868, p. 36) made in 1867, on the Eastern Railway of France, showed a very considerable diminution in the resistance of oil-boxed rolling stock as compared with that fitted with grease boxes. But, weighed upon the other hand, are the facts, first, that the line was of 6-feet gage, and, *pro tanto*, so much the worse for traction; secondly, that the wheels were comparatively small, and the inside journals of comparatively large diameter, the ratio of the former to the latter being as 7⅞ to 1, instead of 12 to 1 as on English lines. It is difficult to believe that the length and steadiness of the double bogie goods wagons, scarcely liable as they are to lateral vibrations, had not something to do with the result, which is in some respects unique in the history of railway traction. The result, although not absolutely showing the real resistance to traction, nor the real adhesion of the engine, presents this alternative; namely, that the resistance must have been unusually small, or the adhesion unusually large."

In the discussion which followed some doubts were expressed as to the accuracy of Mr. Colburn's conclusions, drawn from the experiments described; but it was conceded by some who took part in the discussion that some of the features of our practice might be advantageously copied in England. For the most part, however, the opinion prevailed that the features of our system, which are here regarded as almost indispensable, could not be introduced into English practice with advantage.

BOILER COVERING.

BY C. M. O'HARA, C. E.

At the regular weekly meeting of the Polytechnic Association of the American Institute, held on Thursday evening, the 25th ult., the subject of boiler clothing was discussed at some length, but without any decisive conclusion being arrived at respecting the most serviceable and economical material for that purpose. It appeared from the testimony adduced, that though there is a variety of substances in use, even those which are practically acknowledged as being the most efficient are far from coming up to the required standard of utility, and are characterized by defects which are at once forced upon us by a little close examination. Felt is an admirable non-conductor of heat, but owing to its combustible nature it is quite unreliable when subject to the heat of a high pressure of steam. A large fragment of this material which had been taken off the boiler of a North River steamboat was exhibited at the meeting, scorched and charred as if it had been exposed to the direct action of fire. For these reasons felt covering is, generally speaking, confined to boilers in which a comparatively low pressure of steam is maintained. But even under the most favorable circumstances of actual wear its durability is limited to a short period.

Powdered charcoal possesses the elements of efficiency as a non-conductor in an eminent degree; but its susceptibility of taking fire militates strongly against its adoption as a boiler covering.

Besides the materials above mentioned, there are some which come under the denomination of cements; but the use of such is somewhat at variance with what a dull world would call "facts." Employing them as a clothing for a vessel in which it is necessary to retain heat is certainly the wrong way of doing a right thing, if the evidence of distinguished experimenters be worth anything.

The researches of most well-informed physical philosophers go to prove that the conducting properties of bodies are augmented by cohesion, and that heat is conveyed profusely and energetically through all solid and ponderable substances. Thus gold, silver, and others of the most solid metals are the best conductors. Next to the pure metals in conducting powers are rocks, flints, porcelain, earthenware, and the denser liquids as the solutions of the acids and alkalies. As a further evidence to prove that the passage of heat through all substances is increased by cohesion, even some of those which are known to be among the best conductors are deprived of this property by a division or disintegration of their particles. Pure silica in the state of hard, rock crystal is a better conductor than bismuth or lead; but if the rock crystal be pulverized, the diffusion of heat through its powder is very slow and feeble. Heat is conducted swiftly and copiously through transparent rock salt, but pulverization converts the solid mass into a good non-conductor. Caloric has for the same reason a stronger affinity for pure metals than for their oxides.

Again, wood is known to be a better non-conductor when reduced to shavings or sawdust than when in the solid state. It is probably on this account that trees are protected by bark, which is not nearly so dense and hard a body as the wood. Wool, silk, and cotton are much diminished in conducting qualities when spun and woven, for the reason that their fibers are brought closer together.

Count Rumford discovered that hot water, at a given temperature, when placed in a vessel jacketed with a clothing of twisted silk, and plunged into a freezing mixture, cooled down to 135° Fah. in 917 seconds. But when the same vessel was clothed with an equal thickness of raw silk, water at the same heat and under the same process required 1,264 seconds before it reached the same decrease of temperature. It was also found by Sir Humphry Davy that even metals became non-conductors when their cohesion was destroyed by reducing them to the gaseous state.

It is now generally admitted that, heat being motion, anything, which, by the cohesion of particles, preserves the continuity of the molecular chain along which the motion is conveyed, must augment calorific transmission. On the other hand, when there is a division or disintegration of atoms, such as exists in sawdust, powdered charcoal, furs, and felt, the particles composing such bodies are separated from each other by spaces of air, which the instructed among us well know are good non-conductors of heat. The motion has, therefore, to pass from each particle of matter to the air, and again from the air to the particle adjacent to it. Hence, it will be readily seen, that in substances composed of separate or divided particles, the thermal bridge, so to speak, is broken, and the passage of heat is obstructed by innumerable barriers of confined air. The correctness of these assumptions has been so abundantly proved by experimental demonstrations, that every mind that is tolerably informed on the subject must be relieved of every shade of doubt respecting the greatly superior non-conducting powers which bodies consisting of separate atoms possess over those of a solid concrete nature.

The next matter of interest connected with the subject under notice is its relation to the philosophy of radiation. It has long been known that the emission of heat from a polished metallic surface is very slight, but from a surface of porcelain, paper, or charcoal, heat is discharged profusely. Even many of the best non-conductors are powerful radiators, and throw off heat with a repellent energy difficult to conceive.

"If two equal balls of thin, bright silver," says Sir John Leslie, "one of them entirely uncovered and the other sheathed in a case of cambric, be filled with water slightly warmed and then suspended in a close room, the former will lose only eleven parts in the same time that the latter will dissipate twenty parts." The superior heat-retaining capacity which a clean tin kettle possesses over one that has been allowed to collect smoke and soot, lies within the compass of the most ordinary observation.

The experiments of the eminent philosopher just mentioned furnish a variety of suggestions on the radiation from heated surfaces. He found that, while the radiating power of clean lead was only 19, it rose to 45 when tarnished by oxidation, that the radiating power of plumbago was 75, and that of red lead 80. He also discovered that, while the radiating power of gold, silver, and polished tin was only 12, that of paper was 98, and lamp black no less than 100. He further says: "A silver pot will emit scarcely half as much heat as one of porcelain. The addition of a flannel, though indeed a slow conductor, far from checking the dissipation of heat, has directly a contrary tendency, for it presents to the atmosphere a surface of much greater propulsive energy, which would require a thickness of no less than three folds to counterbalance."

It is safe to infer from this analogy that the felt covering of boilers should not only be of considerable thickness, but should be protected by an external jacketing of some sort; for, though felt is a good non-conductor, it is a powerful absorber and radiator, more especially when it has been allowed to contract soot and dust.

Various experiments have lead to the general conclusion that the power of absorption is always in the same proportion as the power of radiation. It must be so. Were any substance a powerful radiator and at the same time a bad absorber, it would necessarily radiate faster than it would absorb, and its reduction of temperature would continue

without limit. It has, furthermore, been proved that the absorptive property of substances increases as their reflecting qualities diminish. Hence, the radiating power of a surface is inversely as its reflecting power. It is for this reason that the polished metallic sheathing on the cylinders of locomotive engines, and on the boilers of steam fire engines, is not only ornamental but essentially useful. Decisive tests have also established the fact that radiation is effected more or less by color. "A black porcelain tea pot," observes Dr. Lardner, "is the worst conceivable material for that vessel, for both its material and color are good radiators of heat, and the liquid contained in it cools with the greatest possible rapidity; a polished silver or brass tea urn is much better adapted to retain the heat of the water than one of a dull brown, such as is most commonly used."

A few facts like those above stated afford more decisive information regarding the nature of heat than columns of theory or speculation. Yet it is rather strange that when so many learned and reliable men have experimented so much and commented with such persuasiveness upon the subtile agency of heat and the vast amount of waste that must accrue by injudicious management, comparatively few have availed themselves of the united labors of these indefatigable pyrologists; manufacturing owners and corporations still persisting in having their steam boilers painted black or dull red and leaving them exposed to the atmosphere. Some persons, who pass themselves off very satisfactorily as clever engineers, affect a contempt for the higher branches of science, and assert, in a very positive and self-sufficient manner that experiments made in a study or laboratory are on too trifling and small a scale to be practically relied upon; that a tin kettle or a saucepan is a very different thing to the boiler of a steam engine.

This may be so in one sense, but the same chemical forces which operate upon the one will be just as active in a proportionate degree in their action upon the other. It was said by Aristotle that the laws of the universe are best observed in the most insignificant objects; for the same physical causes which hold together the stupendous frame of the universe may be recognized even in a drop of rain. The same observation may be applied to the laws of heat in all their ramifications; for, after all, our experiments are, in many instances, but defective copies of what is continually going on in the great workshop of nature.

It would be needless to insist on the wasteful and destructive effects produced by the exposure of boiler surfaces to the open atmosphere. Such a practice can be neither supported by experience nor justified by analogy; and it is to be hoped that it may before long be consigned to the limbo of antiquated absurdities and be satisfactorily forgotten. Seeing that it cannot with any show of reason be affirmed that the boiler covering materials in present use possess the requirements necessary to recommend them; the question arises as to what is the best means of achieving the object required. This is an inquiry which it is the office of time alone to answer. As the problem is obviously one of primary importance, and well worthy of the attention of inventors, it is hazarding nothing to predict its satisfactory solution at no distant date.

The plain truth is, boilers have of late become gigantic foes to human life. Explosions have increased, are increasing, and should be diminished; and they are, in many instances, caused by boilers being strained and weakened by sudden contraction from having their surfaces exposed when the fire has been withdrawn from them. Boilers are also materially injured by the excessive furnace heat which it is necessary to maintain to compensate for the large amount of caloric which is dissipated from their surfaces, not only by radiation but from absorption by the surrounding atmosphere.

As the views here laid down are drawn exclusively from the region of fact and experiment, it is to be hoped that an enlightened sense of self-interest may prompt those whom the subject may concern, to give it that special attention which its importance demands.

Attachment of Saws to Swing-Frames.

To insure the efficiency of mill-saws, it is highly important to have them firmly secured in the frames by which they are reciprocated. Swing-frames for carrying saws are ordinarily of wrought iron or steel, and made up of several pieces mortised and tenoned together in the form of a rectangular frame or parallelogram, of which the longest sides are termed verticals and the shortest crossheads or crossrails. In the case of deal frames, the swing frame differs somewhat from that of a timber frame, in having two extra verticals, which separate it into two equal divisions. These are necessary in order that two deals may be operated upon simultaneously, each division being devoted to a separate deal, and likewise to enable the connecting-rod which works the frame to pass up the center and oscillate on a pin near the top, thereby avoiding the deep excavations and costly foundations required where the rod is engaged with the pin at the bottom. The rack that advances the deals to the saws passes through a "bow" in the connecting-rod and the middle of the frame, the deals are placed on either side of it, on rollers purposely provided. In sawing hard deals, the saws require to be sharpened about every tenth run or journey, and every twentieth for soft. Fifty runs, or one hundred deals, are reckoned an average day's work; this is inclusive of the time required for changing the saws, returning the rack for another run, and other exigencies. For attachment to swing-frames the saws have buckles riveted to them; these are by various modes connected to the crossheads. Each top buckle is passed through the crosshead, and is pierced with a mortise for the reception of a thin steel wedge or key, by whose agency the blade is strained and tightened. The edge of the crosshead upon which the keys bed is steeled to lessen the wear invariably ensuing from frequently driving up the keys. The distances between the blades are adjusted by interposing strips of wood, or packing pieces, as they are termed, of equal thickness with the required boards or leaves; the whole is then pressed together and held in position by packing screws. The saws themselves are subsequently tightened by forcing home the keys until a certain amount of tension has been attained; this is ascertained only by the peculiar sound which emanates from the blade on being drawn considerably tight and tense. Great experience is required to accustom the ear to the correct intonation, as in general the tensile strain on the saws approximates so closely to the breaking point that one or two extra taps on the keys are quite sufficient to rupture them.

Mr. Brunel, in the government saw-mills at Woolwich, adopted a method of hanging saws by means of a weighted lever, like a Roman steelyard. A cross-shaft affixed above the saws to the cornice of the main frame carried a lever, weighted at one end and provided with a hook or shackle at the other for engagement with the saw buckle. In using this apparatus the blades were strained one at a time by linking the lever to the buckle and then adjusting the movable weight until the desired tension was acquired, after which the key was inserted into the mortise and the lever released. This arrangement is not now in common use on account of the trouble attending its employment, and at present the saws are merely strained by hammering up the keys. The saw blades had usually a tensile strain of upwards of one ton per inch of breadth of blade. It is to be further observed that the cutting edges of the saws are not quite perpendicular, but have a little lead, or their upper ends overhang the lower about three eighths of an inch or one half of an inch, according to the nature of the material to be sawn. The object of this is that the saws may be withdrawn from the cuts in the ascending or back stroke, and allow the sawdust free escape. The eccentric actuating the mechanism for advancing the timber to the saws is generally set in such a manner that the feed commences just at the moment when the frame has attained half its ascending stroke, and continues until the entire stroke has been completed. By this regulation the saws are not liable to be suddenly choked, but come smoothly and softly into their work.—*Worssam's Mechanical Saws.*

PATENT DECISION.

In the matter of the application of William N. Bartholomew, assignor to J. Eckendorfer, for letters patent for a design for Rubber Eraser.—Letters patent for designs have increased in importance within the past few years. Formerly but few were granted, now many are issued. To this day they have made so little figure in litigation that but three reported cases are known in which design patents have come into controversy. With their increase, questions have arisen concerning their scope and character, which have given rise to dispute and to inquiry as to the correctness of the current practice of the office in this branch of invention. While on the one hand, it is insisted that the practice has always been uniform, and is therefore now fixed and definite: on the other, it is asserted, that there has never been, and is not now, any well-defined or uniform practice, either in the granting or refusal of design patents.

The act of 1836 made no provision for the patenting of designs. The earliest legislation upon this subject is found in the act of August 29, 1842, section 3; and the only legislation upon the subject is found in this section and in section 11, of the act of March 2, 1861. The definition of the subject matter, or, in other words, of a "design," is the same in both acts. It is as follows:

"That any citizen, etc., who, by his, her, or their own industry, genius, efforts, and expense, may have invented or produced any new and original design for a manufacture, whether of metal or other material or materials, any original design for a bust, statue, bas-relief, or composition in alto or basso-relievo, or any new and original impression being formed in marble or other material, or any new and useful pattern, or print, or picture, to be either worked into or worked on, or printed, or painted, or cast, or otherwise fixed on any article of manufacture, or any new and original shape or configuration of any article of manufacture not known or used by others, etc."

This definition embraces five particulars.

1. A new and original design for a manufacture.
2. An original design for a bust, statue, etc.
3. A new and original impression or ornament to be placed on any article of manufacture.
4. A new and useful pattern, print, or picture to be worked into or worked on, or printed, or painted, or cast, or otherwise fixed on any article of manufacture.
5. A new and original shape or configuration of any article of manufacture.

The first three of these classes would seem to refer to ornament only; the fourth to ornament, combined with utility, as in the case of trade marks; and the fifth to new shapes or forms of manufactured articles, which, for some reason, were preferable to those previously adopted.

The disputed questions which have thus far arisen under these definitions are:

1. What variations may be claimed or covered by the patent consistently with unity of design.
2. Is a new shape of an article of manufacture, whereby utility is secured, a subject of protection under this act; and
3. Is mechanical function of any kind covered by it.

As to the first of these questions, it seems to have been assumed that the design spoken of in all parts of the sections referred to covered a fixed, unchangeable figure; that the protection of letters patent did not extend to any variation, however slight, but that such variation constituted a new design, might be covered by a new patent, and might safely be used without infringement of the first. This, it is said, is the correct theory of the law, and has been the uniform adjudication of the Office.

Neither of these statements is absolutely correct. The law by no means defines a design with such strictness. The language is, "new and original design for a manufacture," "new and original impression or ornament," "new and original shape or configuration." It would seem to be too plain for argument, that the new design, or impression, or shape, might be so generic in its character as to admit of many variations, which should embody the substantial characteristics and be entirely consistent with a substantial identity of form. Thus, if the invention were of a design for an ornamental button, the face of which was grooved with radial rays, it would seem that the first designer of such a button might properly describe a button of five rays, and, having stated that a greater number of rays might be used, might claim a design consisting generally of radial rays, or of "five or more" rays; and, that it could not be necessary for him to take out a patent for each additional ray that could be cut upon his button. So, if the design were the ornamentation of long combs by a chain of pearls, it would seem that a claim for such a design might be maintained against one who arranged the pearls, either in curved or straight lines, or who used half pearls only, and that such modifications, if they had occurred to the designer, might properly have been enumerated in his specification as possible and equivalent variations. In short, I can see no reason, under the law, why designs may not be generic, why what are called "broad claims," may not be made to them, and why the doctrine of artistic or æsthetic equivalents may not be applied to them.

This has been recognized to a greater or less extent in the adjudications of the courts and in the practice of the Office.

One of the reported cases is that of Booth *ex.* Garelly 1, Blatch. 247. The design is described as consisting of "radially-formed ornaments on the face of the molds or blocks of which the button is formed, combined with the mode of winding the covering on the same, substantially as set forth, whether the covering be of one or more colors." The specification, in "substantially" setting forth the design, contained this language: "It will be obvious from the foregoing that the figures can be changed at pleasure by giving the desired form to the face of the mold by depressions and elevations which radiate from a point, whether in the center of the mold or eccentric thereto."

In the consideration of the case by the Court no objection was made to this statement or claim. In the case of Root *ex.* Ball, 4 McLean 180, the learned judge instructed the jury that "if they should find that the defendants had infringed the plaintiff's patent by using substantially the same device as ornamental on the same part of the stove they would, of course, find the defendant guilty. To infringe a patent right it is not necessary that the thing patented should be adopted in every particular; but if, as in the present case, the design and figures were substantially adopted by the defendants, they have infringed the plaintiff's right. If they adopt the same principle the defendants are guilty. The principle of a machine is that combination of mechanical powers which produce a certain result. And in a case like the present, where ornaments are used for a stove, it is an infringement to adopt the design so as to produce substantially the same appearance."

It has been the constant practice to grant patents for designs for fonts of type, for sets of silver plate, for a series of printers' flourishes, and the like. This class of cases has always passed without objection.

Two other cases which have arisen within the Office deserve notice. The first was for a series of miniature shoulder straps, with emblems denoting rank, provided with a pin, to be worn under an officer's coat, upon his vest, or as a lady's breastpin. The drawing shows eight of these pins with emblems of rank, varying from that of second lieutenant to major-general, specification describing the brooch for a second lieutenant goes on to say: "I propose to introduce, on some of them, the different ornaments showing the respective ranks of the army, from a major-generalship to a second lieutenancy. See Figs. 2, 3, 4, 5, 6, 7, 8."

The second case was that of an application for a monogram visiting card, on which the name was to be inscribed or printed in the form of a monogram. The applicant filed a drawing, showing a card upon which was a monogram of his own name. In his specification he gives certain rules for forming such monograms, and then says: "It is manifest that the form of the letters as well as the letters themselves can be changed as required by circumstances or the taste of the individual for whom the monogram is designed; and that the general form and outline of the monogram may be varied; and, indeed, must vary to be adapted to the particular name it is required to represent."

The claim was for "a monogram, visiting card, or visiting card upon which the name is inscribed or printed in the form of a monogram, substantially as herein specified."

This application was rejected by the Examiner and Board of Examiners-in-Chief, but was allowed by the Commissioner upon appeal.

It is true that, before and since this patent was issued, many patents have been refused for what I have called generic designs. One man having designed a tack head, ornamented with radial lines, was compelled to take out one patent for his tack with six radial lines, and another for the same tack with eight. There are other instances of like character, but they only serve to show that the practice of the Office has not been uniform, and that the true practice is still to be adopted and followed.

I have no hesitation in saying, in view of the premises, that a valid patent may be granted for a new genus or class of ornaments as well as for specific ornaments, though I do not doubt that, under the statute, every species, variety, and individual having distinct characteristics under such a genus might also be patented, the patent being subordinate and tributary to that which covered the class. From the nature of this subject-matter there must always be more latitude in the issue of patents for trifling changes, or form, or outline, since it is only necessary that such changes should constitute a new "design" to entitle them to a patent of this class.

The second question relates to the elements of utility in patents for designs.

Upon this point, it is said by my predecessor, in Jason Crane *ex parte* Commissioners, December—May, 1869, p. 1, that the construction which has been given to the act of 1842, by the Office, ever since its passage, is that it relates to designs for ornament merely; something of an artistic character as contradistinguished to those of convenience or utility.

The Board of Examiners-in-Chief, in the present case, say "The practice of the Office has been uniform from the beginning, and has always excluded cases like the present from the benefit of the laws relating to designs." And, again, "The general understanding has always been that the acts of 1842 and 1861 were intended to cover articles making pretensions to artistic excellence exclusively."

In thus denying that a new "shape or configuration" of an article, whereby utility or convenience is promoted, is the proper subject of a patent under the acts referred to, the Office would seem to have involved itself in the absurdity that if a design is useless it may be patented; whereas, if it be useful, it is entitled to no protection.

Fortunately no such "uniform practice" has existed, and the Office is relieved from so grievous an imputation. The practice seems to have been taken for granted by the appellate tribunals; and, so far from being as stated, is, as nearly as possible, the reverse of it. Articles have been, and are being, constantly patented as designs which possess no element of the artistic or ornamental, but are valuable solely because, by a new shape or configuration, they possess more utility than the prior forms of like articles. Of this character are designs for ax heads, for reflectors, for lamp shades, for the soles of boots and shoes, which have been heretofore patented as designs; and to this class might be added, with great propriety, that class of so-called "mechanical" patents, granted for mere changes of form, such as plowshares, fan blowers, propeller blades, and others of like character.

When, therefore, my learned predecessor in Crane's case added to this number a box so designed as to hold with convenience a set of furs, he did but confirm and not alter the practice of the Office, so far as it can be gleaned from the patented cases. I am of opinion that the class of cases named in the act as arising from "new shape or configuration" includes within it all those mere changes of form which involve increase of utility. This I take to be the spirit of the decision in Wooster *ex.* Crane, 2 Fisher 583. The design was of a reel in the shape of a rhombus. The learned Judge says: "In this case, the reel itself, as an article of manufacture, is conceded to be old and not the subject of a patent. The shape applied to it by the complainant is also an old, well-known mathematical figure. Now although it does not appear that any person ever before applied this particular shape to this particular article, I cannot think that the act quoted above was intended to secure to the complainant an exclusive right to use this well-known figure in the manufacture of reels. The act, although it does not require utility in order to secure the benefit of its provisions, does require that the shape produced shall be the result of industry, effort, genius, or expense, and must also, I think, be held to require that the shape or configuration sought to be secured shall, at least, be new and original as applied to articles of manufacture. But here the shape is a common one in many articles of manufacture, and its application to a reel cannot fairly be said to be the result of industry, genius, effort, and expense. No advantage whatever is pretended to be derived from the adoption of the form selected by the complainant, except the incidental one of using it as a trademark. Its selection can hardly be said to be the result of effort even; it was simply an arbitrary chance selection of one of many well-known shapes, all equally well adapted to the purpose. To hold that such an application of a common form can be secured by letters patent, would be giving the act of 1861 a construction broader than I am willing to give it."

It would seem from this language that if there had been "advantage," that is, utility in the adoption of the form of the rhombus, that it would have found more favor in the eyes of the Court.

This subject has been well discussed in the opinion of Commissioner Foote in Crane *ex parte*. I concur in that opinion, except as to the recital of the former practice of the Office, which a careful examination has shown to be erroneous.

The third question may be readily disposed of. Modes of operation or construction, principles of action, combinations to secure novelty or utility of movement, or compositions of matter, can hardly be said to be "shapes, configurations, or designs," but where the sole utility of the new device arises from its new shape or configuration, I think it may fairly be included among the subjects which the act of 1842 was designed to protect.

The present case may, in view of the foregoing consideration, be disposed of without difficulty. Letters patent are asked, by applicant, for a new design for a rubber eraser, which consists in giving to the eraser a cylindrical body, with ends beveled to an edge. The claim is for the "cylindrical rubber eraser provided with a wrapper or case, as herein shown and described."

In the body of the specification the applicant describes the mode of making the eraser, and he also enumerates its advantages over erasers of the ordinary forms.

The Examiner does not object to the application because of the utility of the eraser, although the Board of Examiners-in-Chief seem to base their decision upon that point alone, but he pronounces the form already old in its application to artists' stumps, and he insists that the mode of composition or construction can form no element for the claim for a design patent.

In the latter statement he is undoubtedly right. These patents are granted solely for new shapes or forms, and the form being new it is immaterial by what process that form is attained. The composition of matter or the mode of construction is neither "design," "shape," nor "configuration," and must be protected, if at all, under a patent of another kind. I cannot say that the presence of such matter in the specification would be objectionable if description merely, but it could in no way be allowed to enter into, or to modify the claim.

As to the first ground of rejection, I think the Examiner is in error. This purports to be a new form or shape of a distinct article of manufacture, to wit: rubber erasers. If it be new, as thus applied, it is immaterial whether pencils, or stumps, or pen holders, or anything else, may or may not have been made cylindrical. If they are not substantially the same article of manufacture as erasers, the old form applied to this new article is unquestionably entitled to protection.

The applicant has not defined his invention with entire accuracy. He should strike from his claim the words "provided with a wrapper or case," as those relate to construction and not configuration; and he should insert the words "having the ends beveled to an edge" in lieu of the phrase erased, or he should adopt the usual form of claim for designs, viz.: "The design for a rubber eraser, as shown and described."

As the claim stands, it ought not to be allowed, and the decision must be affirmed; but the applicant will be allowed to amend as suggested.

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

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

3,301.—SEWING MACHINE.—H. A. House, Bridgeport, Conn. November 4, 1869.

3,311.—BORING TOOL.—Alexander Allen, New York city. November 5 1869.

3,315.—MODE OF AND DEVICES FOR SECURING STAIR RODS.—H. Uhry, New York city. November 6, 1869.

3,329.—TRANSPORTATION OF LETTERS, PARCELS, AND OTHER FREIGHT BY ATMOSPHERIC PRESSURE, AND IN APPARATUS CONNECTED THEREWITH.—A. E. Beach, Stratford, Conn. November 9, 1869.

3,503.—RELOADING CARTRIDGE SHELL.—R. J. Gatling, Indianapolis, Ind November 16, 1869.

3,542.—WOODEN PAVEMENT.—I. Hayward and J. F. Paul, Boston, Mass. November 20, 1869.

3,558.—MACHINERY FOR DISTRIBUTING TYPE.—O. L. Brown, Boston, Mass. November 20, 1869.

3,319.—WEIGHING MACHINE.—M. Kennedy, New York city. November 10, 1869.

3,260.—BRAN DUSTER.—W. Huntley and A. Babcock, Silver Creek, N. Y. November 12, 1869.

3,339.—RAILWAY CARRIAGE.—E. Robbins, Cincinnati, Ohio. November 19, 1869.

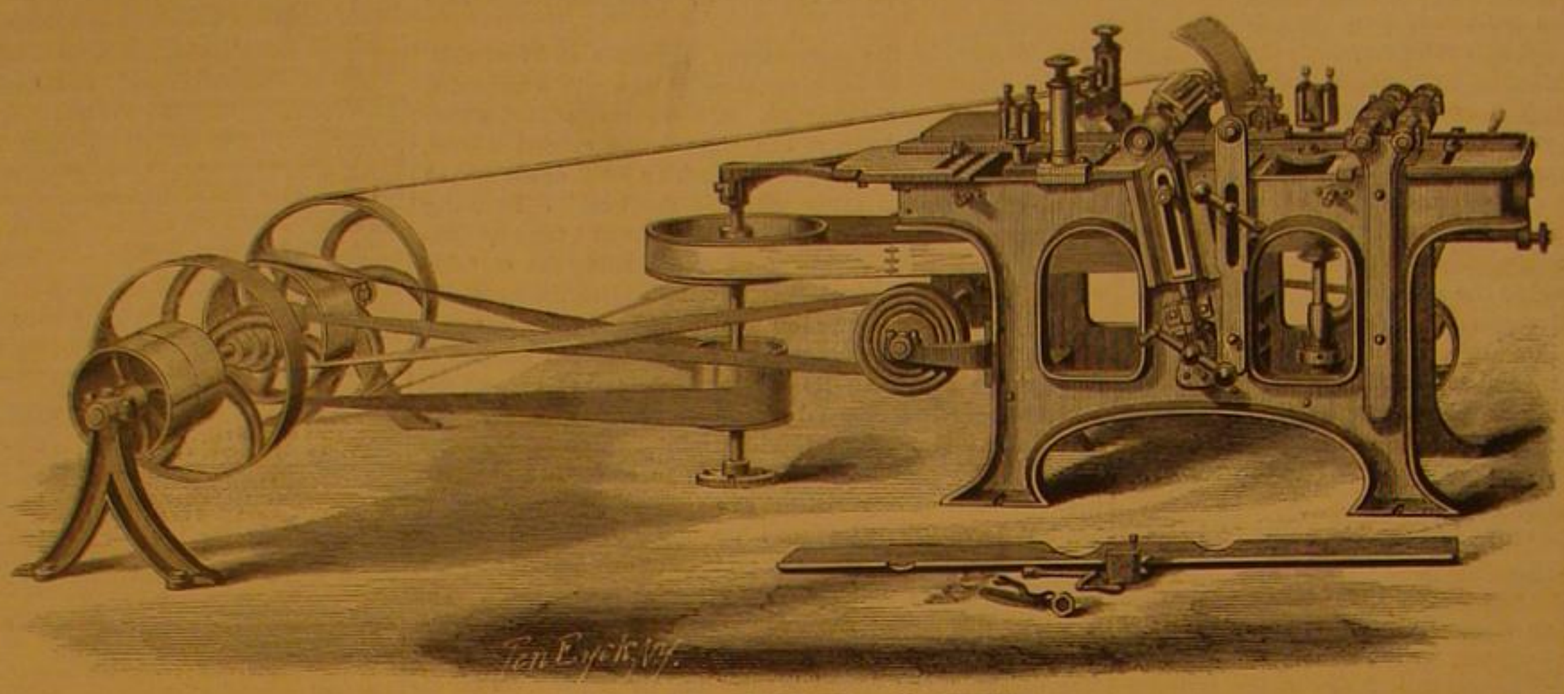
3,341.—REVOLVING BATTERY GUN.—R. J. Gatling, Indianapolis, Ind. Nov. 19, 1869.

3,350.—SASH FASTENER.—S. L. Loomis, South Byron, N. Y. November 29, 1869.

3,363.—MAGNETIC MACHINES AND MAGNETS.—J. Burroughs, Jr., Newark, N. J. November 29, 1869.

Russ' Improved Wood Molding Machine.

A comprehensive description of this excellent machine was given upon page 230, Vol. XVIII., of the SCIENTIFIC AMERICAN. We now present our readers with an engraving of it and a summary of its important features, which doubtless render it equal if not superior to any machine of the kind in market. The frame in which the feed rollers are arranged is so hung to the frame-work of the molding machine, that it can be raised or lowered at pleasure, in order to properly adjust the feed rollers for action upon the "stuff," and it is also so constructed as to permit the feed rollers to yield in case of variations in the thickness of the "stuff" passing under them. The spindle of the side cutter-heads is hung in a vertical frame arranged to be moved up and down, and laterally, to adjust the cutter-head for action, and is provided at its upper end with a box or bearing, whereby the bearing of the box is always kept upon the spindle instead of at different points of the same as in other machines, and this without interfering with the adjustability of the side cutter-head. Thus uneven wear is avoided.



RUSS' MONITOR MOLDING MACHINE.

The bed of the machine is formed with a series of slots or openings provided with bridge bars so that the cutters may act upon the edges of the stuff without danger of injury from striking the bed. The presser shoe is also made adjustable for different thicknesses of the "stuff" and self-yielding to variations in thickness, by a peculiar method of hanging the bar, which carries the presser shoe, to the framework of the machine.

The clamp which holds the press block which acts upon the "stuff" after it has passed through the cutter, is of novel construction, and the spindle of the side cutter-heads is so arranged in connection with a loose pulley and the pulley-drums, that both cutter-heads are driven by one belt and in the same direction.

The bed plate is provided with springs through which the side cutter-heads are arranged, to move laterally or transversely with a bridge-plate or plates, susceptible of adjustment independent of the cutter-heads, whereby an adjustable support to the "stuff" is given as it passes over the line of the openings in the bed.

Most machines have weighted pressure feed, but this having steel springs adjustable by a screw and hand wheel, a heavy or light pressure can be applied according to the work done or size of molding. The cutter-heads are square and slotted so that any style of molding can be stuck by putting cutters on all sides of the head, thus equalizing the cost and lessening the power. The pressure shoe is arranged to hold the "stuff" at the very point of contact with the cutters, and, as we have shown, is readily adjusted to a long or short cutter, so that a small molding can be made as smooth as a large one, and so as not to require any finishing with sandpaper or a hand tool.

The machine has also a bevel track very useful for picture frame molding, and a patent cap of great value for the cutters, and readily applied to any slotted head or common head. The wrenches that go with the machine, and the common malleable iron caps for the top cylinder, are shown in detail. These machines are now running in Worcester, Boston, and Fitchburg, Mass.; Chicago, Ill.; Philadelphia, Pa.; Brattleboro, Vt.; Whitesboro, N. Y.; Charleston, S. C., and other places, and, it is claimed, are capable of doing better work and more of it than any machine now in use.

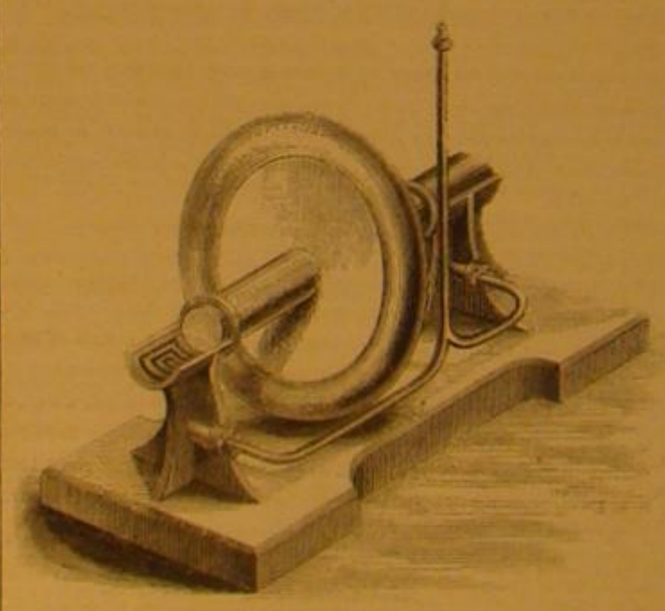
This machine is covered by several patents taken through the Scientific American Patent Agency. It is manufactured by R. Ball & Co., of Worcester, Mass, to whom write for further information.

A Lost Civilization.

At the last regular meeting of the American Geographical and Statistical Society at its rooms in the Cooper Institute, Professor Newberry, of Columbia College, delivered an address on the subject of his explorations in Utah and Arizona Territories. The speaker commenced by giving a short history of the circumstances under which the two government expeditions to which he was attached were organized. He then confined his remarks to the subject of the latter expedition, no account of which has yet been published. Its aim was principally to explore the region embraced by what is known as the old Spanish trail from Santa Fe to California. After giving an interesting account of the topography of the region traversed, he proceeded to speak of the traces which were found on every hand of a former occupancy by a numerous population now extinct. These were most numerous near the course of the San Juan river. There were found ruins of immense structures, a view of one of which he exhibited, built regularly of bricks, a foot in thickness, and about eighteen inches in length, with the joints properly broken, and as regularly laid and as smooth as any in a Fifth Avenue mansion. This structure he said was as large as the Croton reservoir. Inside were rooms nicely plastered as the walls of a modern house. There were also traces of extensive canals, which had been constructed to bring water to these towns, which were received into large cisterns. The lecturer also exhibited pieces of pottery which he said abounded everywhere, showing that in a former age all this vast region had been inhabited. He gave it as his opinion that the depopulation of this region was attributable to the fact that both to the north and the south were warlike hordes, and from the incursions of one and the other of these, the peaceable Aztecs, who had been the former denizens of the country, had been gradually wiped out. The only people left here now were the Mokies, who lived in towns inclosed within high, thick walls, and who were almost inaccessible. These people were visited, and the explorers were received by them with great hospitality. The speaker concluded by giving a short account of the manners of the people and their customs, as far as an opportunity was had to observe them.

GIRARD'S "PALIER GLISSANT."

The term "*palier glissant*," which does not admit of being very happily translated into an English term of equal brevity, is the name given by the inventor, Mr. Girard, to a frictionless support, or socket, designed to sustain the axes of heavy wheels in machinery. Since it is a contrivance deriving its efficacy from hydraulic pressure, it may, without impropriety, be considered here. The friction of axles in their supports is the occasion of a considerable loss of power in every machine.



The loss of power itself, though a real disadvantage, is nevertheless a matter of secondary consequence compared with the attendant elevation of temperature, which, were not means carefully provided for reducing friction to the lowest point possible, might soon be so great as to arrest the operation of the machine itself. It was stated in a public lecture delivered in May, 1867, before the Scientific Association of France, that, in a certain instance within the lecturer's knowledge, the screw shaft of a French naval propeller became absolutely welded to its support, though surrounded by the water of the sea, in consequence of the great heat developed by its revolution.

The ordinary means of reducing friction is to apply oil, or some other unctuous substance, to the parts which move upon each other. Some disadvantages attend this expedient, but till a better is suggested they have to be endured. The cost of the oil expended in maintaining in proper condition the axles of the machinery in a foundery, or of the rolling stock of a railroad, amounts to a large sum annually; while the want of neatness which its use makes, to a certain extent, inevitable, and the labor which must be constantly employed to prevent this want of neatness from becoming much greater than it is, are serious items to be set off against its positive usefulness.

The object of Mr. Girard is to get rid of all these drawbacks by the simple expedient of substituting water for oil. It would not avail to apply water precisely as oil is applied. Though any one's experience may tell him that two smooth pieces of metal will slide more smoothly on each other when they are wet than when they are dry, yet every one knows also that oil facilitates the movement much more perceptibly than water; and also, that in the case of oil there is no difficulty in maintaining the lubricating film, whereas water easily evaporates, and in case of the accident of even a moderate elevation of temperature, it would be expelled from the joint entirely. Mr. Girard proposes, therefore, to employ the water to act, first, by its pressure, to lift the journal to be lubricated; and secondly, by its fluidity, to form a liquid bed or cushion between the journal and its box, on which the journal may rest in its revolution, without touching the metal of the box at all.

The construction will be understood by referring to the figure. One of the journals is represented as removed, and in the cylindrical surface of the socket are seen grooves occupying a considerable part of the area exposed. These grooves communicate, by an aperture in the middle, with a tube which is represented externally, and which sends a branch to the other journal, through which water under a heavy pressure is introduced into the box beneath the journal. The effect of the hydraulic pressure is to lift the axle, opening a passage for the escape of the compressed water, which at the same time, because of its release from compression, loses the power to sustain the weight. If, therefore, by the first impulse, the axle is thrown upward to any sensible distance, it will immediately fall back again, once more confining more or less completely the water. After one or two oscillations, therefore, the axle will settle itself at length in a position in which, while the water will escape, it will escape but as a film of inappreciable thickness. In this condition the journal turns upon a liquid bed, and the resistance to its revolution is so excessively small that a slow rotation given by hand to a wheel sustained by it will be maintained for many minutes without perceptible retardation. In fact, the most striking illustration which can be given of the immense superiority of the *palier glissant* over a support lubricated in in any other way, is furnished by placing two precisely similar wheels or disks side by side, weighing five or six pounds each, with a diameter of seven or eight inches, and journals of half an inch in diameter; one of them furnished with *paliers glissants*, and the other with boxes lubricated with fine oil. Give each of them a velocity of rotation of about one revolution in a second; the one lubricated with oil will come to rest before the other begins to give evidence of any sensible retardation; but if at any moment the stop-cock which supplies the water to the second be turned, this one will also stop, and its stopping will be instantaneous.

It might be supposed that a journal supported in the manner above described would be unsteady and liable to injurious vibrations. This is not the case, and it is easy to see why not. When the journal is truly in the middle of the socket, that is to say when there is an equal distance between it and the wall of the socket on either side, it will be equally pressed from both sides. But if it is in the least displaced laterally, the pressure on the side toward which it moves will instantly increase, while that on the other side will correspondingly diminish: both causes transpiring to resist the displacement, and to maintain the journal in the position of true equilibrium.

The water pressure by which these "slippery supports" are supplied must be created by a force pump worked by the machine itself. The reservoir need not be large as the expenditure of water is very minute in volume. To the objection which may naturally be made, that the working of the pump must be a tax on the motive power without return, a reply at once simple and satisfactory is found in the experience of Mr. Girard, that the working of the pump does not consume so much as half, and sometimes not more than one one quarter, of the power which is lost in friction when the ordinary modes of lubrication are employed; so that by the adoption of this expedient the available power of the machine is very sensibly increased after deducting all that is expended in the performance of this additional work.

BEES BENEFICIAL TO FRUIT.—Dr. A. Packard, editor of the *American Naturalist*, replies to a query in regard to the effects produced upon fruit by the agency of honey bees, that all the evidence given by botanists and zoologists who have specially studied the subject, shows that bees improve the quality and tend to increase the quantity of fruit. They aid in the fertilization of flowers, thus preventing the occurrence of sterile flowers, and, by more thoroughly fertilizing flowers already perfect, render the production of sound and well developed fruit more sure. Many botanists think if it were not for bees, and other insects, many plants would not bear fruit at all.

STEAMBOATS on the American plan are to be introduced on Lake Geneva, Switzerland. This will add very greatly to the comfort and pleasure of tourists on that beautiful lake.

Scientific American,

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A HAPPY NEW YEAR!

Is the heartfelt wish conveyed in this beautiful and unusually large number, to each and all of our friends and readers. This holiday number is worthy of note, not only on account of its size, its rich table of contents, and profuse illustrations, but because we publish this week the largest edition ever sent out from this office.

Our readers may be surprised at our publishing the title page of the volume again this week, but they will please observe it is the title page of Vol. XXII, which we are now commencing. The title pages will hereafter be published with the first instead of the last number of each volume, so as to bring it in its proper place for binding.

Subscriptions are pouring in from all parts of the country in the most encouraging manner. Many have already secured the prize engraving, by sending in the requisite number of names—but we feel obliged to confess that there is now a considerable want of vitality in the competition for the cash prizes. We expect, however, that as soon as the new year's greetings are fairly exchanged, that this opportunity to receive some purse money will attract the attention of our enterprising readers. The times may be a little close just now, but we are confident that the spring will open joyously, and we are quite sure that the people will still want to know what is going on in the GREAT WORLD OF INDUSTRY, which it will be our duty to chronicle.

All lists intended to compete for the cash premium must be marked "Cash prize list."

Once more we say a "Happy New Year" to all.

THE SUEZ CANAL NOT YET A FAILURE.

The daily press is giving currency to a great many facts in regard to the present incomplete condition of the Suez Canal, and some journals are arguing therefrom that it is a failure. As yet, ships of heavy draft are unable to get through it. Some disasters to shipping have occurred in the Red Sea after the canal has been passed, and it is not at all improbable that more troubles will arise before everything goes smoothly.

The Red Sea is comparatively unknown to navigators. It contains hidden rocks which must be charted and buoyed before its navigation can be rendered safe. Surely this ought not to take the world by surprise. As to the canal itself, we are only surprised that it has reached its present state of perfection, and we advise those who now make haste to prophesy ignominious defeat for one of the greatest enterprises of the century, to suspend judgment for a time. New York journalists might certainly call to mind with profit, the annual troubles attending the opening of the canals in this State. Frosts heave and rats undermine, and banks annually give way, yet these things are not regarded as surprising. But upon the opening of a work, to which all the minor canals in the world are like the rods of the magicians to Aaron's rod which swallowed them up, it is expected that everything shall move without difficulty, and that no oversight will have been committed. Truly this would be to attribute a power of prevision to M. Lesseps beyond what is human. The world can afford to wait a little till this huge machine gets oiled. Great enterprises move slow at the outset. We have yet unshaken faith in the ultimate success of the Suez Canal.

TUBULAR BOILERS AND BOILER EXPLOSIONS.

In our description of the novel steam boiler, published on page 209, last volume, we made a quotation from several eminent writers and experimenters on the subjects of heat and steam, to the effect that the tubular system in steam boilers was wrong in theory and unsafe in practice, and although this system has hitherto been extensively used on account of some advantages which it secures, it has long been a serious question with thinking men whether these advantages were not obtained at too dear a rate.

While not prepared to admit all the force of the objections made to the tubular system, there are arguments against it that it will not do to treat lightly and which seem to us more and more forcible the more we candidly reflect upon the subject. One of the most forcible of these which occurs to us is, that in the tubular system the disruptive force of unequal expansion is far more likely to become a cause of danger than in the plain cylinder boiler. In such boilers the tension of expanded tubes is transmitted to the shell, which are greatly strained without doubt, often nearly to the verge of rupture. When this occurs it is evident an unusual strain, caused by sudden generation of steam, would act in concert with the expansion of the tubes, and we have no doubt these causes combined have given rise to many an explosion when the steam, acting singly, could never have produced rupture.

But while we give due weight to this argument, there is one often referred to by our correspondents, and which we often see stated in newspapers, as ridiculous as the one we have noticed is forcible. It is that when, in such boilers, water, by carelessness or otherwise, is allowed to fall below any of the tubes, the steam which surrounds them is decomposed, and becomes an explosive mixture of hydrogen and oxygen gases, ready to explode with terrible violence whenever the temperature of the tubes shall have reached the proper point.

This argument is ridiculous, because it rests on no experimental basis. It is a flimsy theory, entirely unsupported by any facts. Never has it been proved that hot iron, at any temperature likely to be obtained in steam boiler tubes, decomposes steam except by itself appropriating the oxygen of the steam, and leaving the hydrogen, by itself no more explosive than any other heated gas.

The sole object of the tubular boiler is to increase the heating surface, without corresponding increase in other particulars. That it is not the only means whereby this object can be secured has already been demonstrated and we believe will hereafter be shown in divers ways. We have no more doubt that the next fifty years will witness the total abandonment of the tubular system, than we have that the world will last that length of time.

AMERICAN RAILWAY MANAGEMENT.

There seems a growing opinion among railway managers that the sole end and purpose of a railroad is to line the pockets of, if not its stockholders, at least its directors. In fact we not long since saw a statement in a widely-circulated journal, that, as the sole purpose of railroads is that the companies who own them should make money, it is absurd to suppose they would be content to manage them in any way whereby such a result would not be most likely to accrue.

The journal referred to, in making this statement a basis for an argument in favor of railway consolidation, entirely ignored the rights of the public from which railway corporations have obtained their charters. In these charters certain privileges were granted, not out of pure generosity, but with the understanding that certain benefits were to accrue to the public. Its safety and convenience were to be considered as well as the profits to the owners.

Every charter granted to these roads involves a contract on their part to do the public a certain service, and in a large majority of cases these contracts are to-day unfulfilled. Day after day sees the power to control more and more centered in a few unscrupulous wily managers, and the comfort and safety of passengers more and more disregarded; yet still the people submit.

But they do not submit without complaint. Now and then a newspaper correspondent grumbles, and the news of smashes that may be almost daily seen in the papers gives a text for an occasional editorial blast, as little heeded by the delinquent companies, as a zephyr is felt by an oak.

Thus the New York *Times*, on the occasion of a recent railway disaster, gives vent to a little mild denunciation. It says:

"The general rule in this country (to which there are indeed exceptions) in regard to the purchase of railway materials is simply this: buy the cheapest. First cost is the controlling and often the only question entertained. The nature of the materials and processes to be used in the manufacture of rails, for instance, are not mentioned. The buyers for some of our roads, especially new roads, never make the slightest allusion to quality, and never specify tests and inspections, but simply go about among the mills, comparing and beating down prices, and accepting the very lowest. More than one of our rail makers are to-day rolling, under protest, rails upon which they decline to put their trade-mark—rails made from the very cheapest materials, in the very meanest manner—for all that is required is that they shall stick together till they are laid. And if American makers will not roll them, Welsh makers will. The late report of the State Engineer of New York says: 'American railway managers, instead of offering anything like a reasonable price for good iron rails, have made themselves notorious by establishing as standard, a brand of rails known all over the world as "American rails," which are confessedly bought and sold as the weakest, most impure, least worked, least durable, and cheapest rails that can be produced.' The State Engineer refers, in confirmation of this opinion, to the statement of Mr. A. S. Hewitt, United States Commissioner to the Paris Exposition, a statement not yet controverted; and to a statement of Mr. Sandberg, an English engineer of note, in the London *Times*. A leading American railway president and reformer has publicly said: 'There is a fear on my part that railway companies will themselves tempt steel makers to send a poor article by buying the cheapest—first cost only considered—*as they did with the ironmasters.*'"

This certainly is a blessed state of affairs. We have given privileges to giant corporations, which they have improved so profitably, that they now can defeat, in our Legislatures, any attempt to revoke them, and can laugh at any demand for better management.

Disguise it how we may, the railroads have got the upper hand of the people, and they seem likely to keep it, unless, indeed, their rapacity shall react against themselves.

At the moment of this writing accounts reach us of the officers of a prominent railway line intrenching themselves against the officers of the law, and employing force to resist the service of precepts calling them to account for alleged frauds upon the stockholders.

That the Legislature of this State has the power to put a stop to these disgraceful proceedings, is certain; what it will do remains to be demonstrated.

THE AMERICAN INSTITUTE PRIZES AWARDED TO STEAM ENGINES.

If there is anybody satisfied with the action of the managers of the American Institute, in the matter of awarding prizes to the competing engines exhibited at the recent fair, we have yet to meet that complacent individual. Neither the exhibitors nor the general public could be expected to accept with equanimity such a report as the managers have made, because it is inadequate to give any real idea of the relative merits of the engines tested. The exhibitors, at a large expense, took their engines to the hall of exhibition, placed them in position, and with them drove the machinery exhibited there; and now, when in return they had a right to expect a decided, manly course on the part of the managers, the oyster is swallowed and the contestants are each politely handed a shell.

The conditions on which the general test was to be made contained, among other specifications, these: that "the water supplied to and evaporated in the boiler will be measured by means of a meter, and the coal burned may also be weighed."

Only one of the conditions quoted was properly complied with. The coal was weighed, but though a meter was used to measure the water, tests made, we are informed, *after the trial of the engines*, showed that the meter was so inaccurate as to completely invalidate any calculation based upon its record of the water supplied. Nevertheless this has, we are credibly informed, been made the basis of calculation; and the amount of coal consumed during each trial has been rejected either as a basis of calculation or a check on the inaccuracy of the meter.

Other prescribed regulations were observed with great care. The engines were indicated in a masterly manner by a gentleman of great experience, as the cards—tracings of which we have seen—bear ample testimony. The temperature of the feedwater was 47 degrees; it should, in our opinion, have been heated, but we waive this point. The state of the barometer and temperatures of engine room and fire-room were observed; but we respectfully submit, that with coal consumption left out of the calculation, and the water consumption an unascertained quantity, the question of relative economy, the vital point to be settled, is as uncertain today as it was before the test.

In the *Tribune* of December 20, appeared a statement of the test to ascertain the accuracy of the meter used, which showed that in an aggregate of twelve tests it varied nearly three per cent in its record from the actual quantity delivered, while at times it was so erratic that it varied in one instance over *ten per cent.*

Truly, considered in connection with this fundamental error, temperatures of engine and boiler rooms, and states of barometer, will not count for much with engineers.

An oversight like this would, however, never have been laid at the door of the managers, however it might invalidate the test; but when the utterly absurd decision announced in the papers, after a tedious delay had led the public to expect an exhaustive statement, gave rise to general disappointment and excited the utmost dissatisfaction, it became manifest that a manly, straightforward course on their part was not to be hoped for, and that any protest against the consummation of the farce would be vain.

It is not for us to decide on the merits of the engines submitted to test. It was for the judges to do this. We maintain that nothing that the public will accept as a decision has been reached, and on behalf of the public we protest that the managers have not only placed themselves in a very unenviable position by their action in the premises, but have done a lasting injury to the American Institute, the results of which will be disastrously felt in future exhibitions.

The studied ambiguity of the report which awards two first prizes to the competing engines, is no less apparent than the desire to shun responsibility.

A PROTEST AGAINST THE CANADIAN PATENT LAW.

In July, 1869, the New Dominion Patent Law went into operation, but it has not yet been approved by the Queen, and if rejected the Canadian Parliament will perhaps try its hand again. Although Canadians may freely go to all parts of the world and take out patents for their inventions, they

have always manifested a mean spirit and adopted a narrow policy, in reference to inventors of other nations. Their present patent laws are so framed as practically to debar all persons except Canadians from taking patents; and the result is that American and English inventions are pirated and patented in the Dominion, without so much as a "thank you, sir," to the *bona fide* originators.

A protest has been presented to her Majesty's Secretary of State for the Colonies, asking that the new law may be rejected, on the ground that it deprives the subjects of the Crown of their equal rights throughout the empire. There is force in this objection, and Lord Granville has promised that it shall be duly considered before the Queen is advised to sign the law.

The probable result will be a revision of the Dominion patent code so as to let in Englishmen but exclude the Yankees, from whom the Canadians derive whatever of improvement, progress, and energy they possess.

THE BRIGHTER SIDE.

Ingratitude seldom enters into the composition of a true inventor, and nothing in our business career has afforded us more pleasure than the frequent letters addressed to us by those who have, during more than twenty years, employed the Scientific American Patent Agency. We cannot find room for all the pleasant missives that come to us from our extensive list of clients, but we may give a few as samples of the many.

Mr. Daniel J. Gale, of Sheboygan, Wis., has recently secured through our Agency Letters Patent for a "Perpetual and Lunar Calendar Clock." In the fullness of his satisfaction he thus writes: "The fact is, I shall never be able to thank you sufficiently for what you have done for me. I sent you a copy of the paper printed here, which favorably notices my improvement and your great Agency. The fees charged me for my patent have been low enough. Already, by one of my own townsmen, I have been offered $4,000 for my interest in the patent. But I must not take up too much of your time. Please allow me to add that I regularly receive your valuable paper, the SCIENTIFIC AMERICAN, and that you may number me as one of its stanch friends."

Mr. Edwin Norton, of Brooklyn, N. Y., in a recent note, says: "Allow me to express my thanks for the promptness and efficiency with which the business of obtaining a patent for my 'Cinder and Dust Arrester' has been conducted through your Agency—and not only in this case but in several previous ones. This is the *fourth* patent obtained by me through your Agency within nine months. It gives me pleasure to add my testimony to that of many others, with respect to the very satisfactory manner in which your Patent Agency is conducted."

Mr. E. J. Marsters says, in reference to his improved "Field Press"—"I find everything correct. You certainly accomplished more than I expected after the first examination by the Primary Examiner. I hope soon to be able to give you another case."

Mr. S. P. Williams, an old client, writes as follows: "I received the patent on my 'Trace Lock for Whiffletrees,' and I am truly pleased with the prompt manner in which you have done the business. It is only a few weeks since I made the application, and I expected that it would be as many months before the patent could be granted."

PROFESSOR FISKE'S LECTURES AT HARVARD.

It certainly argues well for the intellectual character of the readers of the New York *World* that during the prevalent taste for sensational journalism, it has found the publication of a series of philosophical lectures acceptable. We thank our neighbor for thus making these lectures available to the general public. Their ability is unquestionable; and the calmness and candor which Professor Fiske brings to the treatment of the subject is such as to add greatly to the force of his logic.

The "positive philosophy" has been shown by Professor Fiske to be much misunderstood, misapprehension not being confined solely to the ranks of its opponents.

His exposition of some of the misconceptions on which Professor Huxley has based some criticisms upon the writings of Comte, strikes us as especially forcible; and the whole course of lectures proves Professor Fiske to be one of the clearest and most able of American thinkers.

These lectures are followed as they appear, with great interest, and their publication in the *World* we regard as a real and permanent benefit to the public.

SCIENTIFIC LECTURES BEFORE THE AMERICAN INSTITUTE.

The announcement of these lectures came to hand too late for our last issue, and the first has already been delivered. The course is as follows: Friday, Dec. 17, The Battle Fields of Science, by Andrew D. White, President of the Cornell University, Ithaca, N. Y. Friday, Dec. 24, How Animals Move, by Professor E. S. Morse, of the Peabody Academy of Science, Salem, Mass. Friday, Dec. 31, The Correlation of Vital and Physical Forces, by Professor G. F. Barker, of Yale College, New Haven. Friday, Jan. 7, The Air and Respiration, by Professor J. C. Draper, of the College of the City of New York. Friday, Jan. 14, The Connection of Natural Science and Mental Philosophy, by Professor J. Bascom, of Williams College, Williamstown, Mass. Friday, Jan. 21, The Constitution of the Sun, by Dr. B. A. Gould, of Cambridge, Mass. Friday, Jan. 28, The Colorado Plateau, its Cañons and Ruined Cities, by Professor J. S. Newberry, of Columbia College, New York.

The course is a good one, and ought to be, and doubtless will be, well attended. Abstracts of the lectures will appear as delivered, in the SCIENTIFIC AMERICAN.

THE BATTLE FIELDS OF SCIENCE.

LECTURE BY PROFESSOR WHITE, BEFORE THE AMERICAN INSTITUTE.

This lecture did not disappoint the expectations of those familiar with the subject of the discourse, which, considering the difficulty of restating familiar historical facts in such a manner as to clothe them in a garb of originality, is high praise. Many, however, found great difficulty in hearing the speaker at the back part of the hall, and some left the room on that account. This was unfortunate, as the lecture will scarcely be exceeded in interest by any subsequent one of the course. The speaker said that "In all modern history, interference with science in the supposed interest of religion—no matter how conscientious such interference may have been—has resulted in the direst evils both to religion and science, and *invariably*. And on the other hand all untrammeled scientific investigation, no matter how dangerous to religion some of its stages may have seemed, temporarily, to be, has invariably resulted in the highest good of religion and science. I say *invariably*—I mean exactly that. It is a rule to which history shows not one exception. It would seem, logically, that this statement could not be gainsaid. God's truth must agree, whether discovered by looking within upon the soul or without upon the world. A truth written upon the human heart to-day in its full play of emotions or passions, cannot be at any *real* variance even with a truth written upon a fossil whose poor life was gone millions of years ago. And this being so, it would also seem a truth irrefragable; that the search for each of these kind of truths must be followed out in its own lines, by its own methods, to its own results, without any interference from investigators along other lines by other methods. And it would also seem logically that we might work on in absolute confidence that whatever, at any moment, might seem to be the relative positions of the two different bands of workers, they must at last come together, for truth is one. But logic is not history. History is full of interferences which have cost the earth dear. Strangest of all, some of the most direful of them have been made by the best of men, actuated by the purest motives, seeking the noblest results. These interferences and the struggle against them make up the warfare of science. One statement more to clear the ground. You will not understand me at all to say that religion has done nothing for science. It has done much for it. The work of Christianity has been mighty indeed. Through these 2,000 years it has undermined servitude, mitigated tyranny, given hope to the hopeless, comfort to the afflicted, light to the blind, bread to the starving, life to the dying, and all this work continues. And its work for science, too, has been great. It has fostered science often and developed it. It has given great minds to it, and but for the fears of the timid its record in this respect would have been as great as in the other. Unfortunately, religious men started centuries ago with the idea that purely scientific investigation is unsafe—that theology must intervene. So began this great modern war."

Professor White next reviewed the battle between science and theology on the subjects of the "earth's shape, surface, and relations," "the position of the earth among the heavenly bodies," in which Copernicus and Galileo struggled so bravely and successfully for truth.

The lecturer said:

"The principal weapons in the combat are worth examining. They are very easily examined; you may pick them up on any of the battle-fields of science; but on that field they were used with more effect than on almost any other. These weapons were two epithets—the epithets 'Infidel' and 'Atheist.' These can hardly be classed with civilized weapons; they are burning arrows; they set fire to great masses of popular prejudices. Smoke rises to obscure the real questions. Fire bursts out at times to destroy the attacked party. They are poisoned weapons. They go to the heart of loving women; they alienate dear children; they injure the man after life is ended, for they leave poisoned wounds in the hearts of those who loved him best—fears for his eternal happiness, dread of the Divine displeasure. The battle-fields of science are thickly strewn with these. They have been used against almost every man who has ever done anything for his fellow-men. The list of those who have been denounced as Infidel and Atheist includes almost all great men of science—general scholars, inventors, philanthropists. The deepest Christian life, the most noble Christian character has not availed to shield combatants. Christians like Isaac Newton and Pascal, and John Locke and John Howard, have had these weapons hurled against them. Nay, in these very times we have seen a noted champion hurl these weapons against John Milton, and with it another missile which often appears on these battle-fields—the epithets of 'blasphemer' and 'hater of the Lord.' Of course, in these days these weapons, though often effective in disturbing the ease of good men, and though often powerful in scaring women, are somewhat blunted. Indeed, they do not infrequently injure assailants more than assailed. So it was not in the days of Galileo. These weapons were then in all their sharpness and venom. The first champion who appears against him is Bellarmine, one of the greatest of theologians and one of the poorest of scientists. He was earnest, sincere, learned, but made the fearful mistake for the world of applying direct literal interpretation of Scripture to science. The consequences were sad, indeed. Could he with his vast powers have taken a different course, humanity would have been spared the long and fearful war which ensued, and religion would have saved to herself thousands on thousands of the best and brightest men in after ages. The weapons, which men of Bellarmine's stamp used, were theological. They held up before the world the dreadful consequences which must result to Christian theology were the doctrine to prevail that the heavenly bodies revolve about the sun, and not about the earth.

"The next great series of battles were fought on those great fields occupied by such sciences as *Chemistry and Natural Philosophy*. Even before these sciences were out of their childhood—while yet they were tottering mainly towards childish objects and by childish steps—the champions of that same old mistaken conception of rigid Scriptural interpretation began the war. The catalogue of chemists and physicists persecuted or thwarted would fill volumes."

After alluding to many other battle-fields of science which might not for want of time be dwelt upon at length the lecturer reviewed the battle grounds of medicine and anatomy on which some of the severest warfare has been waged.

The speaker here remarked that "perhaps the most unfortunate thing that has ever been done for Christianity is the tying it to forms of science and systems of education, which are doomed and gradually sinking. Just as in the time of Roger Bacon excellent but mistaken men devoted all their energies to binding Christianity to Aristotle. Just as in the time of Reuchlin and Erasmus they insisted on binding Christianity to Thomas Aquinas, so in the time of Vesalius such men gave all efforts to linking Christianity to Galen. The cry has been the same in all ages. It is the same which we hear in this age against scientific studies—the cry for what is called '*sound learning*.' Whether standing for Aristotle against Bacon, or Aquinas against Erasmus, or Galen against Vesalius, or making mechanical Greek verses at Eton, instead of studying the handiwork of the Almighty, or reading Euripides with translations instead of Lessing and Goethe in the original, the cry always is for 'sound learning.' The idea always is that these studies are *safe*."

The speaker next proceeded to show that not alone in Catholic countries, has such warfare been waged, and that even now in Protestant America the fight is going on.

One of the fields on which the severest warfare had raged in Protestant countries was that of Geology. "From the first lispings of investigators in this science there was war. The early sound doctrine was that fossil remains were *lusus naturæ*—freaks of nature—and in 1517 Fracastor was violently attacked because he thought them something more. No less a man than Bernard Palissy followed up the contest, on the right side, in France, but it required 150 years to carry the day fairly against this single preposterous theory. The champion who dealt it the deadly blow was Scilla, and his weapons were facts obtained by examination of the fossils of Calabria, (1670). But the advocates of tampering with scientific reasoning soon retired to a new position. It was strong, for it was apparently based upon Scripture—though, as the whole world now knows, an utterly exploded interpretation of Scripture. The new position was that the fossils were produced by the deluge of Noah. In vain had it been shown by such devoted Christians as Bernard Palissy that this theory was utterly untenable; in vain did good men protest against the injury sure to result to religion by tying it to a scientific theory sure to be exploded—the doctrine that the fossils were remains of animals drowned at the flood continued to be upheld by the great majority as '*sound*' doctrine. It took 120 years for the searchers of God's truth, as revealed in nature—such men as Buffon, Linnæus, Woodward, and Whitehurst—to run under these mighty fabrics of error, and by statements which could not be resisted, to explode them.

"Strange as it may at first seem, the war on geology was waged more fiercely in Protestant countries than Catholic, and of all countries England furnished the most bitter opponents. You have noted already that there are generally two sorts of attacks on a new science. First, there is the attack by pitting against science some great doctrine in theology. You saw this in astronomy, when Bellarmine and others insisted that the doctrine of the earth's revolving about the sun is contrary to the doctrine of the Incarnation. So now against geology it was urged that the scientific doctrine that the fossils represented animals which died before Adam was contrary to the doctrine of Adam's fall, and that death entered the world by sin. Then there is the attack by the literal interpretation of texts, which serves a better purpose generally in arousing prejudice. It is difficult to realize it now, but within the memory of the majority of those before me, the battle was raging most fiercely in England, and both these kinds of artillery were in full play and filling the civilized world with their roar. Less than thirty years ago, the Rev. J. Mellor Brown was hurling at all geologists alike, and especially at such Christian divines as Dr. Buckland, Dean Conybeare, and Pye Smith, and such religious scholars as Professor Sedgwick, the epithets of 'Infidel,' 'Impugner of the Sacred Record,' and 'Assailant of the Volume of God.' His favorite weapon was the charge that these men were 'attacking the Truth of God,' forgetting that they were simply opposing the mistaken interpretations of J. Mellor Brown. He declared geology 'not a subject of lawful inquiry;' he speaks of it as 'a dark art,' as 'dangerous and disreputable,' as a 'forbidden province.' This attempt to scare men from science having failed, various other means were taken.

"To say nothing about England, it is humiliating to human nature to remember the trials to which the pettiest and narrowest of men subjected such Christian scholars in our country as Benjamin Silliman and Edward Hitchcock. But it is a duty and a pleasure to state here that one great Christian scholar did honor to religion and to himself by standing up for the claims of science despite all these clamors. That man was Nicholas Wiseman, better known afterward as Cardinal Wiseman. The conduct of this pillar of the Roman Catholic Church contrasts nobly with that of timid

Protestants who were filling England with shrieks and denunciations. Perhaps the most singular attempt against geology was that made by a fine specimen of the English Don, Dean Cockburn of York, to *abuse* its champions out of the field. Without apparently the simplest elementary knowledge of geology, he opened a battery of abuse. He gives it to the world at large by pulpit and press; he even inflicts it upon leading statesmen by private letters. But these weapons did not succeed. They were like Chinese gonga and dragon lanterns against rifled cannon. Buckland, Pye Smith, Lyell, Silliman, Hitchcock, Murchison, Agassiz, Dana, and a host of of noble champions besides, pressed on the battle for truth was won. And was it won merely for men of science? The whole civilized world declares that it was won for religion; that thereby has infinitely increased the knowledge of the power and goodness of God."

The lecturer classed the present opposition of the Catholics to the Free School system in this country among the long list of battles between science and theology and concluded his lecture as follows:

"But, my friends, I will not weary you with so recent a chapter in the history of the great warfare extending through the centuries. There are cheering omens. The greatest and best men in the churches—the men standing at centers of thought—are insisting with power, more and more, that religion shall no longer be tied to so injurious a policy—that searchers for truth, whether in Theology or Natural Science, shall work on as friends, sure that, no matter how much at variance they may at times seem to be, the truths they reach shall finally be fused into each other. No one need fear the result. No matter whether science shall complete her demonstration that man has been on the earth six thousand years or six hundred thousand. No matter whether she reveal new ideas of the Creator or startling relations between his creatures—the result, when fully thought out, will serve and strengthen religion not less than science. The very finger of the Almighty has written on history that science must be studied by means proper to itself, and in no other way. That history is before us all. No one can gainsay it. It is decisive, for it is this: There has never been a scientific theory framed for the use of Scriptural texts, which has been made to stand. This fact alone shows that our wonderful volume of sacred literature was not given for any such purpose as that to which so many earnest men have endeavored to wrest it. The power of that volume has been mighty indeed. It has inspired the best deeds our world has known. Despite the crusts which men have formed about it—despite the fetters which they have placed upon it—Christianity has blessed age after age of the past, and will go on as a blessing through age after age of the future. Let the Warfare of Science, then, be changed. Let it be a warfare in which religion and science shall stand together as allies, not against each other as enemies. Let the fight be for truth of every kind against falsehood of every kind—for justice against injustice—for right against wrong—for beauty against deformity—for goodness against vice—and the great warfare which has brought so many sufferings, shall bring to the earth God's richest blessings."

HOW FRENCH BANK NOTES ARE MADE.

When a new batch of French notes is to be printed, an equivalent number of the choicely prepared and preserved sheets of paper is handed over to the superintendent of the printing office. This office is among the inner buildings of the Bank of France, and is governed by very rigorous rules in all things. The operatives are all picked men, skillful, active, and silent. The sheets, the ink, and the matrixes of the plates are kept securely under lock and key until actually wanted. The printing is effected by steam-worked presses. The ink is blue, and its composition known only to a few of the authorities. An inspector goes his rounds during the continuance of the operations, watching every press, every workman, every process. A beautiful machine, distinct from the press, is employed to print the variable numbers on the note; fed with sheets of paper, it will number a thousand of them in succession, changing the digits each time, and scarcely requiring to be touched meanwhile; even the removal of one note and the placing of another are effected by automatic agency. At every successive stage the note is examined. So complete is the registration of everything that a record is always at hand of the number of sheets rejected ever since the Bank of France was established, be its defects in the paper, the printing, or the numbering. When the master-printer has delivered up his packets of printed and numbered sheets, each note is stamped with the signature of the Secretary-General and the Comptroller. This completes the *creation* of notes. The notes so created are kept in a strong box, of which the Secretary-General and the Comptroller have keys, and are retained until the day of *issue*. The chief cashier tells the Governor that he wants a new supply of a particular denomination of notes, the Governor tells the council, the council tell the secretary-general and the comptroller, and these two functionaries open their strong box, and hand over the notes demanded. The notes at this time are not really money; they do not become so until the chief cashier has put his signature to each, and registered its number in a book.

The life of a French bank note is said to average two or three years, and does not terminate until the condition is very shaky indeed—crimpled, pierced with pinholes, corner creases torn, soft, tarnished, decrepit while yet young. Some have been half-burned; one has been found half-digested in the stomach of a goat, and one boiled in a waistcoat-pocket by a laundress. No matter; the cashier at the bank will do his best to decipher it; he will indeed take an infinity of trouble to put together the ashes of a burned note, and will give the owner a new note or the value in coin, if satisfied of the integrity of the old one. The bank authorities preserve specimens of this kind as curiosities, minute fragments gummed in their proper position on a sheet of paper. Very few of the notes are actually and irrevocably lost. During the last sixty-seven years 24,000 bank notes of 1,000 francs each have been issued, and of this number 23,958 had been returned to the bank by the month of January 1869, leaving only 42 unaccounted for. Whether these 42 are still in existence, or have been burned into uncollected ashes, or are at the bottom of the sea, or elsewhere, is not known. Of 500-franc notes, 24,925 have been returned out of 25,000. The bank holds itself morally and financially responsible for the small number of notes unreturned, ready to cash them if at any time presented.

The bank sends the old notes again and again into circulation, if verified and usable; but they are examined first, and any that are found too defective are canceled by stamping a hole in them. These canceled notes pass from one official to another, and are grouped in classified bundles; the book that records the birth of each note now receives a notification of its civil death, and after three years incarceration in a great oak chest, a grand conflagration takes place. A huge fire is kindled in an open court; the defunct notes are thrown into a sort of revolving wire-cage over the fire; the cage is kept rotating; and the minute fragments of ash, whirled out of the cage through the meshes, take their flight into infinite space—no one knows whither. The Bank of France prints a certain number of notes per day, and destroys a smaller number, so as to have always in reserve a sufficient supply of new notes to meet any emergency; but the actual burning, the grand flare-up takes place only about once a month, when perhaps 150,000 will be burned at once. The French go down to lower denominations than the Rank of England, having notes of 100 francs and 50 francs, equivalent to £4 and £2. There must be a great deal of printing always going on in the Bank of France, seeing that in 1868 they issued 2,711 000 notes, of an aggregate value of 904,750,000 francs (averaging about £13 each), and burned 1,927,192, value 768,854,900 francs.

It *sounds* a very dreadful thing for 30,000,000 sterling in bank notes to be willfully burned in one year. But there is always a phœnix to rise from its ashes; the bank can regenerate as fast as it kills. The Bank of France, in 1846, put in circulation a beautiful crimson printed note for 5,000 francs; but the French people did not like notes of so high a denomination, and all but a very few of this kind have been returned and canceled. On one occasion, a superb individual, wishing to pay a dowry in handsome style, obtained twelve notes of 5,000 francs each for the purpose; but they were returned the very next day by the banker, who much preferred smaller notes for his general purposes. The notes now regularly kept in circulation in France are those of 1,000, 500, 100, and 50 francs.

WHAT THE NEWSPAPERS SAY.

A VALUABLE PAPER.—Of all the journals published in the United States, for the mechanic and scientific man, there is nothing that will in any way compare with the SCIENTIFIC AMERICAN, published by Munn & Co., of 37 Park Row, New York. Whether as a work of reference, a record of current scientific development, or as an organ and exponent of our inventors, it stands alone for the general ability of its conduct, the voluminousness and variety of its contents, the exactitude and extent of its knowledge, and the correctness of its information. The SCIENTIFIC AMERICAN is a credit at once to the press and our country, and the small price of a yearly subscription ($3), purchases, it is quite safe to say, the largest amount of solid value to be procured for a like expenditure in the world. With our more intelligent mechanics it has long been a great favorite, while to the inventor it is absolutely indispensable. It has had many imitators and competitors in its day, but they have nearly all died the natural death of a feeble inferiority.—*Argus* (Brooklyn, N. Y.)

THE GREAT JOURNAL OF ARTS AND SCIENCE.—There is a place in the periodical literature of America which is occupied by only one journal; namely, the well-known SCIENTIFIC AMERICAN.

It is almost indispensable to a well-balanced intelligence, that a certain proportion of its reading should be devoted to the industrial arts and sciences, those natural manifestations of the high mental development of the age. Every number of the journal has sixteen imperial pages, embellished with engravings, as illustrations, which are gems of art in themselves. It is most ably edited, and its usefulness is not impaired by technical terms nor dry details.—*Milwaukee Sentinel*

THE SCIENTIFIC AMERICAN.—This paper is the oldest in its peculiar province in the United States, and was, for many years, the only one. More recently others have arisen, and are following in its footsteps; but the SCIENTIFIC AMERICAN still maintains its position as the best American journal of the inventive arts. Its Patent Office department alone is invaluable to inventors, while its editorial articles, illustrations, etc., give not only information, but a constant stimulus to the productive faculty.—*Mobile Register.*

AMONG the papers which we could not very well do without is the SCIENTIFIC AMERICAN, issued from the well-known office of Munn & Co., 37 Park Row, New York. Carefully edited, nicely printed, well illustrated, it is not only a complete record of the progress of useful inventions, but a trustworthy guide to many of the scientific topics that enlist attention at the present day. No one can be a reader of this most valuable journal, without being kept well informed as to current matters of scientific discovery.—*Congregationalist* (Boston).

THE SCIENTIFIC AMERICAN.—In another column we publish the prospectus of this great paper, and would direct our readers to it. It should be on the work bench of every mechanic, and particularly the young men of our country, upon whose intelligence and mechanical skill depends the future dignity of labor and prosperity of American arts and sciences. —*Monitor* (Huntington, Pa.)

We could fill our pages with similar notices, but will close with the following from our cotemporary *De Hope*, published at Holland, Mich., which we doubt not will be read with interest:

Wij plaatsen in dit Nummer het prospectus van den SCIENTIFIC AMERICAN. Het is een zeer schoon blad, dat vooral behoort gelezen te worden door Handwerkslieden. Nieuwe uitvindingen, verbeteringen op het terrein van werktuigkunde, enz, worden daar steeds in vermeld en beschreven. De prijs is zeer matig voor zulk een blad; drie dollars per jaar. Dat belangstellenden de advertentie lezen.

Chinese Methods of Preserving Eggs.

As much has been said of late about the mode of preserving eggs, it may not be uninteresting to say a few words about the Chinese methods, as related by a French chemist, M. Paul Champion, who has lately visited that country, and published a very interesting book on the ancient and modern industries of that curious people. A very common method is to place the eggs in a mixture of clay and water; the clay hardens around the eggs, and is said to preserve them good for a considerable time. But another and much more elaborate method is also commonly practiced. An infusion of three pounds of tea is made in boiling water, and to this are added three pounds of quicklime (or seven pounds when the operation is performed in winter), nine pounds of sea-salt, and seven pounds of ashes of burnt oak finely powdered. This is all well mixed together into a smooth paste by means of a wooden spatula, and then each egg is covered with it by hand, gloves being worn to prevent the corrosive action of the lime on the hands. When the eggs are all covered with the mixture, they are rolled in a mass of straw ashes, and then placed in baskets with balls of rice—boiled, we presume—to keep the eggs from touching each other. About 100 to 150 eggs are placed in one basket. In about three months the whole becomes hardened into a crust, and then the eggs are sent to market; the retail price of such eggs is generally less than a penny each. These eggs are highly esteemed in China, and always served in good houses; but they have undergone a strange transformation, which certainly would not recommend them to English palates; the yolk has assumed a decidedly green tinge, and the white is set. When broken, they emit that unpleasant sulphurous smell which would certainly cause their instant banishment from our breakfast-tables. However, the Chinese are admitted, even by Frenchmen, to be great *gourmets;* and we can only say, therefore, that in questions of eating there is certainly no disputing about tastes.

Steam Boiler Inspection.

Mr. Alfred Guthrie, U. S. Inspector, informs us that the following resolution was recently adopted by the Board of Supervising Inspectors:

Resolved, That a special committee be appointed, to whom shall be referred the subject-matter of steam boiler explosions, who shall be requested to take up the subject in all its varied complications, and present the result of their inquiries, with their opinions of the real causes of such explosions, accompanied by such information as may be of practical benefit and general interest, to be reported at the next annual meeting of the board for its consideration.

Mr. Guthrie, whose address will be at Washington, D. C. until January 10, desires to receive suggestions from practical engineers upon the subject of boiler explosions.

Editorial Summary.

DARKNESS of complexion has been attributed to the sun's power from the age of Solomon to this day. "Look not upon me because I am black, because the sun hath looked upon me." And there cannot be a doubt that, to a certain degree, the opinion is well founded—the invisible rays in the solar beams, which change vegetable color, and have been employed with such remarkable effect on the daguerreotype, act upon every substance on which they fall, producing mysterious and wonderful changes in their molecular state, man not excepted.

THE three companies under whose protection Chinese are brought into California, keep an accurate account of the condition and employment of the persons they import. From these books it appears that 138,000 Chinese have been brought into California. Of these, 10,426 have died, 57,823 have returned to China, and about 91,000 still remain on the Pacific coast. But only 41,000 live in California. Of these 41,000, 9,300 are women, children, old and decrepit, or criminals confined in the jails. The California authorities have at length decided to admit Chinese testimony in the courts.

ONE of our subscribers residing in Maine has read our article "How to Spend the Winter Evenings," and writes to us that up in his section they have no trouble on that score. As soon as the day's work is over the inhabitants commence the job of trying to get their rooms warm, and as soon as a comfortable temperature is reached it is time to go to bed.

DESIGN PATENT DECISION.—We publish elsewhere a recent elaborate decision of Commissioner Fisher, in which he reviews the laws and former practice of the office in regard to applications for patents for designs, with the view to the establishment of a uniformity of practice in regard to design patents. The decision is one of much interest to inventors and agents, and fully warrants its publication.

A MECHANICS' FAIR.—George Wood, proprietor of Wood's Museum in this city, advertises in another column that he has fitted up extensive apartments, furnished with steam power, for the purpose of exposing for trial and sale the useful inventions of the country; thus affording a good opportunity for inventors to exhibit their machines.

THE STEVENS BREECH-LOADING RIFLE.

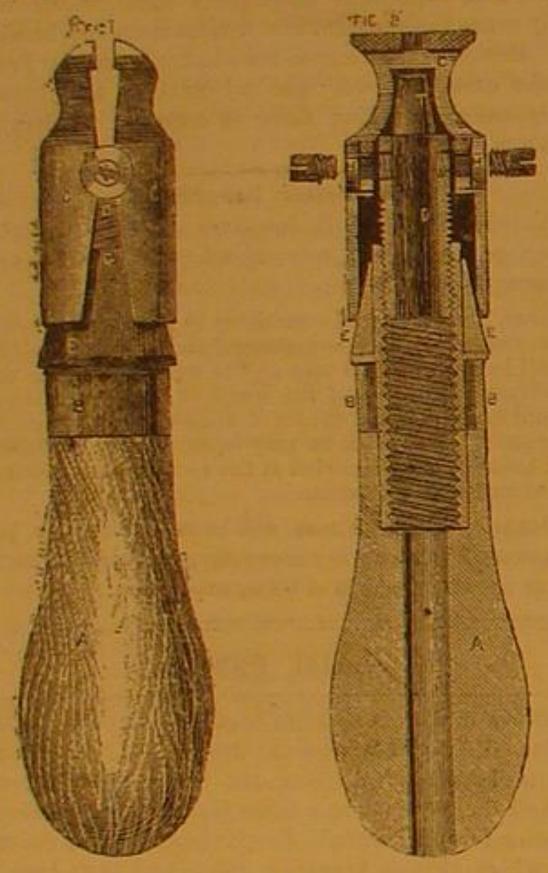
This new arm, a patent on which was obtained through the Scientific American Patent Agency, June 11, 1867, is destined, in our opinion, to become a formidable rival to the breech-loading rifles which have already attained popularity. It is one of the most simple and effective guns we have yet seen. Only three motions are required to load, discharge the piece, and throw out the shell of the cartridge. The breech-block is side-hinged, and it is opened and the shell is thrown out by simply bringing the gun to half cock. The gun may, however, be cocked without opening the breech by pressing the trigger while cocking.

The gun, when held in position, may be fired at the rate of forty shots per minute. All the movements of the parts are directly backward and forward; in our opinion the best that can be employed for this purpose, and the least liable to get out of order. In short, the gun possesses all the essentials of a first class rifle, and has advantages which we think are not ordinarily met with in arms of this character.

A NOVEL FRENCH HAND VISE.

In using ordinary hand vises several inconveniences are met with. For instance, if it is desired to work a piece of metal of a certain length, it must necessarily be presented obliquely on the side of the jaw of the vise, because of its screw, which is horizontal and forms a knob in the axis of the vise. The consequences are, first, that on tightening the nut of the horizontal screw vise the pressure is only exerted on the side, and greatly tries the vise itself while obtaining an irregular pressure; secondly, that as the piece to be worked is held obliquely, however skilled the workman may be, he always finds himself cramped in the execution of his work, particularly if of a delicate nature.

To avoid these inconveniences a Parisian mechanic has designed and lately patented in England the neat form of hand vise of which we annex illustrations, Fig. 1 being an elevation and Fig. 2 a longitudinal section. In these views, A, is a wooden or metal handle pierced throughout its length; this handle of metal may be made in one piece, with the nut, and the conical ferrule. B is the ring or ferrule of the handle;



and C are the jaws of the vise worked by the adjusting screw, D, and the springs, *r r*. E is a conical ferrule or shoulder, fixed or movable, and serving to open or close the jaws of the vise according as the handle is turned right or left; this conical shoulder is protected from wear by a tempered steel washer, *v*. G is a nut with collar carrying the conical ferrule or shoulder, E, and the steel washer, *v*, while H H are the joints of the jaws of the vise held by a screw, I, which serves as a support to the adjusting screw.

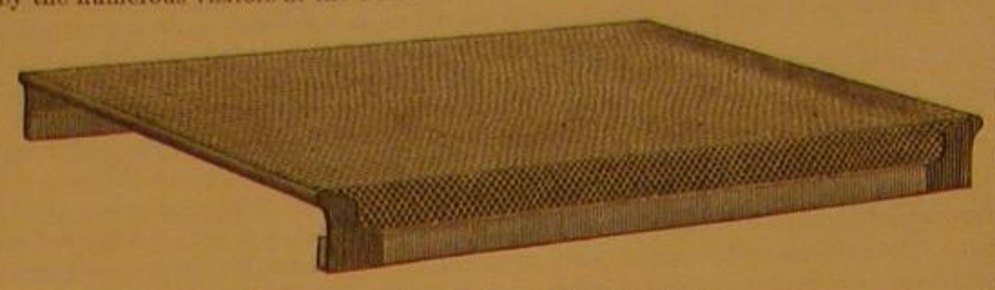
This hand vise may be applied to a number of uses, and among others it may be readily converted into a haft or handle for any kind of tailed or shanked tool, such as files, wrenches, olive bits, chisels, or screwdrivers, and may also serve as pincers or nippers. It is of very simple construction.

The Mound-Builders in Colorado.

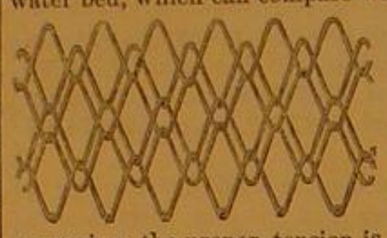
New evidence of the existence of the Mound-Builders in the mountain ranges of Colorado, similar to those in Montana, Utah, and Nevada, have recently been discovered by Mr. C. A. Deane, of Denver. He found upon the extreme summit of the snow-range structures of stone, evidently of ancient origin, and hitherto unkown or unmolested. Opposite to and almost north of the South Boulder Creek, and the summit of the range, Dr. Deane observed large numbers of granite rocks, and many of them as large as two men could lift, in a position that could not have been the result of chance. They had evidently been placed upright in a line conforming to a general contour of the dividing ridge, and frequently extending in an unbroken line for one or two hundred yards. The walls and the mounds are situated three thousand feet above the timber line. It is, therefore, hardly supposable that they were built for altars of sacrifice. They were not large enough for shelter or defense. The more probable supposition is that, like the large mounds in Montana and elsewhere, they were places of sepulture.

THE WOVEN-WIRE MATTRESS.

Most of our readers who attended the last Fair of the American Institute, will recall an article in the furniture department, which attracted much attention on account of its novelty and utility. We refer to the wire mattress, or bed, manufactured by the Woven Wire Mattress Company, of Hartford, Conn. To the ordinary mind a new invention is interesting or not, in proportion to the probability of its coming into every-day use, and many a good housewife lingers in admiration over an improved sewing machine or cooking stove, to whom a new steam engine has no attraction. For this reason it was that the wire mattress was sat on and lain on by the numerous visitors at the Fair.



The engraving presented herewith will give the reader, who has not seen the article, a good idea of its appearance. It consists of a fabric represented below, half an inch thick, composed of fine wire springs, each one the length of the bed; all the three hundred spirals, being so woven and braided together, in a double "weave," by machinery, that a sort of wire cloth is produced. It differs from any other material hitherto made, in that it has great strength and elasticity. There is, in fact, no other device, except the air or water bed, which can compare with it in its elastic properties.



We are informed that nine hundred pounds of dead weight of wire were placed on it for nearly five days, without injurious effects. This fabric is stretched on a frame, as seen in the first engraving, the proper tension is secured to suit the fancy, and the mattress is ready for use. It is then set into the bedstead, like the ordinary spring bed, except that only two slats are used to support it. Thus, with a slight covering in summer, and a thin hair mattress for warmth in winter, a most perfect sleeping arrangement is secured.

The first adaptation of the wire mattresses was for private houses, but they have been found to have special advantages for hospital use. They have been largely introduced into the Hartford Hospital, the Bellevue Hospital, New York, and the Marine Hospital, Brooklyn, and have proved to be, after months of the severest use, with all classes of patients, a very great success for such purposes. The elastic flexible mattresses yield to every motion and part of the body, much to the relief of the suffering patient.

Another very great advantage is, that when carefully painted they are always clean.

Pillows of the same materials are made soft and pliable by using a fine wire and small coil. They are always cool, and afford the opportunity of placing bags of ice under the head in case of sickness.

One of these mattresses and a bedstead and pillows complete—all of which the Company make—furnish, with the addition of a folded blanket or comfortable, a perfect outfit for hospital use.

They are particularly useful for ships' berths, as they dispense with the ordinary bottom, and the sacking and thick mattress. Shippers know this.

We are assured that a coating of paint, carefully applied to the well-tinned wires will protect them from rust.

There can be no question but that these beds, with a light covering—scarcely more than a sheet—are especially adapted for hot climates. The Company have already orders for them for the Brazilian market, and they have been introduced into many of the Southern States.

This wire fabric is adapted to other articles of furniture, and is used in place of the ordinary springs in chairs, sofas, etc. For out-door settees, lounges, car seats, and other like purposes, it is well adapted.

Three patents have been issued to the Company on the wire mattress, through the Scientific American Patent Agency. [See advertisement of the Woven Wire Mattress Company on another page.]

Flouring Mill Hazards.

A correspondent, in discussing the causes of fires in flour mills, gives the following facts and queries:

"F. Bertchey's mill, at Milwaukee, burned in September last. The fire originated from a candle held near a bran or feed spout, reaching from the upper to a lower floor. The ignition was instant, and attained different points of the building at about the same moment.

"On November 20, 1868, Schmidt & Co's mill, at St. Louis, burned in a similar manner, the light in this case being in a globe lamp, but the conflagration was, nevertheless, quite as sudden and general as in the first case cited. Other instances of like character have occurred quite recently. And now the query is, What caused the disaster? Whence the combustion?

"It has been conjectured that the bran-dust, or fine and dry powder, passing down or up these conductors, may be the kindling cause of the fire in these cases; but bran is not over combustible in itself, nor do we know why it should become so when thus reduced to an impalpable powder.

"Another theory is that a gas arises from the transmuting grain, which, excluded from surrounding atmosphere in these close conduits, becomes inflammable, and hence the results, as recited above, whenever a lighted flame is brought in contact therewith.

"Be the cause gas or dust, the disaster is the same: and is it not a phenomenon worth studying and remedying, so far as within the province and control of those most interested?"

Some similar instances came under our personal observation while adjuster for the Ætna at its western branch. The Star Mills at Mascoutah, Ill., burned about the year 1864. They were grinding middlings. About three o'clock in the morning the miller in charge went up to the chamber (a large box extending through several stories), as he had often done before, to jar the middlings down, they having clogged. He carried a small, open oil lamp, which he placed on a beam, just behind and above his head. He then opened a slide and thrust in a shovel, which started the middlings down with a thump, raising a great dust. As this dust issued in a thin cloud from the slide, it approached and touched the lamp, when instantly, as if it had been coal gas, it flashed, burning the millers, hair and beard, and filling the middlings box with a sheet of flame, which spread with great rapidity and destroyed the mill.

A mill at Dover, Ky., had accumulated a large quantity of middlings in an upper story, when the weight caused some sagging, and a man was sent up with a shovel to "even" the bin. His pressure was the "last straw," and the floor under the man broke through, pouring out a cascade of middlings, which flowed down from story to story, filling the mill with its dust. In a very few minutes it reached the boiler room, and the instant it touched the fire it ignited with a flash, and the mills was in flames instantly. It was totally destroyed.

In this last named case the gas theory will not apply. The dust was not confined in a spout, but was floating free in the air throughout the mill. The phenomenon was like the others mentioned, and seems to indicate that the fine dust itself, when floating in the air, is the fatal incendiary.

The subject is worthy of a scientific analysis, such as we have never seen bestowed upon it. The facts are well authenticated, but the philosophy of such ignition is not generally understood.—*Insurance Monitor.*

Fire-proof Buildings.

"It has long been a vexed problem with architects and builders, how to make a building completely fire-proof without the enormous expense of iron beams and girders, and even this has sometimes failed to prove a complete protection. In the building of the National State Bank, the architect estimated that it could not be made fire-proof in the ordinary style for less than $6,000, and while hesitating as to the expense and seeking to provide some remedy against the dampness incident to iron beams, Mr. Fowler learned from the SCIENTIFIC AMERICAN that Edwin May, of Indianapolis, the well-known architect of our county jail, had taken letters patent on a fire-proof lath for ceilings and inside partition walls, together with a concrete floor for the protection of the upper edge of the joist which by actual test had been demonstrated to be fire-proof. After a critical examination of the invention upon its merits, it was adopted, and the workmen are now engaged in putting it in. Our citizens engaged in, or contemplating building, will be interested in an examination of the work while in progress."

[We copy the above from the *Lafayette* (Indiana) *Courier*, and in this connection we make the following extract from a letter just received by us from Mr. May, the inventor:

"You will see by the above notice one result of my advertisement in the SCIENTIFIC AMERICAN. This is only a *mite*. I have more than I can do, and I would say to inventors who are not realizing what they expected from their patents, that one *illustrated advertisement* in the SCIENTIFIC AMERICAN will effect more than a notice in all the newspapers in the United States. This is saying a good deal but such is my belief."

The Decline of American Shipping.

At a meeting of the New York Chamber of Commerce, held December 16, to consider means for reviving American commerce, the following resolutions were adopted:

Resolved, That this Chamber recommend to the Congress of the United States, about to assemble, the modification of existing laws, so that

I. Foreign-built steamers may be imported free of duty, and privileged to carry the American flag, provided they are American owned and not to be employed in our coastwise trade.

II. That iron plates and such other material for the construction of steamers as may be deemed advisable, be admitted free of duty.

III. That on all ship stores procurable in bond, drawback be returned, as upon goods shipped for sale to foreign lands and

Finally, That ample subsidies be granted to lines of steamers built in American yards, to the end that competition with powerful foreign organizations may be successfully inaugurated and sustained.

The Chamber ordered the resolutions engrossed, accompanied by a memorial forwarded to Congress.

These resolutions, in our opinion, embody the solution of the question under consideration, and we trust they may be speedily and favorably acted upon by Congress.

YOUNG MEN out of employment can easily obtain enough subscribers for the SCIENTIFIC AMERICAN to receive a cash prize of sufficient magnitude to insure them a good salary for six weeks' work. Send for prospectus and circulars.

Correspondence.

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

Aerial Navigation---A Suggestion.

MESSRS. EDITORS:—As a constant reader of your invaluable paper, many subjects of deep interest come under my observation, and doubtless no journal throughout the land contains more instructive reading—that which tends to accelerate the progress of scientific investigation, and promote the general interest of the people—than the SCIENTIFIC AMERICAN. The series of articles under the head of "Aerial Navigation," commenced on page 309, volume XXI., has, perhaps, been read with as much pleasure and interest as anything published in your valuable journal. I say with pleasure—because it is really gratifying to mark the advancing steps which inventors are making in this branch of science; and with interest—because every new idea set forth, calculated to further the success of aerial navigation, should be, and no doubt will be, regarded as of great importance by every one. And, as the more suggestions placed before the minds of those working for the improvement of any invention, the greater number will they have from which to choose or experiment upon, I would like to make one suggestion here, which may be of some importance in the construction and operation of the "Aeroport," under the supervision of Mr. Porter, of your city, a description of which is given on pages 346-7, volume XXI., of your paper.

I suggest that the propelling wheels be placed in some other position than that given in the said description. From what little knowledge I possess of aerial navigation, I am persuaded that it would take less power to propel the "Aeroport" at a given speed, if the wheels were placed at the rear or front portion of the flying ship. My reason for being thus persuaded is, that as the forward and aft halves of the float are cone-shaped—the center being the base, and the front and rear ends being the vertexes—there must be an increased velocity of the atmosphere from front to aft as the aeroport advances. Consequently the driving wheels being placed under the center or largest diameter of the float, they must evidently revolve with greater rapidity in the current of air passing between the float and the saloon, going in opposite direction to that in which the aeroport is flying at a given speed, than they would were they placed in front or behind where the atmosphere is comparatively at rest. I take this view from the fact that steamboats and other vessels proceed with greater speed, with a given power, *down* stream than they do *up* stream, mostly on account of the paddles striking against the current flowing in the same direction in which the vessel is rowing. The propelling wheels placed either at the front or rear may have the axle extended through the end of the float to the center, and the cog-wheel, for the chain, placed on the inner end of the axle, and the chain descending through the bottom of the float, and connected to the engine in the same manner as given in your paper. The chain should be inclosed from the float to the saloon below, with a pipe of the same material as the float, and sufficiently large to insure the free action of the chain, and the axle of the propellers should be made tight with suitable packing to prevent the escape of gas. However there may be different arrangements employed for connecting the engine to the wheels. A shaft extending directly under the float, and reaching from the center to the axle supporting the propellers, and connected therewith by means of side cog-wheels, might be used; and as the shaft would necessarily diverge from a straight line with the said axle, the shaft having the chain-wheel on the end directly over the engine and connected therewith in the manner proposed by Mr. Porter, I would suggest further that it would, perhaps, be preferable to place the wheels at the front end, that the rudder might remain in its original position, and the aeroport could swing behind the propellers on encountering side currents of air, and could thus be more easily guided. I firmly believe that Mr. Porter has taken "the right step in the right direction" to accomplish that which has been so long sought, and which evidently will be accomplished at some future time. The air will yet be navigated by numerous flying ships, going from one city to another like those that now cover the broad bosom of our oceans.

HIRAM VAN METER.

Macomb, Ill.

Puttying Floors of Jewelers Shops and Otherwise.

MESSRS. EDITORS:—I am a reader of your valuable paper and find in it much to interest, and many practical hints that are useful in my vocation; I would not be without it for any consideration and I think every mechanic in the land should take it, read it, and profit by the reading.

I notice, in Vol. XXI, page 371, a communication headed, "Watch Repairers' Shop," in which directions are given to fill the chinks in the floor around the work-bench with soft pine and putty, etc., etc.; this is all well enough, but will not prevent the breaking of pivots should a balance wheel be dropped, neither will it prevent the wheel being stepped upon and so rendered useless, as often happens.

I am a watch-maker and jeweler, and I never drop a wheel or part of a watch on the floor. I have an apron about one yard wide, and in the corners of it are eyelet-holes, so that I can pin it to the bench when I am working; I have strings to it, but do not generally tie them around me, but let it be loose in my lap as I have to jump up, to attend to customers in the shop. In the shop where I learned my trade (in London, England), every workman was *compelled* to wear an apron, and so much waste of property and valuable time was saved; the saving of *time* in *one week* will more than pay the cost of the aprons.

Sidney Plains, N. Y. GEO. C. L. KENT.

Western Demand for Agricultural Implements.

MESSRS. EDITORS:—I often think, on perusing your very valuable journal of science, and the numerous mechanical and scientific problems it unfolds, that the tendency of the age is to supersede all manual labor by machinery. Whether such a thing is possible is not the question for me to consider; I only know that the tendency of universal human genius seems directed to that end.

I make the above observation casually, in order to introduce a few ideas on the subject of improvement in agricultural implements—the great *desideratum* of the West at this moment. Here nature has opened her stores so munificently, that all the husbandman has to do is to plow, sow, and garner the fruits of his labor. But two great improvements are needed to enable the western farmer to keep pace with improvements in the mechanic arts and other kindred employment. Indeed, we at the West, particularly, need a good, cheap, steam plow that can be made practicable for at least the better grade of farmers. The English plan of moldboards, that overcome all possible traction and necessitate the duplex stationary engines, with the cumbrous "artillery of attachments," may do for sluggish people but will never meet the wants of the Yankee nation.

The steam plow suited to the genius of our people, must, to use a vulgarism, "get up and go." It must possess sufficient power of propulsion and traction to pulverize the ground better, deeper, and more rapidly than the "old way." Such is the want of the great West in reference to preparing the soil for crops. I do not know of such a machine in use, nor do I believe in the theory of Dr. Brainard, that the moldboard is the only plan for properly pulverizing the soil; for I am satisfied that such plan is wholly inadmissible in steam plowing in this country, for want of sufficient traction for self-propulsion, and observation has taught me that a self-propelling plow is the only steam plow our people will tolerate.

I have lately examined the drawings of a steam plow invented by a gentleman of this city (which I am not at liberty to explain in detail) that seems to meet the great want I have spoken of. The invention consists in a very simple device, by which the whole force of pulverizing the ground is applied to propel the machine, and if this be not sufficient, an independent force may be applied, so arranged as to govern the speed of the machine at the will of the operator. You will, no doubt, in due time hear more of this machine, which seems to me to meet the great want so long experienced in Western cultivation.

The next great want of the West is a practical grain binder, that shall securely bind the grain as cut. The scarcity and high price of labor renders such a machine an absolute necessity. The efforts to supply this great want have been numerous, but with no flattering success so far as I am able to learn, except the machine invented by a citizen of this place, which has already made its mark by demonstrating that automatic machinery can and does bind the grain as fast as cut. The machine I speak of is yet in a chrysalis state, so to speak, but it has been worked two years in the field, the last season without missing a bundle, though not without the usual difficulties of all new machines in respect to the workings of some parts—too weak, etc. It is believed that the coming harvest will witness its triumphant success. If so, the production of our staple cereal will be greatly cheapened. I shall be glad to renew "old acquaintance," by a more detailed statement hereafter.

I send enclosed the pay for another year of the SCIENTIFIC AMERICAN, which I can no more do without than my accustomed dinner.

C.

Madison, Wis.

Economical Steam Engine.

MESSRS. EDITORS:—Permit me now to make a few remarks in regard to an article on page 344, last volume of the SCIENTIFIC AMERICAN, entitled "Which is the Most Economical Steam Engine?" The principles laid down in that article, I think are correct.

I run a saw-mill with an engine which fills those conditions nearer than I ever saw, and I would like to give your readers a brief description of it. The cylinder is 10-inch bore, and 14-inch stroke; steam chest extends enough beyond the ends of the cylinder so that the steam travels only 2¼ inches, the shortest distance possible, after leaving the valve before it reaches the piston-head, and the space between the piston-head and cylinder-head is only one-fourth of an inch, the bolt heads being counter-sunk until even. Other things about this engine are in proportion. With this engine attached to a direct acting circular mill, I can saw 2,000 feet of hard-wood inch boards in one hour.

If any of your readers can beat this, I would like to hear from them.

JOHN CARNES.

Friction and Percussion.

MESSRS. EDITORS:—In reply to "Spectrum," page 358, of last volume, I will be brief. In his third paragraph he claims that he has merely *suggested* that friction and percussion may often be one and the same thing; and immediately claims that in the case of the polished button rubbing a planed pine board, the force which overcomes and levels the undulations of the wood, is percussion, and that percussion is also the cause of the heat; the microscopic hills and hollows on the shining brass button skipping and jumping along the pine, produces little infinitesimal bumpings, and so pound out the heat. This *little* theory should be known to the homeopaths—they could illustrate infinitesimal quantities by it!

"Spectrum" treats my hammered horsenail illustration shabbily. After indirectly acknowledging that there is a point where hammering will no longer produce heat, he puts it on the grindstone, subjects it to friction, and when it burns his fingers, throws his hat in the air and shouts "Hurrah for *percussion!*" We agree perfectly, except that he calls hammering, *condensation;* calls friction, *percussion;* and drops friction from the mechanical dictionary altogether.

A railway car axle often heats and sets fire to the packing, when the journal is smooth as polished glass; but I never heard of those parts of the car which are constantly undergoing percussion, even getting uncomfortably warm. The natives of the South Pacific produce fire by rubbing pieces of dry wood together, but I never heard of their rapping sticks for the same purpose. I have seen a new, sharp knife made hot enough to raise a blister, whittling a clean dry stick of pine, and I would like to have "Spectrum" tell us, if in all the above cases percussion is the cause of the evolution of of heat, and what is friction doing in the mean time.

New Albany, Ind. C. C. H.

Oiling a Preservative of Brown Stone.

MESSRS. EDITORS:—I have read the article entitled, "What is to Become of our Brown Stone Fronts," and have waited to see what others have to say. But with so much at stake, no body seems to know what to do or say. Being a practical painter, it has been my lot to oil some of the best fronts in New York, namely corner of 23d Street and 5th Avenue, No. 2, West 23rd Street, also No. 1, West 30th Street; also the residence of E. S. Higgins, the carpet manufacturer, done by other journeymen.

They were very dark in color for a few weeks, but now after two years, they are bleached almost as light as they were at first.

These fronts were cleaned whenever necessary, and then oiled with fresh raw linseed oil from the press, put on pretty much as carefully as in ordinary varnish work. No second coat or lapping over of the oil. All was put on at once that it would take without running down in streams.

The result: the oil penetrates into good dry stone probably 1½ inches, making the stone hard and flinty, as any stone cutter will soon find out if he tries to trim it.

It keeps the damp and therefore the frost out of the stone, as will be seen any foggy day, the damp running down in streams on the oiled stone, and the unoiled stone absorbing the dampness. It is therefore necessary to oil during dry weather.

The oil is especially beneficial to balustrades and carvings, as they are generally got out of soft stone. It is also beneficial underneath balconies and porches, as the sun never has a chance to dry the stone in such situations before the frost flakes it.

This I send in part payment for the great deal I have learned from your paper.

T. H. RILLEY.

New York City.

Interesting Correspondence from China.

MESSRS. EDITORS:—Your paper seems to increase in interest. I brought the back volumes from Madras to Pekin, and am glad to refer to them here where I must depend upon myself.

I have been building and repairing premises since I came here last year. I find the carpenters and masons are very much delighted with our tools, especially our saws, planes, borers, vise, and hammers. Our lathe is a wonder. They use only the ancient spindle turned backwards and forwards by a treadle or by the left hand while the right guides the chisel or turning-tool, which cuts only half the time. They use only the turning saw, which often fails them because it cannot be used in splitting wide boards in the middle, and in many other places. They are great sawyers, however. They stand heavy pine spars on end, if rather short, say 8 feet, the common length of many intended for making coffins, and cut them up into three-eighths or half-inch stuff with great patience. A longer one they will lean over and prop up, raising it towards the perpendicular as they advance. They must have some hard jobs. I have just measured a poplar plank in front of a coffin manufactory, which I found to be 5 ft. 3 in. at the butt, 3 ft. 10 in. at the top, 8 feet long, and about 8 inches thick. For a crosscut saw they rig one like our woodsaw. I am sure it would deeply interest you to make a visit to Pekin and see how this ancient, patient, and industrious people do their work. It is truly painful to see how much time they spend in making the simplest tool for want of at least a few labor-saving appliances. Doubtless you have their tools on show in New York. They are to me an interesting study, though I have been long familiar with the rude tools of the Hindoos. It is constantly suggested to me that we must have got many hints from the Chinese, or else indeed they have taken hints from the West; or again, which is perhaps the true solution, implements like words have a common origin. I should think from what I have observed in a short time, that the Chinese resemble the Europeans in their tools more than the Hindoos—a thing I did not at all anticipate. A clever man could write you an interesting chapter on the ways of the Pekinese, the Chinese Manchus, Mongols, and the rest mixed together, though the Chinese are confessedly the workers in wood, iron, and everything else. The Manchus are mostly hangers on of the government, living mainly upon a miserable monthly stipend.

The reading of your unequaled journal makes me interested in you as if you were personal friends, and so I have run away with these pointless remarks. I am sure you will excuse me, and not wonder that one wishes to breathe now and then.

I was an old subscriber in Madras, and hope to be till I can read no longer. My son, who perished at Andersonville, was a subscriber to the SCIENTIFIC AMERICAN till the day of his capture by Mosby.

Pekin, China. P. B. HUNT.

Communication Between Deaf and Blind Mutes.

MESSRS. EDITORS:—In a recent number of the SCIENTIFIC AMERICAN I notice an ingenious method of teaching deaf and dumb persons to converse in the dark, which is also applicable to blind mutes, and it brings to my recollection a method which was in use among the "telegraph boys" some years ago when I was one of them. Sometimes when we were visiting and asked to communicate to a "brother chip," anything that it was not advisable for the persons around us to know, a slight tap-tapping on the table or chair would draw the attention of the party we asked to talk to, and then by his watching the forefinger of the writer, if across the room, or if near enough, by placing the hand of the writer carelessly on the shoulder of the party we desired to communicate with, the communication was written out in the telegraph alphabet or by taking hold of his hand and writing upon the finger.

I think this method will be found much less complicated, if not quite as rapid, as the method with both hands, and much more convenient, as it is only necessary to have hold of one hand of the person communicated with, and is more rapid than writing with a pen.

For the benefit of those not acquainted with the telegraph alphabet, I give it:

A	B	C	D	E	F	G	H	I
.—	—...	—.—.	—..	.	..—.	——.	....	..
J	K	L	M	N	O	P	Q	
.——.	—.—	.—..	——	—.	———	.——.	——.—	
R	S	T	U	V	W	X	Y	
.—.	...	—	..—	...—	.——	—..—	—.——	
Z								
——..								

The uninitiated will observe that O differs from I in the distance between the dots, made thus: I by two quick strokes of the forefinger; O by one quick stroke, slight pause, and another quick stroke; the dashes are made by holding the finger down for a short space: thus SCIENTIFIC AMERICAN would be written:

S	C	I	E	N	T	I	F	I	C
...	—.—.	..	.	—.	—	..	..—.	..	—.—.
A	M	E	R	I	C	A	N		
.—	——	.	.—.	..	—.—.	.—	—.		

In a very short time any one can learn to read by the sight or by the touch. Anything which can add to the pleasure or comfort of these unfortunates is of importance.

MAGNET

[Nothing can compensate for want of rapidity in a language designed for colloquy. Although our correspondent found the Morse telegraph alphabet a resource on occasion, he would scarcely be content to use it, and it only for life, even if emancipation from it involved months of labor. The motions required to spell SCIENTIFIC AMERICAN by the telegraph alphabet are thirty-nine, but as the short dashes occupy the time of two dots for each dash, and there are eight of these, eight more ought to be counted in a comparison of it with an alphabet composed wholly of dots, this would make forty-seven. To spell the same words in full by the mute alphabet referred to would require only twenty-three motions. A still greater disparity in rate would, we think, be found in an entire colloquial sentence. Thus the sentence "Hand me an apple" would require, by the mute alphabet, the time of fourteen dots, while with the telegraph alphabet it would require the time of thirty-nine.—EDS.

Cheap Cotton Press Wanted.

MESSRS. MUNN & CO.:—Please give us any information of cheap cotton-presses, such as small neighborhoods, or single planters, in the South could own. In particular, a press that will put 40 pounds cotton into each cubic foot. We want cotton better handled, and to that end may want small bales, say 150 pounds each. But these must be put into three or four cubic feet, or they will cost too much for covering, ties, etc. Perhaps you can furnish us with a wood-cut of some, or several, presses worked by hand, or by horse-power, that will do good service, not cost too much, be simple in operation, not require too much power, and be effective as above. It may be for the interest of some of your clients or correspondents to give us the facts, as we shall put them into a report for circulation amongst the entire cotton interest of the country.

Yours very truly. WALTER WELLS, *Sec'y.*

National Association of Cotton Manufacturers and Planters, No. 11, Pemberton Square, Boston, Mass.

A Singular Freak of a Magnet.

MESSRS. EDITORS:—In my library hangs a powerful horse-shoe magnet which has a keeper and a weight attached of about three ounces. This weight is sustained firmly by the attracting power of the magnet, and is not easily shaken off by any oscillating motion, yet through some (to me) unknown cause during each of the last ten nights the magnet has lost its power, and the keeper and weight lie in the morning on the bottom of the case where the magnet has hung for many years without a like occurrence, except once on the occasion of a severe shock of an earthquake which took place December 17, 1867.

There is no possible way for this magnet to be disturbed except by the electric current; then why should its power thus return without the aid of a battery or keeper? Will some one explain?

FLOYD HAMBLIN.

Madrid Springs, N. Y.

SPEAKING makes the ready man, writing the correct man, and reading the full man.

PRESERVATION OF IRON.

BY PROF. HENRY E. COLTON.

"What is wanted is something equally applicable to large or small pieces of iron, and which will answer to ward off the attacks not only of the common atmospheric oxygen, but also remain unaffected by acids or salt waters."

The above from a late number of the SCIENTIFIC AMERICAN states not only the writer's ideas but also one of the greatest wants of the age. Iron is daily being put to more and more varied uses. On land the great question is what will prevent rust; on water, what will prevent rust and fouling of bottoms of iron vessels. We will briefly summarize the many patents granted for this purpose.

Eight are for sheathing of various kinds put on in varied modes. The most practicable of these is a system prepared by Daft. Most iron vessels are now constructed by every other plate lapping the edges of the one between. He proposes, instead of having the plates all the same width, to have one wide and one very narrow plate. This would leave a trough between the two wide plates of the depth of the thickness of the plates. He proposes to force into this trough very tightly pieces of teak, and to the teak, thus embedded, he nails a sheathing of zinc. The zinc is kept clean by slowly wearing away of its surface from action by contact with the iron and salt water.

There are four patents, in which various, so-called, non-conducting coats are put on the iron, and copper pigment in some form put on over them. These have been specially condemned in England, as no matter how good the non-conducting substance —and many are so only in name—it will become rubbed off at some points, and there the bottom will be eaten both by salt water and action of copper.

Coal tar and asphaltum are the subjects of patents in various forms.

One patent claims rubber or gutta-percha dissolved in linseed oil as a vehicle in which to grind the pigment; another the same dissolved in naphtha or bisulphide of carbon as a pigment; another hard rubber, ground.

Enameling with different materials is proposed by some, while one proposes to glaze the bottoms so that barnacles and grass would find a slippery foothold.

Combinations of tallow, resin, and tar—mineral and pine—are patented mostly to use over other paints.

Coal tar, sulphur, lime, and tallow, are the subject of one patent; guano, red lead, and oil of another; while sulphur and silica are claimed by a third.

Paints containing mercury, arsenic, and even strychnine, are the subjects of several patents. A mixture of coal tar and mercurial ointment of one.

Galvanism is proposed to be used in various ways—strips of copper and zinc, or by galvanizing the plates before use. Black lead finds a place in many compositions.

One patent, by a complicated process, effects a union of metallic zinc and iron; this, granulated and ground fine, then mixed with red lead and oil, makes the paint. It is said to be the best of all the patented stuffs.

It is astonishing how many use oils derived from coal, peat, or resin, and tars of the same.

There are about fifty patents for this object and with all of them before their eyes, the British Society for the Advancement of Art still hold the $5,000 reward for a pigment or covering which will perfectly protect from rust and fouling. However they may puff their products for selling, no one has the temerity to claim that they deserve the reward.

We think it would be difficult to find so many expedients ever before adopted for the accomplishment of any one object. These are all English patents, England having necessarily been obliged to use iron for vessels from its cheapness as well as its consequent first introduction there. In the United States no patents worth mentioning have been granted.

The first requisites for a pigment or coating for iron are, that it should not contain any copper—the corrosive action of that metal on iron being intense. Then if for work exposed to air it should form such a coating as to be impervious to that gaseous fluid, and be so constituted chemically as not to be oxidizable by it; if under water—especially sea water—to be impermeable to moisture, so elastic as not to crack, so insoluble as not to chloridize; to form a perfect, apparently hard, coating: and yet wear just enough to keep off incrustation, barnacles, or growth of grass. In fact, this slow wearing away is the only preventive of fouling in iron vessels. Wooden bottoms may be poisoned by solutions of copper—and that metal has no superior for such uses, especially when it is combined in mixture with mineral or resinous tars and spirits—these compounds, however, are not only useless on iron bottoms, but also injurious. What then is *the* substance: 1st. One of the oxides of lead (red lead). 2d. The purest oxide of iron to be found. If properly made these articles can be carried to no higher state of oxidation, and respectively, as to order named, they have no superiors for body and durability. By preference, 1st, red lead, either out of or under water; 2d, Prince's oxide of iron only, out of water. The color of these paints—the first red, the latter brown, may be hidden by a coat of white or tinted color. If there were to be had in combination as a white paint, an oxide of lead and an oxide of zinc, it would be immensely superior to either, but that such has not been produced is rather the fault of carelessness than of possibility. Zinc protects iron with great effect, but it is too rapidly worn in the effort to be of lasting value. Hence the great desideratum, the yet to be, the coming pigment is a white oxide of lead or a combined white oxide of lead and white oxide of zinc, without sulphates or chlorides.

Those materials answer very well for work exposed to atmospheric air, and perhaps nothing will ever be found better; but a different need is that for salt water. No mere protector of the iron from rust can be found superior to pure red lead and linseed oil. We have seen a natural combination of zinc, lead, and iron, which, in our experience, ranks next; but the zinc is acted on by the chloride of sodium, and wears away too much of the material. Red lead, however, while covering the iron perfectly and effectually preventing rust, and also having but little disposition to chloridize, when it does, will foul both with grass and barnacles. Hence, the first desideratum being obtained, how shall we accomplish the other. The prevention of fouling may be accomplished in two ways: First, cover the vessel's bottom with two or even three coats of red lead, and give each time to dry hard. Then melt in an iron pot a mixture of two parts beeswax, two parts tallow, and one part pine resin; mix thoroughly, and apply hot one or two coats. This mixture may be tinted with vermilion or chrome green. It is not necessary to use any poisonous substance, as it is only by its softness and gradual wear that it is kept clean. Second, mix red lead and granular metallic zinc, ground fine, or such a mineral as we have mentioned—crystalline and granular in its character. Put on two or three coats, and allow each to set—they will never dry hard. The zinc will slowly wear off, keeping the whole surface clean, while there will be left enough coating of the lead to preserve the iron from rust. The oil I would urge for these pigments is linseed—as little boiled as possible, to be thinned with spirits of turpentine. There seems to have been a mania for mixtures of tar and resins, their spirits and oils; my experience fails to show me any advantage for them on an iron bottom. They have neither elasticity nor durability, while linseed oil has both in a pre-eminent degree, and is no more likely to foul than they, when in a combination that does not dry hard. Besides they are difficult to grind, inconvenient to transport, and offensive to use.

Perhaps we have not, in the opinion of some, answered the want expressed in the first paragraph. No pigment with the requisites of durability and cheapness will resist the attacks of strong acids on iron. The first we have mentioned will—all such as may float in our air from factories or chemical works. Chemically it is converted by nitric acid and chlorine into an insoluble substance—plumbic acid or the cyanide of lead. An experience of more than three years, with almost unlimited means at our command for experiment, demonstrates to us that we have indicated the means of filling the other requisites asked for. It may be that something new will be discovered, but we doubt it. Let any one tread the road we have trod, investigate and experiment where and as much as we have, and, if that place is, where we have not, and their experience will be the same as ours.

THE BANANAS AND PLANTAINS OF THE TROPICS.

[For the Scientific American.]

Poets have celebrated the banana plant for its beauty, its luxuriance, the majesty of its leaves, and the delicacy of its fruit; but never have they sufficiently praised the utility of this tropical product. Those who have never lived in southern countries are unable to fully appreciate its value. Some look even with indifference upon the gigantic clusters of this fruit, as they are unloaded from the steamers and sailing vessels; and yet they deserve special attention and admiration, for they are to the inhabitants of the torrid zone, what bread and potatoes are to those of the north temperate zone.

The banana tree is one of the most striking illustrations of tropical fertility and exuberance. A plant, which in a northern climate, would require many years to gain strength and size, is there the production of ten or twelve months. The native of the South plants a few grains, taken from an old tree, in a moist and sandy soil, along some river or lake; they develop with the greatest rapidity, and at the end of ten months the first crop may be gathered, though the cluster and bananas are yet small; but the following year one cluster alone will weigh some sixty or more pounds. Even in the South they are always cut down when green, as they lose much of their flavor when left to ripen or soften on the tree.

The trunk of the tree, if it may be so called, and which grows to a hight of some fifteen feet, is formed only by the fleshy part of the large leaves, some of which attain a length of eighteen feet, and are two and a half feet in width. While from an upper sprout you perceive the large yellow flowers, or already formed fruits, you see underneath a cluster, which is bending the tree by its weight.

The plantain tree is much the same as the banana, with the difference, however, that its fruit cannot be eaten raw, like the banana's, and that it is much larger in size. Almost every portion of the banana tree is useful. First of all, the nutritious fruit. The plantains when green and hard, are boiled in water or with meat like our potatoes, or they are cut in slices and fried in fat, when they are soft and ripe. There is a singularity about the boiled plaintain, worthy of being mentioned. Pork especially, and other meats are so exceedingly fat in the tropics that they would be most disgusting or even impossible to eat with either bread or potatoes, but the plaintain seems to neutralize or absorb all the greasy substance, and the fattest meat is thus eaten by natives and foreigners without the least inconvenience.

Ripe bananas are mashed into a paste, of which the natives bake a sort of bread, which is very nourishing, though somewhat heavy. This paste, which contains much starch, can be dried, and thus kept for a length of time, which is often of great service to mariners. The young sprouts are used and prepared like vegetables, and the fibrous parts of the stalks of the majestic leaves are used like manilla for ropes and coarse cloth.

The utility of the leaves is a theme rich enough to fill a volume; they are used to cover the huts, for table-cloths and

napkins, or wrapping paper. The dough of bread, instead of being put in a pan, into the oven, is spread on a piece of plantain leaf; it will neither crisp nor adhere to the bread when taken out. The Indians of America carry all their products, such as maize, sugar, coffee, etc., in bags made of this leaf, which they know how to arrange so well, that they transport an "arroba," or twenty-five pounds any distance without a single grain escaping, and without any appliance other than a liana or creeper to tie it up with. As to the medicinal qualities of the leaves, they are numerous. Indeed, a book has been written upon them. I speak, however, from my own experience. The young, yet unrolled leaves are superior to any salve or ointment. If applied to an inflamed part of the body, the effect is soothing and cooling, or if applied to a wound or ulcer, they excite a proper healthy action, and afterwards completely heal the wound. Decoctions made of the leaves are used among the natives for various diseases

Since the beginning of the world this plant has ranked among the first in the Flora of Asia. The Christians of the orient look upon it as the tree of Paradise which bore the forbidden fruit, and they think its leaves furnished the first covering to our original parents. According to other historians, the Adam's fig was the plant, which the messengers brought from the promised land to Moses, who had sent them out to reconnoitre. "It is under the shade of the *musa sapientium*, that," as recorded by Pliny, "the learned Indians seated themselves to meditate over the vicissitudes of life, and to talk over different philosophic subjects, and the fruit of this tree was their only food." The Oriental Christians, up to the present date, regard the banana almost with reverence; their active fancy beholds in its center, if a cut is made transverse, the image of the cross, and they consider it a crime to use a knife in cutting the fruit.

In the holy language of the Hindoo, the Sanscrit, the Adam's fig is called "modsha," whence doubtless, the word "musa" is derived. It is generally believed that the plant came from India to Egypt in the seventh century; it still forms a most important article of commerse in the markets of Cairo and Alexandria. In the year 1516, the banana was brought to the West Indian Islands by a monk, since which time it has rapidly spread over the tropics of America, and is found to the twenty-fifth degree north and south of the equator. It is equally indispensable and is appreciated by the immigrant and by the native as a beautifier of the landscape; affording shelter from the sun and rain, and giving bread to the children; for if every other crop should fail, the hungry native looks up to the banana tree, like a merchant to his well-filled storehouse.

PUTTING UP STOVES.

BY MARK TWAIN.

We do not remember the exact date of the invention of stoves, but it was some years ago. Since then mankind have been tormented once a year, by the difficulties that beset the task of putting them up, and getting the pipes fixed. With all our Yankee ingenuity no American has ever invented any method by which the labor of putting up stoves can be lessened. The job is as severe and vexatious as humanity can possibly endure, and gets more so every year.

Men always put their stoves up on a rainy day. Why, we know not; but we never heard of any exception to this rule. The first step to be taken is to put on a very old and ragged coat, under the impression that when he gets his month full of plaster it will keep the shirt bosom clean. Next, the operator gets his hand inside the place where the pipe ought to go, and blacks his fingers, and then he carefully makes a black mark down the side of his nose. It is impossible to make any headway, in doing this work, until this mark is made down the side of the nose. Having got his face properly marked, the victim is ready to begin the ceremony.

The head of the family—who is the big goose of the sacrifice—grasps one side of the bottom of the stove, and his wife and the hired girl take hold of the other side. In this way the load is started from the woodshed toward the parlor. Going through the door, the head of the family will carefully swing his side of the stove around and jam his thumb nail against the door post. This part of the ceremony is never omitted. Having got the family comfort in place, the next thing is to find the legs. Two of these are left inside the stove since the spring before. The other two must be hunted after, for twenty-five minutes. They are usually found under the coal. Then the head of the family holds up one side of the stove while his wife puts two of the legs in place, and next he holds up the other while the other two are fixed, and one of the first two falls out. By the time the stove is on its legs he gets reckless, and takes off his old coat, regardless of his linen.

Then he goes for the pipe and gets two cinders in his eye. It don't make any difference how well the pipe was put up last year it will always be found a little too short or a little too long. The head of the family jams his hat over his eyes and taking a pipe under each arm goes to the tin shop to have it fixed. When he gets back, he steps upon one of the best parlor chairs to see if the pipe fits, and his wife makes him get down for fear he will scratch the varnish off from the chairs with the nails in his boot heel. In getting down he will surely step on the cat, and may thank his stars that it is not the baby. Then he gets an old chair and climbs up to the chimney again, to find that in cutting the pipe off, the end has been left too big for the hole in the chimney. So he goes to the woodshed and splits one side of the end of the pipe with an old axe, and squeezes it in his hands to make it smaller.

Finally he gets the pipe in shape, and finds the stove does not stand true. Then himself and wife and the hired girl move the stove to the left, and the legs fall out again. Next it is to move to the right. More difficulty now with the legs. Move to the front a little. Elbow not even with the hole in the chimney, and the head of the family goes again to the woodshed after some little blocks. While putting the blocks under the legs, the pipe comes out of the chimney. That remedied, the elbow keeps tipping over, to the great alarm of the wife. Head of the family gets the dinner table out, puts the old chair on it, gets his wife to hold the chair, and balances himself on it to drive some nails into the ceiling. Drops the hammer on wife's head. At last he gets the nails driven, takes a wire swing to hold the pipe, hammers a little here, pulls a little there, takes a long breath, and announces the ceremony concluded.

Job never put up any stoves. It would have ruined his reputation if he had. The above programme, with unimportant variations, will be carried out in many respectable families during the next six weeks.

THE MAGIC LANTERN.

The invention of the magic lantern dates back to 1650, and is attributed to Professor Kircher, a German philosopher of rare talents and extensive reputation. The instrument is simple and familiar. It is a form of the microscope. The shadows cast by the object are, by means of lenses, focussed upon something capable of reflection, such as a wall or screen. No essential changes in the principles of construction have been made since the time of Kircher; but the modern improvements in lenses, lights, and pictures, have raised the character of the instrument from that of a mere toy to an apparatus of the highest utility. By its employment the most wonderful forms of creation, invisible, perhaps, to the eye, are not only revealed but reproduced in gigantic proportions, with all the marvelous truth of nature itself. The success of some of the most celebrated demonstrations of Faraday, Tyndall, Doremus, Morton, and others, was due to the skillful use of the magic lantern. As an educator, the employment of this instrument is rapidly extending. No school apparatus is complete without it; and now that transparencies are so readily multiplied by photography upon glass, and upon mica, or gelatin, by the printing press or the pen, it is destined to find a place in every household; for in it are combined the attractive qualities of beauty, amusement, and instruction.

The electric light affords, probably, the strongest and best illumination for the magic lantern: then comes the magnesium light; but their use is a little troublesome and rather expensive; next to these in illuminating power is the oxy-hydrogen or Drummond light. The preparation of the gases and the use of the calcium points involve considerable skill.

Need has long been felt for some form of the magic lantern, having a strong light, but more easily produced than any of those just mentioned; and this has at last been accomplished, after several years' study and experiment, by Prof. L. J. Marcy, 632 Arch St., Philadelphia, Pa.

The "Sciopticon," is the name of his new instrument, and from actual trial we find that it possesses many superior qualities. Its lenses are excellent, and in illuminating power its light ranks next to the oxy-hydrogen. The sciopticon light is produced from ordinary coal oil by an ingenious arrangement of double flames, intensifying the heat and resulting in a pencil of strong white light. Prof. Marcy's instrument is the perfection of convenience, simplicity, and safety. Any one may successfully work it and produce the most brilliant pictures upon the screen. It is peculiarly adapted for school purposes and home entertainment. Those who wish to do a good thing for young people should provide one of these instruments. Photographic transparencies of remarkable places, persons, and objects, may now be purchased at small cost; while there is no end to the variety of pictures which may be drawn by hand at home upon mica, glass or gelatin, and then reproduced upon the screen by the sciopticon.

The Largest Well in the World---Capacity 1,000,000 Gallons of Water per Day.

One of the grand necessities of the Prospect Park, Brooklyn, N. Y., that of providing for a continual supply of water for all the purposes of the Park developed itself, as the Commissioners progressed with their stupendous undertaking. Mr. Stranahan, the President of the Board, after carefully weighing the cost, the practicability, and importance, of having an independent water supply for the Park, advised the Commissioners of the plan which had suggested itself, and the calculations which had been made by the engineers relative to the project, and the work was commenced, the first idea being to secure at least a partial supply of water by means of a well constructed in the Park. The subject was thus treated in the last annual report of Mr. C. C. Martin, the engineer in charge:

"This well has been located on the south side of Lookout Hill, near the lake, and work was commenced upon it late in the season. After a careful consideration of various methods for sinking the well, it was decided to build the wall and then to excavate the material from within, trusting to the weight of the wall to force it down. Sixteen feet of the wall were laid securely bolted together, before the excavation was commenced. A derrick with a boom fifty-five feet in length was set up near the wall, so that the sweep of the boom commanded the interior of it. Iron buckets containing fourteen cubic feet each were obtained, and a six-horse power hoisting engine purchased. With these appliances the excavation was commenced, and carried on with slight interruption until the work was suspended on account of the frost."

The well is now completed, and is one of the most important features of the Park. It is worthy to rank as a feat of engineering skill with any of the great works of modern times. The Commissioners decided to put its powers to the test yesterday afternoon, but owing to the unpropitious weather of the forenoon the trial was postponed. Nevertheless, Commissioners Stranahan, Fiske, and Haynes, with Mr. Martin, engineer in charge, and Mr. John Y. Culyer, his assistant, were at the well. During the last summer some difficulties were encountered in the sinking of the wall, which were set down by superficial observers as the utter failure of the enterprise. Mr. Stranahan received but little encouragement from his fellow Commissioners, some of whom had never seen greater works of engineering than the construction of street sewers. He assumed the responsibility of seeing the work through, feeling that the whole thing depended entirely upon the ability of the engineers, in which he had abundant faith. All obstacles were surmounted; the work proceeded and the well is now finished, and so far as is known, is understood to be the largest one in the world.

The outer wall is fifty feet in diameter, two feet thick, and fifty-four feet high. The inner curb, or wall, is thirty-five feet in diameter and two feet thick, having a depth of ten feet. The masonry, as seen from the top of the structure, is a marvel of neatness and solidity. The water surface in the well is thirteen feet above high-tide level, and the depth of water in the well is fourteen feet. The pump foundations are entirely independent of the walls. This plan was adopted so as to obviate any possible difficulty which might arise from displacement. The pump is the Worthington patent, and, with a pressure of forty pounds, is capable of raising one million gallons of water every twenty-four hours a hight of 176 feet, and is competent to a lift of 180 feet.

The boiler house is a neat, pressed-brick structure trimmed with Ohio stone, standing on the surface near the mouth of the well. The interior of the well is reached by a spiral stairway built in the wall, and commencing in the boiler house. In this way the engineer is able to reach the pump. It is a fact worthy of notice in connection with the construction of the wall, or rather the sinking of it, that the outer wall rests upon four feet of wooden cribwork, two feet thick, and having an iron shield. The inner wall is built upon a similar crib only two feet deep, also shielded with iron.

The Commissioners were led to the construction of this well in presence of the danger at any time of some accident taking place in connection with the Brooklyn Water Works which would render it necessary for the Water Board to cut off the Park supply so as to secure the citizens from suffering. This well has more than the necessary capacity to supply the Park abundantly with water, yielding most when most is needed. This is established by the discovery that the time of drought from which the well is, or may be, likely to suffer, occurs in the Fall. Besides these facts, it further appears that in order to furnish the supply of water to the Park the Water Board would have to go through the process of pumping their water twice to convey it to the required elevation, equal to 225 feet from its original level.

The work of the well will be to supply the pools at an elevation of 133 feet. From the pools the water is conducted to the lake. Besides this, there is an independent connection with the lake by which, as necessity may suggest, the water can be directed to the lake, a lift of only seventy feet. The lake, when completed, will occupy an area of fifty acres, which will be kept continually supplied with fresh water, the arrangements being such, or to be such, as will insure a permanent change of water, and prevent any of the evils that may arise from stagnancy. The well is fed from the earth, consisting of a circuit of two miles, with a fall of five feet to the mile. For this reason it does not appear easy to exhaust the supply, as when the water is pumped out to four or five feet from the surface of the well it is replaced at a rate equal to the demand. Every allowance has been made for evaporation from the lake and pools, and the supply is regarded as inexhaustible. Another important fact here suggests itself; that is, that sufficient rain falls during the season in the area of two miles around the well to make the supply perennial. The Prospect Park well is a credit to Brooklyn.—*New York Times.*

PAPER FOR BUILDING.

Our readers will find in another column an advertisement of this new building material which is now attracting much attention in the West, and of which we have received very favorable reports. It has been recently tested in Chicago with the result we are informed of fully establishing its utility. It is said that a house twenty-two feet long, sixteen wide, and fourteen high, can be covered on the outside for less than $9; and a house thirty-six feet by twenty-two, and twenty feet high, for $20. The building can be done at any season, and can be finished with great speed, and there are said to be numerous other advantages connected with the use of the paper. It differs from ordinary paper in consistency, compactness and solidity. In the manufacture it is subjected to a pressure of hundreds of tuns, which squeezes out the liquid matter, leaving a substance of the right thickness. It is said to be proof against damp and gnawing of vermin, and it being an excellent non-conductor of heat, must make a warm dwelling in winter and a cool one in summer. It is used in the place of plastering for inside walls.

THE Prussian Government has military maps of every foot of its territory so complete that every hill, ravine, brooklet, field, and forest is delineated with perfect accuracy. It is a common boast of Prussian military men, that within the space of eight days 848,000 men can be concentrated to the defense of any single point within the kingdom, and every man of them will be a trained and well-equipped soldier.

Improved Muzzle-Pivoting Gun.

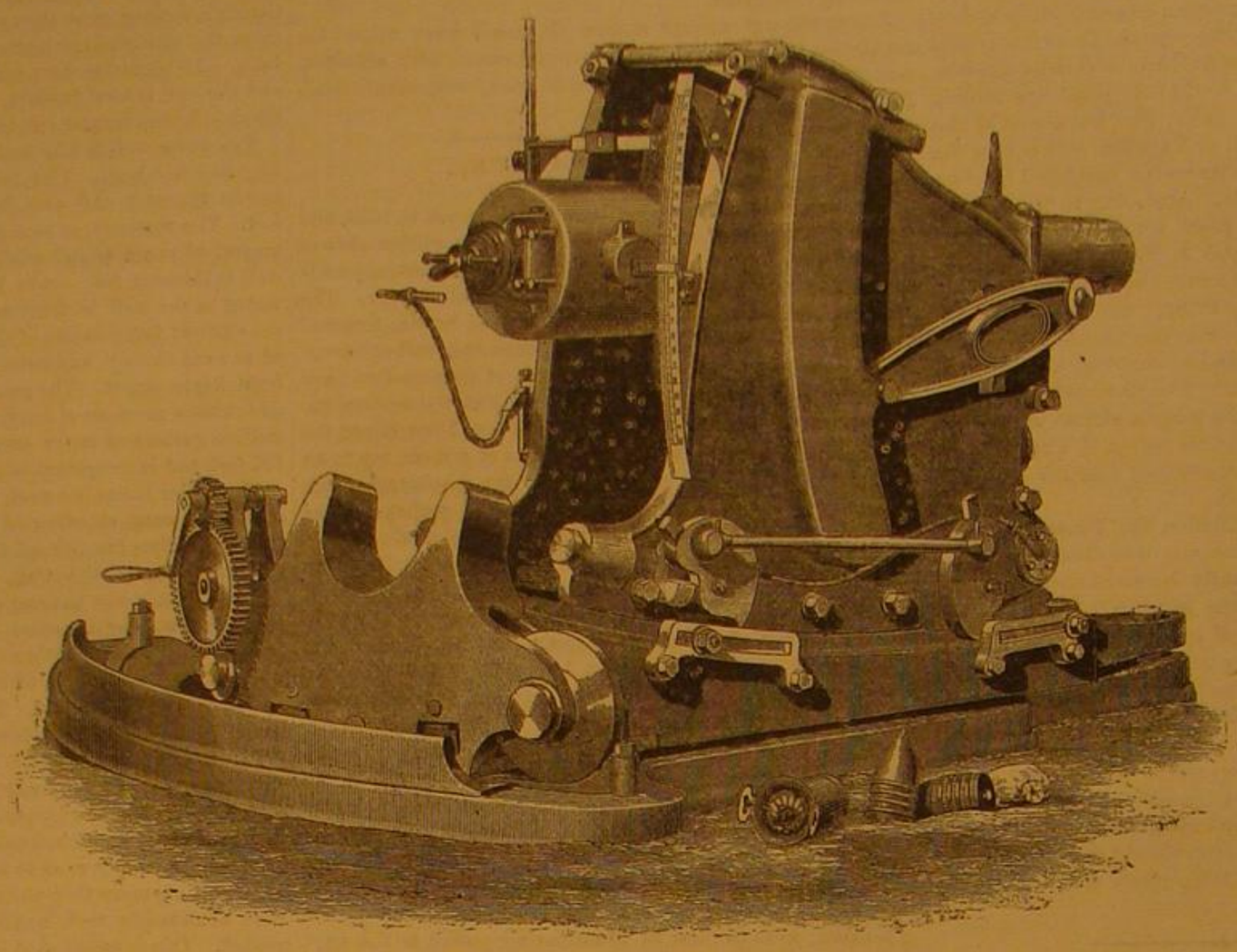
We are indebted for the following able description and criticism of this Prussian gun to our able cotemporary, *The Engineer*.

Viewed as a piece of mechanism, nothing can well be more beautiful in mutual adaptation of parts to the fulfillment of given and rather recondite movements, and in point of execution, than this muzzle-pivoting arrangement of Herr Gruson's; but having said this we are compelled to add, as impartial engineering critics, that it is nothing more.

A very few words of description, aided by the very clear engraving annexed, will suffice to make the arrangement plain to every mechanical reader. The entire structure is metallic, chiefly of cast iron or of steel. Upon the platform of the casemate, or deck of the ship, or turret, is laid the heavy bed or traverse plate, cast hollow in iron, holding the vertical pivot at its forward end, on which the gun slide traverses in azimuth, and at its rear end the segment plate, bolted down and separately adjustable as to position upon the bedplate. The slide is also a ponderous hollow casting, the upper surfaces of which, on which the gun carriage runs forward or recoils, are curvilinear in a vertical plane, so that the inclination to the horizon is greatest at the rear end. At the rear end of the slide it traverses upon two heavy cast-iron turned conical rollers, which are geared together and actuated by the winch handle and spur gear, seen in our engraving; by these the slide is practically held fast in any position on the bedplate. The gun itself—in the model, a steel breech-loader, on the Prussian regulation system, very slightly modified—is sustained between two high and ponderous cheek plates of cast iron, which constitute the sides of the carriage, and which are connected together strongly at the lower edges by a heavy base or bottom plate, and at the top by two light cross distance bolts. The muzzle and breech extremities of the piece project well beyond those cheeks. Along the bottom of the trough of the carriage, directly under the gun, lies a nearly horizontal hydraulic press cylinder, the pump and handle actuating which are seen in the figures to the proper left of the gun, and the supply of water for which is contained in the hollow bottom of the carriage. On each side cheek of the carriage is formed, by curved planing, a circular segmental race, opening inward or toward each other, rectangular in cross section and into each of which is fitted a segmental block just filling it up, and occupying a portion of its length so as to slide easily up or downward through the whole range of the arc or segment.

The center point of the length of each of those blocks carries one side of the gun, which is connected also with the two heavy radius bars seen outside the cheeks, and pivoted close to the segment races on the outside, and with a system of link work between the gun itself and the crosshead of the ram of the hydraulic cylinder, which gives motion to the gun in elevation or depression, through a vertical arc, the imaginary center of which, and of the segments of the side cheeks, is situated in the horizontal diameter across the muzzle of the gun. This is in brief the muzzle-pivoting part of the arrangement, of which, were it worth while to go into its details, we should need some further diagrams to make it quite clear. Nor is it worth while to go into the description of various minor points of refinement about the gun mounting, such as the very exposed long tangent scale seen in the figure, by which the elevation or depression is read off, nor the still more exposed and rather ricketty arrangement by which the rear sight is arranged to rise and fall with the gun, and allowance for dispart avoided. The recoil of the gun is resisted through and by the segment blocks in the side cheeks, and by the heavy radius bars, etc., and thus transferred to the carriage itself. This moves upon four eccentro-concentric rollers, in all respects identical with those brought before the Ordnance Select Committee of Woolwich by Mr. Mallet, in 1858—then rejected, after some time adopted, and brought into use in our own service, where they are now universal, and from which they have been adopted into every artillery in the world, and, we understand, without the slightest recognition of the inventor's rights. On the axle of each of these rollers is keyed a circular eccentric cam plate, those at the same side being connected together by a linking bar so as to move in concert. Adjustable tripping plates attached to the sides of the slide, are so arranged that when the loaded gun has been run forward its carriage base rests hard down, with its full weight upon the top faces of the slide, and thus the recoil is made under the full resistance due to the friction of the entire load. Arrived at the highest point, it rests there until loaded. The cam plates being then given a slight motion of rotation by the help of socket levers—the rectangular projections to be received by which are seen on the top edges of the cam plates in the figure—the carriage, by its own commenced descent, gets again upon its rollers, and runs forward upon these at once into firing position. The two elevated horns which are seen standing up at the rear part of the slide above the roller frame are designed to receive the thump of the two short buffer-blocks—seen at the rear part of each carriage cheek—in the event of the recoil not being wholly expended in raising the weight of gun and carriage, etc., along the curved racers of the slide. These buffer-blocks bear against plugs of vulcanized india-rubber secured in the bottoms of the buffer cylinders.

We have thus, though very briefly, described the whole of this mounting. As a carefully thought out and elaborated



GRUSON'S SYSTEM OF MUZZLE-PIVOTING APPLIED TO MONITORS.

piece of elegant mechanical complication Herr Gruson's muzzle-pivoting carriage attracted much attention at Paris, in 1867, and its merits were regarded as great by those whose thoughts went little further perhaps. We should have been glad had it been in our power to have joined in its praise. We are, however, obliged honestly to say that, however highly creditable to its designer as an ingenious and capable mechanism, it shows that he has never realized to himself as a practical artillerist the primary, most absolute, and indispensable conditions of construction for a serviceable muzzle-pivoting gun for either land or sea service.

As to the general merits, or general conditions, of muzzle-pivoting, however, once in doubt at first, these are admitted now by all; and the latter resolve themselves almost into this—that system of muzzle-pivoting must be best which, while preserving the essential point of leaving the muzzle of the gun free of any direct attachment, *i.e.*, with an imaginary, not an actual, pivot of vertical arc motion, shall be *the simplest possible* in its parts, have the least details, the fewest parts capable of being struck by splinters or shot, and all its parts of such materials and character as to receive the smallest amount of injury if so struck. In every one of these aspects Herr Gruson's mounting is at fault. With parts and movements far more ingeniously adapted than those of the crude and unskillfully designed muzzle-pivoting carriages of Captain Heathorn, also exhibited at Paris, and much exhibited and exposed since, the Gruson mounting is even more complicated, expensive, and liable to injury of every sort to which a gun carriage can be conceived liable. We may even venture to affirm that ponderous as was the mass of cast iron, etc., in the Paris model carrying only a 12-pounder gun, were it all enlarged in such ratio as might appear to suit for a 10-inch 25-ton rifled gun of the British type, the almost proverbial relations, between weight, velocity of impulse, and brittleness of cast iron, would show themselves, in the whole machine going to pieces within a very few rounds.

Stock Feeding by Clock Work.

Mr. F. B. Robinson, of North Haven, Conn., has invented a very neat arrangement, whereby horses or stock can be fed at any time required with certainty and without personal attention at the time of feeding. His invention consists of a hopper with a drop bottom in which the provender is placed. A latch secures the drop bottom, the latch engaging with a spring catch. A simple arrangement of clock work on the principle of the alarm clock, may be set to release the spring at any hour or minute desired, when the drop falls and the provender falls through a chute into the feeding trough. This invention may be adapted to feeding any number of horses or cattle, only one clock being required. We regard the invention as one of much value. By its use much neglect of careless attendants may be obviated, and a farmer without help, might leave home for an evening's entertainment, or absent himself on business, without fear that his stock would suffer. Besides being so convenient the cost of the apparatus is a mere bagatelle.

Milk, and What Comes of It.

Orange County has long been a land flowing with milk and —butter. Three or four of these most beautiful autumn days were spent by us, says a writer in *Harper's Weekly*, among the farmers which are supposed to butter our New York city bread, and qualify our tea and coffee. Recent mechanical improvements have taken away much of the traditional romance of the farm, but, on the whole, the loss is more than made up by the gain of perfect system and wonderful adaptation. Instead of four or five cows, known by such names as Brindle, Bess, and Sukey, milked by rosy-cheeked maidens, we have now droves of fifty or a hundred, milked by men, who know them only as "good" or "poor milkers."

In some fine farms a large and luxuriant pasture, with running brooks and border of woodlands, affords, with the herd feeding in it, a beautiful picture; and the substantial barns constructed to keep the cattle comfortably cool in summer and warm in winter, with ample drinking troughs and stalls for fastening up at night, are indicative of the good shelter at hand when winter storms drive the cows indoors. To the farm-yards the cows are brought night and morning, in summer, to be milked. The strained milk is put into large cans holding forty quarts, such as the milkmen use in distributing it through the city. These cans are then put into tanks made in some cool running stream, where the water comes nearly to the top of the can. Frequent stirring is necessary until the animal heat is quite gone. The milk is then fit to be sent to the cars. This process can never safely be omitted for, paradoxical though it may seem, milk is "fresher" and sweeter when it reaches the consumer if it is delayed at the farm for at least twelve hours. Even in hot weather, it is more certain to keep sweet when twenty-four or thirty-six hours elapse between the milking and the using in the city.

There has been much discussion as to the best means of cooling milk for market, and patent pails have been tried in which the milk passes directly from the cow through small, coiled tubes surrounded by ice. But this rapid cooling does not work well, and practical experience indicates that the old simple process is the best. Every well-appointed farm must have, therefore, a cool and unfailing stream of water. There are two such streams in one of the farms we visited. One passes through the barn, furnishing drinking troughs for the cattle, and a tank for cooling milk in winter. The other, running through the pasture, supplies a trout-breeding pond, and furnishes a tank for summer use. In a little hut under the trees, the milk cans are kept in a stream, which even the severe drought of last summer did not dry, nor the heat raise to a temperature of 60°.

We are assured most positively that none of the spring water finds its way over the mouth of the can into the milk. Its dilution, of which there is so much just complaint, must be done, if at all, in the city, for the wholesale buyer is said to have such means of testing the milk as effectually protects him against the farmer. May the man be busy at work who is to give each family such a protection. We have heard it said that one end of a small piece of common tape placed in a pan of milk will carry from it all the water into another vessel in which the other end of the tape should be placed; but we have never found this a safe test.

Strange to say, no butter is made on these large milk farms. The supply for the family is obtained from market, or, more rarely, from a neighbor who churns all his milk for the accommodation of those who send all theirs to the city. Our notions of the way to make butter were decidedly overturned on going to such a dairy. No setting of the milk in shallow pans for cream to rise; no skimming and putting away in jars until "churning day," when the thick cream was agitated by a strong arm until the butter came, then worked and salted. Instead, there is a daily pouring of the unskimmed, soured milk into a common churn, perhaps somewhat larger than ordinary. The dasher is fastened to a shaft, which is moved by a crank. The crank is turned by means of a nearly horizontal wheel some eight or ten feet in diameter, which is kept in motion by a dog, sheep, or calf standing on it, something after the manner of the old tread-mill.

When taken from the churn, the butter is worked by hand, as of old. The farmer with whom we have talked said he was about determined to send his milk to the creamery, since butter-making made it so hard for the women. Surely woman is less a drudge than she used to be. If, after being relieved from the labor of churning, the remaining working of the butter is considered too hard for the farmer's wife, the day of a woman's redemption must be near at hand.

Only one butter farm have we been able to find, and not

enough is made there to supply the immediate neighborhood Where, then, does all the Orange county butter come from? Mostly from the West. Farmers buy from the vicinity of the Alleghenies, and even further west, large quantities, which they sell in the original package or repack in pails. Since railroads have become so numerous, New York drinks up all the milk in Orange county, and must butter her bread elsewhere.

The largest institution for the disposition of milk is the Creamery, which is, in other words, a cheese factory. Here is brought the milk which the farmers themselves are unable properly to prepare for market, for want of cool springs or sufficient help. Received here, it is placed in deep but narrow tin pails holding twelve or fourteen quartz. These are floated in large tanks of water. From these pails the cream is carefully taken and sent to market. The skimmed milk is then placed in a large vat and heated, by means of steam pipes to about 80°. Then the rennet is put in. From twenty to thirty minutes suffices for curdling, and the mass is then stirred to separate the curd from the whey. After which it is heated still more; and then the whey, passing off through a strainer, goes to feed hogs, while the curd remains in the vat, to be salted and worked before putting into the presses. In two or three hours the curds become hard enough for the canvas to be put upon them ready for the shelves. Very carefully they must then be watched, lest the fly lying in wait for them makes in them a snug house for her family. Greasing and turning must be a daily labor, and some weeks must pass before they are sufficiently cured for market.

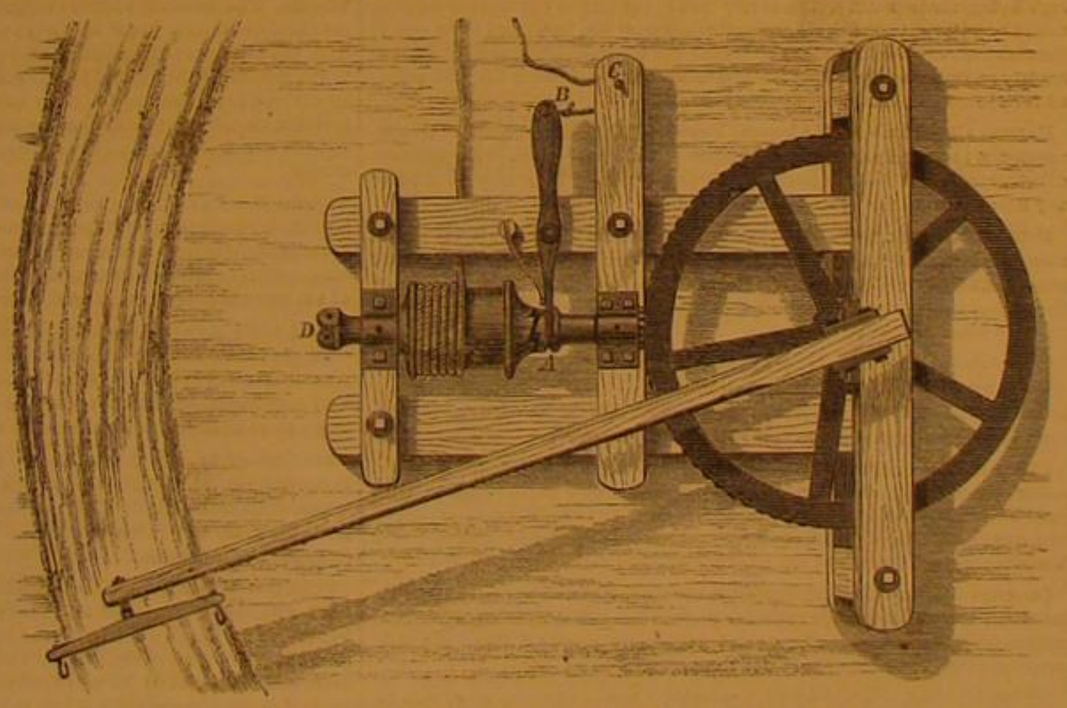
For the benefit of city consumers, who are paying ten and twelve cents a quart for milk, from a tenth to a quarter of which is not infrequently pure Croton, we may add that the highest price the farmer ever gets for his milk is seven cents a quart; and he sometimes sells it for as low as two cents and a half. Our friends, the milkmen, have, therefore, it will be seen, a pretty good margin for freight and profit.

Improved Hay Elevator.

The method most generally used for elevating hay is evidently not the most economical application of the power of horses for the accomplishment of the purpose desired. The tackle involves a great deal of friction, and as the quantity which can be thus raised at once is, probably, on the average, not more than from 150 to 200 lbs., much more time is employed in re-adjusting the fork, than would be the case if a larger quantity were elevated.

The invention under consideration supplies a means whereby it is claimed hay may be unloaded with far greater facility than heretofore, with less labor to the team and with fewer hands than are at present employed.

A primary gear wheel is propelled horizontally by a lever worked by a horse. The primary gear impels a pinion keyed to the shaft of a windlass, upon which is wound the elevating rope, whenever the clutch, A, is made to operate through the cord and lever, B. This cord runs over a pulley on the under side the wood framework at C, and its further end may be held in the hand of the workman on the hay load, who, when he has properly adjusted the fork, pulls the cord which operates the clutch, and the "fork-full" of hay is at once elevated. The cylinder of the windlass, not being keyed to the shaft, only operates when the clutch is closed by the cord.



DERR'S CAPSTAN FOR ELEVATING HAY FORKS.

The horse, or horses which furnish power to the machine, may, therefore, keep on traveling in the same direction, and no time is lost in stopping and backing, as in the method in general use.

There is no doubt but that this is a cheap, durable, and desirable machine, and one that can be used to great advantage, not only for the elevation of hay, but for many other purposes. We think it would be found a decided improvement in discharging cargoes of coal from barges, and for handling coal in storage yards.

The inventor claims that twice as much hay can be raised in a given time by its use, as can be done by the old method; and it dispenses with one hand at the barn or stack.

A coupling at D, enables attachments to be made, which extend the usefulness of the machine very much. It may be used as a power for driving wood saws, cutting fuel, thrashing, and other work where a simple horse power is desirable.

Address for further information, Wm. Derr, Tiffin, Ohio.

COMPETITORS FOR PRIZES.—The interest that our friends have taken in obtaining additional names to send with their own subscriptions to the SCIENTIFIC AMERICAN for the coming year, is without a parallel. The clubs sent by competitors for the cash prizes are not so many or so large as we expected, but the number of applicants for the steel plate engraving exceeds our expectation.

THE Emperor of France is said to be interested in the art of flying and to have given money to fledge some inventions.

IMPROVEMENT IN LAMP WICKS.

Our engravings show a novel substitute for the cotton lamp wick. The wick, two forms of which are shown in Figs. 1 and 2, are made of glass, and are filled preferably with pulverized gypsum, although any finely-ground stone, mineral, or metal may be employed. The bottom of the glass tube is closed by wire gauze, or other suitable strainer, through which the fluid flows; and is carried by the capillary attraction of the pounded material to the top of the wick.

Thus a permanent wick is obtained, which may be employed with any form of lamp, and will last for an indefinite



time. It may also be used in connection with an open cup, which the inventor terms a poor man's lamp. A perforated card is laid upon the top of the cup or tumbler as a support to the wick.

It may be used either with or without a chimney, and it is claimed that with good kerosene oil it is perfectly safe, and consumes less of it, while it may be also used as a candle.

Patented through the Scientific American Patent Agency, September 14, 1869, by Edward D. Boyd, of Helena, Ark.

Address for rights, etc., the patentee, as above, or Jos. P. Branch, 277 Fulton street, Brooklyn, N. Y.

Great Transformation.

Seven years ago, says the Port Said correspondence of the London *News*, there was nothing to distinguish Ismailla or the smiling lake before you from the rest of the desert, and all was sand. It is the canal which has raised up the numerous handsome villas and fine gardens. Fresh water is all that is needed to turn the arid desert into a fruitful soil; and the supply of this is provided by the subsidary canal which the company has formed side by side with that broad salt one which now unites two worlds. Wonderful stories are told of the productiveness of the gardens, and a walk through any of those belonging to the leading officials stationed at Ismailla is to verify them all. Vines with large bunches of grapes pendent from their branches; orange trees with green fruit just showing a golden tint; ivy, roses, geraniums from England, and an endless variety of rich tropical plants are all flourishing. In the centre of the town is a square with trees and a building clothed with rich creepers in its midst. Everything here looks French. A handsome boulevard runs down to the point of embarkation, the streets and squares are on the true Parisian model, and there are *cafes*, billiard rooms, and *cafe chantants* which might easily belong to Nantes or Lyons. There are of course huge gaps where the houses and shops will be; the roads are, many of them, still of sand; camels draw carts, and generally pervade the place in long strings; but with all this you are kept in a state of wonder during your stay at Ismailla at the marvelous conversion which has taken place under your eyes.

AMERICAN agricultural implements are highly praised in newspaper reports of the Metropolitan Cattle Show, held recently in London.

Moore's Rural New Yorker

For Dec. 25 contains a splendid full-page Engraving of the PRIZE FOWLS at the recent State Poultry Show—the Best Poultry Picture ever given in an American newspaper.—Also, a magnificent CHRISTMAS PICTURE, and other fine Illustrations. For sale by all Newsdealers; price 8 cents. See advertisement of RURAL in this paper.

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.

To ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's manufacturing news of the United States. Terms $4.00 a year.

Ties, timber, and lumber seasoned by steam, without a building. Costs $2, worth $26 per M. Stops ersmacausis. H. G. Balkley, N. Y.

Wanted—Light Machinery or Articles to Manufacture. Work done in a neat, prompt manner. Address W. E. Bradner & Co., 13 Mulberry st., Newark, N. J.

Parties wanted—Containing Gold, Silver, or Copper. Address A. G. Hunter, Jackson, Mich.

Those wishing articles of metal or light machinery manufactured, will find it for their interest to address J. B. Heald, Milford, N. H.

One horizontal stationary steam engine, with variable cut-off, 60-H. P.; one plain do., 25-H. P.; one do., 20-H. P.; one Portable 12-H. P., on hand and for sale low. Albertson & Douglass Machine Co., New London Conn.

For sale cheap—Good 2d-hand plate iron. 50 plates 3-8 thick, 42 inches wide, 120 inches long. Been used 3 months for a floor. Price 3 cents per lb. Address box 1352, Norwich, Conn.

The head draftsman of a locomotive works, just closed, desires another engagement. Familiar with stationary, marine, or locomotive machinery. Unexceptionable references. Watkins, 13 Dutch st., N. Y.

Wanted—Iron Planer about 4 ft., describe same and price. Geo. S. Grier, Milford, Del.

Wanted—Best Water Filter for Household purposes. Frank Alexander, Box 3769, New York.

A Brick Machine wanted. Address A. Hansen, Sumter, S. C.

For Sale for want of use—A 3-Horse portable steam engine and boiler, in perfect running order. Address B. S. Nichols & Co., Burlington, Vt.

Patent Rights bought and sold by R. T. Bradley & Co., 131 Fourth st., Cincinnati, Ohio.

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

Every wheelwright and blacksmith should have one of Dinsmore's Tire Shrinkers. Send for circular to R. H. Allen & Co., Postoffice Box 375, New York.

For Small Engine Lathes, with foot-power, Hand Lathes, Bolt or Turret Cutters, Planers, etc., address W. E. Bradner & Co., Newark, N. J.

Aneroid Barometers made to order, repaired, rated, for sale and exchange, by C. Grieshaber, 107 Clinton st., New York.

Foundery and Machine Business.—Experience, with some capital, wants an engagement. South or West preferred. Address Box E. E., Catskill, N. Y.

Foreman in a Machine Shop—A person having ten years experience in that capacity is desirous of forming a new engagement. Address, with particulars, Postoffice Box 119, La Crosse, Wis.

Makers of Pipe Cutting and Tapping and Screwing Machines send circulars, without delay, to Forest City Pipe works, Cleveland, O.

For Best Spring-bed Bottoms address S. C. Jennings, Wautoma, Wis.

Parties having patents or patent goods to sell, send for The National, Buffalo, N. Y., $1 per year, 10c. single copy.

Back Nos., Vols., and Sets of Scientific American for sale. Address Theo. Tusch, No. 37 Park Row, New York.

Mineral Collections—50 selected specimens, including gold and silver ores, $15. Orders executed on receipt of the amount. L. & J. Feuchtwanger, Chemists, 55 Cedar st., New York.

The Babcock & Wilcox Steam Engine received the First Premium for the Most Perfect Automatic Expansion Valve Gear, at the late Exhibition of the American Institute. Babcock, Wilcox & Co., 44 Cortlandt st., New York.

For best quality Gray Iron Small Castings, plain and fancy Apply to the Whitneyville Foundery, near New Haven, Conn.

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

Foot Lathes—E. P. Ryder's improved—220 Center st., N. Y.

Those wanting latest improved Hub and Spoke Machinery, address Kettenring, Strong & Lauster, Defiance, Ohio.

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

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

Send 3-cent stamp for a circular on the uses of Soluble Glass, or Silicates of Soda and Potash. Manufactured by L. & J. W. Feuchtwanger, Chemists and Drug Importers, 55 Cedar st., New York.

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

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

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

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

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

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4.00 a year. Advertisements 17c. a line.

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

Answers to Correspondents.

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

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

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

C. H. G., of N. Y.—To make pure nitrate of silver, dissolve pure silver in pure nitric acid, evaporate the solution to dryness, or, if crystals are preferred, evaporate until the solution is sufficiently concentrated to form crystals. If you can not get pure silver, you may purify it by dissolving coin in nitric acid, filtering the solution and precipitating the silver in the form of a chloride by hydrochloric acid. Next wash the precipitate with hot water until the washings cease to redden litmus paper. Next mix the pure chloride of silver while yet moist with its own weight of pure crystallized carbonate of soda, place the mixture in a covered porcelain crucible and heat very gradually until the fusing point of silver is reached. The reduced silver will be pure and may be removed by breaking the crucible. Wash the button thoroughly with hot water to remove the flux. In dissolving the pure silver thus obtained in nitric acid, it is better to use an excess of acid; the excess will be driven off by heat in evaporaton.

G. B., of Iowa.—Nominal horse power is merely a conventional expression for diameter of cylinder and length of stroke, and does not apply to the actual power of the engine. It is found by multiplying the cube root of the stroke in feet by the square of the diameter in inches and dividing the product by 47. This rule is based upon the postulate established by Watt, that the speed of a piston with two feet stroke is 100 feet per minute, and that for longer strokes the speed varies as the cube roots of the length of the stroke. It is needless to say this rule is not observed in modern practice, yet the expression, nominal horse power, is like many other relics of past time still retained. The above rule does not apply to high pressure engines. For such engines Bourne has given the following rule: Multiply the square of the diameter of the cylinder in inches by the cube root of the stroke in feet, and divide by 15·6. The real power of an engine is estimated from the mean effective pressure in the cylinder—not the boiler—and the speed of the piston. Your data are insufficient to determine the horse power of your boiler. The horse power of boilers is estimated from the extent of heating surface when the grate and all other things are correctly proportioned, but with them as with engines, only actual test will positively determine it. The pipe you mention ought to be enlarged as proposed.

W. H. R., of Mass.—Pressure acts independently of the mode of application. A ton laid upon the head of a wedge would produce the same effect as though it were applied through toggles. When, however, a weight is dropped its effect increases as the square of its velocity.

J. B., of N. Y.—We recommend you to get "Appleton's Dictionary of Mechanics." Also send for descriptive catalogue to Henry Carey Baird, Philadelphia, from which you will be able to judge for yourself what works are suited to your requirements.

T. D. H., of Mass.—Ammonia, in a weak solution, may be used to cleanse the scalp, but is not recommended for the purpose. Borax in solution is better. The supposed preservation of the color of the hair by its use is a mistake.

F. B. H., of Ill.—So far as we know, nothing better than the flax seed bag has been discovered for packing the lower end of tubes in artesian wells. We have never heard of any trouble arising from the method and think you will have none.

L. G., of Mass.—Express the decimal ratio of the diameter of a circle to the circumference to which you refer, as a mixed vulgar fraction, and you will have what you ask for, if we understand your query.

A. H. S., of Sandwich Islands.—We know of no substance that in our opinion, could be used advantageously to paint the interior of sheet-iron evaporating pans for concentrating cane juice.

L. B., of Wis.—We would be glad to assist you but the data you furnish are not sufficient. The accurate solution of such a problem involves the higher mathematics.

A. H. M.—All animal and mineral oils are destructive to rubber. Linseed oil will not dissolve it. Oils should not be allowed to get on rubber belting.

T. W. J., of Pa.—For your rollers try some emery mixed in a solution of gum shellac in good alcohol.

E. B., of Mass.—The patent can be corrected by reissue.

J. M. T., of Ind.—To find the proper area for a safety valve port, when the evaporating surface is properly proportioned to the engine power, multiply the square of the diameter of the piston in inches by the speed in feet of the piston per minute, and divide the product by 375 times the pressure on the boiler per square inch. Having decided upon the length of the lever, the distance of the valve stem from the fulcrum, and the point from which the weight will be suspended, the weight necessary will be found by multiplying the area of the valve port in inches into the pressure per square inch in the boiler in pounds, and this product into the distance of the center of the valve stem from the fulcrum in inches, and dividing the product thus obtained by the distance from the fulcrum to the point of suspension of the weight in inches. The quotient will give the weight in pounds.

A. K. S., of Ohio.—The inclination of the poles of a planet to the plane of its orbit, determines its zones and also its seasons. The inclination of the earth's axis is twenty-three and one half degrees. This places the tropics the same distance each side of the equator, and the polar circles the same distance from the poles. The torrid zone is therefore forty-seven degrees wide, and the temperate zones each forty-three degrees wide. As the planets vary in their inclination of their axis to the planes of their orbits, it follows that their zones and seasons differ from those of the earth.

W. H. C., of Texas.—The teeth of a circular wood saw to be driven by foot-power, should be not larger than those of the ordinary hand crosscut. The fly-wheel ought to have a rim weighing from eighty to one hundred pounds, and it should be, for a 12-inch saw, not less than a foot in diameter. It should be placed on the saw arbor. The belt should not run on the fly-wheel, but on a special pulley, and the treadle and crank motion should be so adjusted that the foot will move through an arc of from 10 to 12 inches.

A. H. B., of Pa.—We advise you to use a battery in coating the small gray castings, of which you write, with copper. It will be all the more satisfactory in the end. The best polishing material to put in with them in the tumbler we think would be leather cuttings and sweepings. They will not need returning to the tumbler after being coppered. We recommend you to get "Byrne's Practical Metal-workers Assistant," published by Henry Carey Baird, Philadelphia.

J. H. G., of Tenn.—Don't put oil in your boiler to prevent incrustation. It will not probably do any good, and it will cause much foaming, while besides that it is a waste of heat, it is injurious to engines.

S. S. R., of Tenn.—No ammoniacal engines are, so far as we are aware, running in this country.

C. E. C., of Ohio.—The varnish for patterns is common shellac varnish. It is sometimes made black by lampblack.

Recent American and Foreign Patents.

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

MOP.—Philip Cook, Jr., Sioux City, Iowa.—This invention relates to a new and useful improvement in mops, whereby they are so arranged that they may be wrung or freed from water when in use by moving the slides connected with the handle and head of the mop.

VENTILATING HORSE COVER.—Charles P. Eager, Boston, Mass.—This invention relates to a new horse cover, which is so arranged that it will be entirely waterproof, and nevertheless permit a free escape of air from the body of the animal.

CAR COUPLING.—S. O. Campbell, Tipton, Mo.—This invention relates to a new car coupling, which is so arranged that it will be self-coupling, and retain the coupling pin ready to lock as long as the link is not inserted.

GAS STOVE.—Wm. J. Hays, New York city.—This invention has for its object to construct a gas stove, with an extender radiating surface, and with proper air channels, so that, with a comparatively small amount of heat, the air in an ordinary-sized room can be properly warmed.

SCRIBE HOOK FOR WEATHER-BOARDING.—John Nester, Portland, Oregon.—This invention relates to a new scribe hook for weather-boards, which will be generally useful and adaptable to the purposes for which it is intended and to provide an adjustable spur and marker.

RAILROAD SMOKE CONVEYER.—Lemuel Powell, Milford, Conn.—The object of this invention is to prevent the smoke and ashes, issuing from the smoke stack of a locomotive, from entering the cars of the train and from thereby preventing the proper ventilation of the cars.

DRILL FOR BORING POLYGONAL HOLES.—J. C. Broadley, Franklin, N. J.—This invention relates to a new implement for boring polygonal, oval, star-shaped, or holes of other suitable form, in metal, wood, or other material. The invention consists chiefly in arranging the pattern, which regulates the shape of the hole to be bored, on the upper part of the drill shank, and in having the bit shanks, which are pivoted to the lower part of the drill shank, held by means of springs against the inner edges of the inverted cup-shaped pattern.

ROOFING.—H. G. Noble, Selma, Ala.—This invention relates to improvements in roofing, and consists in covering roofs with sheet metal, laid on the rafters and nailed down at the edges, so as to be considerably concaved between them, the joints on the rafters being covered by inverted caps or troughs. The concave form of the sheet is designed to prevent the sheet metal from cracking, to which it is subject by expansion and contraction when laid on flat.

WASHING MACHINE.—John J. Kimball, Naperville, Ill.—This invention relates to improvements in washing machines, and consists in an improved arrangement of operating mechanism for revolving a vertically-suspended shaft with a crank at the top, and carrying within the tub a corrugated or roughened rubber, for action on the clothes. The invention also comprises an improved arrangement of the rubber, whereby it is made capable of sliding up or down on the shaft, according to the amount of clothes to be acted on.

BOLT CUTTER.—O. E. Butler and S. P. Dunham, Marshalltown, Iowa.—This invention relates to improvements in hand instruments for cutting bolts, and consists in the combination with the handles of an instrument, such as patented to the inventors, January 19, 1869, as an improved instrument for sharpening horseshoes, of a cutting pin of peculiar construction, whereby the said tool is adapted, when this cutter is applied in substitution of the cutter and jaw, as used for sharpening horseshoes, to cut off the ends of bolts with great facility.

SHAFT TUG LUGS FOR HARNESS.—T. J. Magruder, Marion, Ohio.—This invention relates to improvements in the construction and application of shaft tug lugs for harness, and consists in forming the said lugs with broad and long plates, properly curved to suit the curve of the pad, and connecting the latter to the under sides of the skirts and to the pads in a way to stiffen the skirt and to hold the stud securely from breaking loose, the said lugs being made solid with a screw nut at the end to confine the bearing straps, or hollow, with female screw threads near the base, and bolts screwing into the said female threads to secure the bearing straps and to admit of readily applying or removing the straps so that the harness may be adapted for use either as single or double harness.

HARNESS BUCKLE.—J. W. Burch, Fayette, Miss.—The object of this invention is to provide buckles for harness and other uses, with tongues constructed in the form of leather punches, whereby they may be used at any time required for punching holes.

HUMMING-WHEEL TOY.—A. F. Able, New Orleans, La.—This invention relates to improvements in humming wheel toys, having for its object to provide an improved holding apparatus for supporting and maintaining the proper tension on the cords, and designed to support the cords of two or more wheels at the same time.

COMBINED CLOTHES IRONING TABLE AND CLOTHES DRYER.—William P. Adams, Brooklyn, N. Y.—This invention relates to a new and useful improvement in an article for the laundry, and consists in an adjustable ironing table, and in combination therewith a clothes dryer.

SEED AND GRAIN STRIPPER.—J. F. King and H. A. Rice, Louisiana, Mo.—The object of this invention is to provide a seed and grain stripper, with light and strong fingers, capable of adjustment as to hight, and arranged in a way to vary the spaces between the teeth at the point of stripping the heads for straw of different sizes.

CLOTHES WRINGER.—M. M. Follett, Lake City, Minn.—This invention relates to a new apparatus for applying pressure to the rollers of a wringer with an object of obtaining equal and adjustable power without any danger to the rubber of the rollers or to the articles to be dried.

AUGER HANDLE.—James Swan, Seymour, Conn.—The object of this invention is to provide a cheap, simple, and durable handle for augurs for boring in wood, one which shall require no fitting except to make the augur enter the socket, and which shall be of such size and shape that the shanks of ordinary augurs shall enter without any fitting at all.

CANDLESTICK.—H. Zahn, San Francisco, Cal.—This invention relates to a new and useful improvement in candlesticks, and consists in the use of a thumb screw in combination with the candlestick tube, whereby the candle is kept steady, and in a perpendicular position in the stick, and firmly held without the use of springs or other attachment.

WASHING MACHINE.—J. S. Merchant, Hopedale, Ohio.—This invention relates to new and useful improvements in machines for washing clothes.

PACKING CASES FOR OIL CANS.—John McLeod Murphy, New York city.—This invention consists of an arrangement especially adapted for use with cans provided with an improved cut-off nozzle, which is the subject of an application for a patent, made by the same inventor and bearing even date herewith, which said improvement comprises the application to the ordinary vertical nozzles of a lateral spout connected to the side, and arranged to open an escape passage for the contents when the said spout is turned with the right position, which position is that best adapted for pouring from the can into another vessel, and in which the said spout projects through a slot in the side of the packing case in closing it, the said case being provided with an opening and a door for closing the same adapted for it.

WASHING MACHINE.—Edward Heim, Pittsburgh, Pa.—This invention relates to a new machine for washing clothes, and consists in the introduction of several improvements whereby the machine is adapted to thoroughly clean coarse as well as fine articles without injury to the same, and in a comparatively short time.

PADLOCK.—John S. Rankin, Ann Arbor, Mich.—The object of this invention is to provide a simple, cheap, and efficient construction and arrangement of the locking and operating parts of padlocks. The invention consists in an improved and simple compound tumbler bolt and relative arrangement thereof with the bow and bow spring.

GRAIN DRILL.—Jacob F. Gibson, Chestnut Level, Pa.—This invention relates to a seed tube pivoted in its drag bars, in such manner that it may yield to an immovable obstruction.

PROPELLING MACHINERY OF COTTON GINS.—Wm. L. May, Linwood, Ala.—This invention has for its object to effect such an arrangement of machinery as will enable a cotton gin to be run at a materially reduced expense.

SNOW PLOW.—Thomas L. Shaw, Omaha, Nebraska.—This invention relates to a snow plow, for a locomotive engine, which takes up a load of snow, is then borne back out of the cut by the engine, and dumps its load when arrived at a clear space.

BEEHIVE.—W. T. Kirkpatrick, Tamarva, Ill.—This invention relates to improvements in beehives, and consists in the combination with beehives in a peculiar way, of a moth box, and moth passage thereto, calculated to entice the moths away from the bee passage and prevent them from entering therest.

SEEDING MACHINE.—M. F. Lowth and T. J. Howe, Owatonna, Minn.—This invention relates to that class of seeders which employ a revolving cylinder, having pockets in its periphery, and placed at the bottom of the hopper which contains the seed, the function of the pockets being to receive seed, when right side up, and drop it when inverted.

UPRIGHT PIANO.—Geo. C. Maaner, New York city.—This invention consists in placing the strings of an upright piano in an inclined position in the frame instead of a perpendicular one, as heretofore, for the purpose of enabling the hammer handle to be pivoted so near the strings that when the hammer head is driven up against them, it shall necessarily fall back again by its own weight.

CARPET CLEANER.—Alexander Stevenson, New York city.—This invention relates to new and useful improvements in carpet cleaning devices, having for its object to provide a simple and efficient apparatus consisting of a yielding bed, brushing rollers, moving rollers, and a beating apparatus, whereby the carpet, being bound upon a roller, or rollers, may be moved along, from time to time, over the said yielding bed and brushing rollers, and be beaten and brushed.

COTTON CULTIVATOR.—I. W. Burch, Fayette, Miss.—This invention comprises a pair of plows suspended from the frame of a truck so as to work on both sides of the row, for "barring off" or scraping the weeds and earth away from the row; also, a pair of rotary cutters having oblique blades for throwing away from the plants, and designed, also, to work on both sides of the rows, and closer to the plants than the plows, both sets of devices having vertical vibration.

WATER WHEEL.—Geo. W. Cressman and Burt Pfleger, Barren Hill, Pa., and Nice Keely Roxborough, Pa.—This invention relates to improvements in turbine wheels designed to produce an arrangement of the gates within the bucket rim (the water being secured from below, and the wheel being made hollow, for the reception of the water, and to provide space for the said gate), in a manner calculated to relieve the wheel of pressure from the water, either in an upward or downward direction.

ATTACHING FLY AND MOSQUITO BARS TO WINDOWS, DOORS, ETC.—James Hebron, Buffalo, N. Y.—This invention relates to improvements in attaching fly and mosquito bars to window sashes or frames, doors, or other light frames to be used in combination with window frames or doors, and consists in attaching one edge of the cloth to a round or other shaped bar or rod of wood or metal, by binding thereon and sewing, passing the thread spirally around the bar or rod, and then securing the rod to the sill or frame, either on the surface thereof, or in a groove formed therein, then stretching the cloth across the window and securing it by clamping another rod down upon it by staples, either in a groove or not, and, in some cases, securing the ends in a similar way. It is also proposed to stretch the cloth over or under these rods.

ADJUSTABLE STOVEPIPE THIMBLE.—H. N. Bill, Willimantic, Conn.—This invention relates to improvements in thimbles for the passage of stovepipes through the walls into flues, and consists in providing a vertically-sliding thimble plate in a metallic frame, having a long opening, and adapted for insertion in an opening through the wall, so as to support the thin plate at or about the line of the face of the flue wall, so that the plate may be drawn up or down to vary the hight of the thimble for pipes of different vertical lengths. The invention, also, comprises an improved mode of attaching the thimbles to this plate by means of radial studs at the rim, separated from the main part of the rim and bent inward so as to pass through slots in the thimble plate around the hole, to engage behind the edge of the plate by turning the thimbles on their axes a short distance after being passed through the slots, while the main part of the rims of the said thimbles bear against the front face of the thimble plate and cover the slots when so turned.

COMBINED HAY RAKE AND TEDDER.—John C. Mills, Palmyra, N. Y.—This invention relates to a new and useful improvement in combining two important agricultural machines in one (or combining a tedder with a hay rake), and it consists in the construction of the tedder and the arrangement of the same in combination with the rake. Patented Dec. 7, 1869.

POST-HOLE AUGER.—Geo. Seeger and Chas. H. Shaffer, Clark's Hill, Ind.—This invention relates to a post-hole boring apparatus, mounted upon a wheelbarrow, and the invention consists in providing the barrow with legs that may be either turned up out of the way or adjusted at any required angle so as to keep the barrow level when on uneven ground.

SELF-DROPPER FOR REAPERS.—T. F. Lippencott, Conemaugh, Pa.—This invention has for its object to furnish an improved self-dropper for reapers, which shall be so constructed as to operate automatically, to fall and deposit the grain and to rise to receive another supply, making the gavels all of about the same size.

PLOWING MACHINE.—Albert Bondell, Philadelphia, Mo.—This invention has for its object to furnish an improved machine for preparing the ground to receive seed, and which shall be so constructed and arranged as to prepare the ground more thoroughly and put it in better condition to receive seed, and which shall be so constructed and arranged as to prepare the ground more thoroughly and put it in better condition to receive the seed than when the ordinary plows are used.

EXPANDING TRIPLE SHOVEL PLOWS.—Edward Wiard, Louisville, Ky.—This invention has for its object to furnish an improved triple shovel plow, which shall be so constructed and arranged that the shovels may be conveniently expanded and contracted, or set at any desired pitch, and, at the same time, in such a way as to be securely held in any desired position.

SEWING MACHINE.—L. W. Lathrop, Nyack, N. Y.—This invention relates to improvements in sewing machines, and consists in certain improvements in mechanism for forming the loop, and for conveying the binding thread through the same, in a manner to prevent the contact of the binding thread spool, or its carrier, with the thread of the needle, and thereby to avoid wearing the same, and to produce more easily operating parts; also, a secure, permanent, and reliable arrangement of apparatus, and calculated also to be more certain to form the stitch.

PORTABLE DERRICK.—J. R. Hammond, Sedalia, Mo.—This invention has for its object to furnish an improved derrick, simple in construction, effective in operation, and easily moved from place to place, designed especially for use in connection with the improved rake, thrasher, loader, and stacker, patented by the same inventor Nov. 30, 1869, but equally applicable for other uses.

WAGON SEAT FASTENER.—Charles Collins, Vernon Centre, N. Y.—This invention relates to improvements in means for holding detachable wagon or sleigh seats to the boxes, and consists in the application to the seat risers of hooks with spring stops, adapted for engaging staples in the boxes below the said hooks, and for being held in such engagement by the spring stops, until disengaged by the operator for removing the seats.

VELOCIPEDE.—William Volk, Buffalo, N. Y.—This invention relates to a new three-wheeled velocipede, which is so arranged that the driving wheels, although mounted on separate axles, will make equal numbers of revolutions, as long as the machine is to be kept in a straight direction, while they can be disconnected when the device is to be turned in a circle.

COFFIN HANDLES.—Clark Strong, Winsted, Conn.—This invention relates to new and useful improvements in coffin handles, and consists in the construction, arrangement, and combination of parts.

LOOM.—Lyman Stone, Nelson, N. H.—This invention relates to improvements in power looms, and has for its principal object to provide an arrangement and construction of the same, calculated to furnish looms of equal or greater efficiency than those now in use, but occupying very much less space, so as to economize materially in room, where large numbers are used on a floor, as is the case in factories; not only in respect of the space occupied by the loom itself, but also in respect of the space required for the passages or aisles between the rows of looms. The invention also comprises improved let-off and take-up mechanisms; also, an improvement in cloth beams; also, an improved picker motion, inducing a novel adjusting arrangement for the picker operating cams; also, an improved construction of treadle cams, whereby an equal capacity of throw is obtained with less size and friction, and with less power, and whereby they are guarded to prevent accidents to the attendant while cleaning when the loom is in operation.

PAPER FILE.—C. W. West, Shiloh, N. J.—This invention relates to a new paper file, which is a compound of two bars that can be tied together so that the paper will be securely clasped between them; the strings for tying them being arranged in a peculiar manner to draw them firmly together.

ROLLING BLOTTER.—C. A. Gale, Demopolis, Ala.—This invention has for its object to provide an improved rolling blotter, which shall be so constructed and arranged that the blotting pads may be conveniently removed when required, and replaced with new ones.

DUMP WAGON.—Daniel Willson, Ishpeming, Mich.—This invention has for its object to furnish a simple, strong, and convenient dump wagon, which shall be so constructed and arranged that it may be dumped when equired, by backing the team.

SEWING MACHINE SOAP HOLDER.—Mary Dewey, New Albany, Ind.—This invention relates to a new device for soaping the cloth that is fed under the needle of a sewing machine, and consists in the attachment of a tubular soap holder to the presser foot of a sewing machine.

MONKEY WRENCH.—Samuel Zarley, Niantic, Ill.—This invention has for its object to furnish an improved monkey wrench, which shall be simple in construction, strong, durable, and easily and quickly adjusted to the nut to be unscrewed.

ANIMAL TRAP.—Adam Brown, Bridgeport, Oregon.—This invention relates to improvements in traps for rats, squirrels, and other animals, and consists in the application through an opening in the side of a box, of a detachable chute extending some distance into the box, forming a passage thereinto the walls of which are armed with spring points arranged in the usual way to permit ingress and prevent egress; the floor of the passage is elevated to form a chamber below for inclosing the bait, so that it cannot all be readily devoured. The invention also comprises in connection with the above, the application to the side walls of the box, which is open at the top, of projecting sheets of metal to prevent the animals from climbing out; also, the application to the top of tilting shelves, for discharging any animals that may climb up the outside of the box, and on to the same.

SHINGLE PACKER.—Robert Taylor, West Pensaukie, Wis.—This invention relates to improvements in apparatus for pressing and holding the bunches of shingles for binding them, and consists of the arrangement on a suitable bench, having end walls for gaging the piling of the shingles at the thick ends, of a pair of vertically sliding bars, a transverse passing bar, and a set of gear wheels, shaft, and hand lever, the said wheels gearing with the vertically sliding bars, which are toothed for the purpose, in such a way that the hand lever may be used to force the transverse bar, which is connected to the upper end of the sliding bar, down upon the bundle of shingles across the center, pressing and holding the bundle till fastened.

REGISTERING APPARATUS FOR VEHICLES.—Thomas Ollis, Netherfield road, South Liverpool, England.—This invention consists in the application of apparatus similar to that used for stamping or indorsing purposes for registering or indicating the number of passengers that have traveled by an omnibus or other vehicle.

STEAM AND CALORIC ENGINES.—Alexander Hendry, Victoria, British Columbia.—This invention consists in an improved arrangement of jacketed cylinders, and jacketed furnace, constituting a water space, for generating steam by the radiating heat of the furnace, and arranged to envelope the cylinders with water to prevent injury by the gases and heat; also, an improved arrangement of chambered pistons, for keeping the same filled with water to counteract the action of the heat upon the same; also, certain improvements in chambered valves, and valve operating devices, the said chambered valves and rods being supplied with water, also to prevent injury by the heat and the gases, and the invention also comprises an arrangement of the furnace calculated to separate and distribute the gases and effect the most perfect combustion.

COTTON BASKETS.—R. S. Myers, Washington, N. C.—This invention relates to improvements in baskets for carrying cotton, especially when ginned, and consists in providing the cotton baskets of the ordinary form and construction with large holes through the center of the bottom, whereby in emptying the said baskets the operator may insert his hand and push the cotton out by one effort in a mass, whereas, by the present arrangement it must be pulled out from the mouth, which takes much more time, as in this way it only comes out in small quantities.

NOTE CASE.—Alphonzo Button, Dunkirk, N. Y.—This invention relates to improvements in note or paper cases or files for inclosing notes, papers, bills, etc., in a simple, cheap, and convenient portable package for the use of bankers and other business men. It consists of a cylindrical case of leather or other light suitable material having an opening from end to end covered by a flap, a central revolving spool, and a web of flexible substance connected to and wound on the spool, so as to be drawn out through the opening, and wound up again, on which web any suitable arrangement of narrow flaps folding over from the edges and connected by elastic bands, in a way to secure papers, notes, etc., in different and separate sections, may be arranged as now arranged in pocket books.

PUMP.—A. C. Judson, Grand Rapids, Ohio.—This invention consists in the arrangement of two dish-shaped metal disks with a diaphragm of leather between them, and another leather diaphragm above, adapted for the better support of the water in lifting; it also consists of an arrangement for operating the pump rod without lateral vibration, so that it may be packed tightly in the tube to prevent foul matter and vermin from getting in.

PANELING, MOLDING, AND CARVING MACHINE.—A. S. Gear, New Haven, Conn.—This machine performs all of the work of the well-known Variety Molding Machine, and in addition molds and carves any desired pattern of panel work, and simultaneously dovetails both mortise and tenon. The wood to be carved is fastened firmly to the bed of the machine, by movable clamps adjustable to suit any required size of wood, and the cutters are fastened to a spindle moved by a universal joint in any direction upon the bed of the machine. The cutter is guided by hand; the guide resting against the pattern. The carving can be gaged to any required depth, and made to conform to any required pattern. A fan blows away chips as fast as they are produced, leaving the work constantly in view of the operator. The same tool which cuts the mortise also cuts the tenon, the two pieces of work to be dovetailed being clamped together to the end of the table. Every kind of finish hitherto made upon the edges of lumber, and which has heretofore been mitered and glued upon the face to create a finish, is planed, beaded, and molded upon the piece itself by this machine.

WASHING BOILERS.—John P. Sherwood, Fort Edward, N. Y.—This invention has for its object to improve the construction of that class of washing boilers in which the clothes are washed by the water as it boils being projected down upon the clothes to percolate through them, and thus remove the dirt. And it consists in the construction and combination of the various parts.

TOY VELOCIPEDE.—H. C. Alexander, New York city.—This invention has for its object to furnish an improved toy velocipede.

BRICK MACHINE.—Thomas Smurdt, Davisville, Mich.—This invention has for its object to furnish an improved brick machine, which shall be strong, durable, simple in construction, and effective in operation, making the bricks rapidly and well.

TRUNKS, ETC.—Thomas B. Peddle, Newark, N. J.—This invention has for its object to improve the construction of trunks, valises, portmanteaus, pelleseirs, traveling bags, etc., so as to adapt them to receive and carry a portfolio in such a way that while carrying it safely, it may be conveniently removed when required for use.

SEED PLANTER.—David C. Woods, Waxahatchie, Texas.—This invention has for its object the construction of a seed planter, which will deposit the seeds in the requisite quantities and the proper distances apart, and which will cover and mark the hills, so that a plowman will not be at a loss where to start at the commencement of a new row, and after having passed around tree stumps or other obstructions, as he can always see the marks on the preceding rows.

WASHING MACHINE.—Joseph Baisley, Bedford, Ind.—This invention has for its object to improve the construction of the machine known as the "Egyptian Washing Machine," so as to make it more convenient in use and more effective in operation.

DENTAL IMPRESSION CUP FOR LOWER JAW.—Robert V. Jenks, Paterson, N. J.—This invention has for its object to furnish an improved impression cup for use in taking a cast of the lower jaw, to form a model of said jaw to fit the plate upon, which shall be so constructed as to enable the dentist to take a more perfect cast than is possible with impression cups constructed in the ordinary manner.

SHOW CARD SUSPENSION RING.—H. S. Griffiths, New York city.—This invention has for its object to furnish an improved suspension ring for suspending show cards, which shall be simple in construction and easily attached to the cards, and which shall, at the same time, be so formed as to take a firm hold upon the card, and not be liable to tear out.

REFRIGERATOR.—Samuel Ayres, Danville, Ky.—This invention relates to improvements in refrigerators, and consists in certain improvements in the construction and arrangement for excluding the external atmosphere, distributing the cold by means of the ice, and also the water resulting therefrom; for economizing space, and for providing convenient access to all the different parts.

CINDER AND DUST ARRESTER FOR CAR WINDOWS.—Edwin Norton, Brooklyn, N. Y.—This invention relates to improvements in apparatus for preventing the cinders and dust from being blown into the cars, when in motion, through the open windows, and consists in the application to the cars at the sides of the windows, on the exterior, by hinging thereto or by other equivalent connection, small guard plates of wood or other substance to project outwardly in a right or other suitable or preferred angle, at the side of the window, to arrest the cinder and dust moving rearward alongside of the car, and conduct it below the windows, the said guard plates being arranged so that those on the side of the windows in the direction of the movement of the train may be adjusted to the operating position while the others are folded back against the side of the car.

HOSE COUPLING.—William J. Osbourne, New York city.—This invention relates to a new and useful improvement in couplings for hose pipe, whereby the parts of a hose are united in a more perfect manner than by the ordinary hose coupling.

SAW GUIDE.—John Trunick, Muscatine, Iowa.—This invention relates to a new and useful improvement in means for guiding circular saws and keeping them to the true saw line.

SQUARE, GAGE, AND LEVEL.—Josiah Potts, Milwaukee, Wis.—This invention relates to a new and useful improvement in a tool for mechanics' use and consists in combining with a try square, a spirit level and a surface gage.

EXTENSION MUFF BLOCK.—C. F. Butterworth, Troy, N. Y.—This invention relates to a new and useful improvement in blocks for forming and stretching muffs in the process of manufacturing that article.

HAY AND GRAIN ELEVATOR.—John Dennis, Oswego, N. Y.—This invention has for its object to furnish an improved device, to be used in connection with the improved hay and grain elevator, patented by the same inventor, September 21, 1869, and numbered 95,006, for the purpose of moving the whole load of hay or grain when elevated to any desired part of the barn before unloading it.

MILLER TRAP FOR BEEHIVES.—T. L. Gray, Thomasville, Tenn.—This invention relates to a device for catching millers, or other insects, in their attempts to gain entrance into beehives.

VALVE GEAR.—Thomas E. Evans, William R. Thomas, and Joshua Hunt, Catasauqua, Pa.—This invention relates to a new and useful improvement in the mode of operating valves of steam engines, more especially designed for pumping engines, but applicable to other purposes or to valves of steam and water engines generally.

WATER WHEEL.—Henry W. McAuley, De Soto, Wis.—This invention consists in certain improvements in the form and arrangements of the buckets and in chutes for delivering the water thereto.

SELF-LOADING HAY WAGON.—James Capen, Charlton, Mass.—This invention relates to improvements in hay loaders, and consists in the application to the rear end of a hay wagon of an endless elevator case and rake, the latter having spring teeth, and arranged for adjustment by means of a hand lever at the front and suitable connecting devices; and the elevator is connected with one or both of the hind wheels of the wagon by machine chains or belts for operation.

ELEVATOR.—Francis Stein and Henry Haering, New York city.—This invention consists in the application to a pair of vertical ports or ways with toothed racks, of a carriage or platform having a shaft provided with a gear wheel at or near each end, and gearing into the toothed rack; also, having in suitable cases sliding on the posts a set of hoisting gears, gearing with the toothed racks and operated by hand cranks, and provided with ratchet wheels, holding pawls, and friction apparatus, arranged in a peculiar way for elevating the platform, holding it in any desired position or governing its descent.

FOLDING AND EXTENSION TABLE.—C. Mayer, Sullivan, Ill.—This invention relates to improvements in tables, and consists in arranging the side rails of the top of the frame, which are enlarged at the center and hinged to the posts for folding against the cross rails, when the top, which is detachably connected, is removed, for economy of space and convenience, in packing for transportation or storage; also in arranging the legs for folding up against the under edge of the cross rails; also in an improved arrangement of the side rails for extension.

MANUFACTURE OF SCOOPS.—S. Geo. Knapp, Woodhaven, N. Y.—This invention relates to an improved mode of manufacturing sheet-metal flour, grain, and other scoops, and consists in forming the bowls in one piece of metal, without seams or joints, by stamping up sheets of metal into the form of a trough, with a flange around the top, and cutting the same transversely in the center, with blanks for the bowls of two scoops, to be finished by trimming or shaping the cut ends, turning down the flange at the top, for stiffening either over wire or not and attaching the handle; the object being to produce scoops with bowls formed in one piece, and shaped at the base or in the part where the handles are connected, and to smoothly effect an economy of labor by stamping two blanks at one blow of the drop press, and also to control the metal under the action of the drop better in shaping the deep curved part of the base so as to upset and stiffen the blanks thereat.

BORING MACHINE.—E. C. Barton, Bloomsburg, Pa.—This invention relates to improvements in wood-boring machines, whereby it is designed to provide a simple and efficient arrangement of frame operating devices and feeding table for boring light articles to be presented to the machine by hand.

HASP LOCK.—E. R. Colver, New London, Conn.—This invention relates to improvements in that class of locks where the locking devices are incased within a hasp, and a hook is used in connection with the hasp for locking, or independently for fastening the door without locking.

WATER WHEELS.—W. J. Thompson, Springfield, Mo.—This invention relates to improvements in that class of horizontally running wheels, which receive the water from above or below on curved buckets taking the water at one side and discharging it at the other, and it consists of an improved arrangement of vertically oscillating gates, which, when open, form chutes for the water; it also consists of an improved means for working the gates.

PIPE COUPLING.—J. D. Ware, Savannah, Ga.—This invention relates to improvements in pipe couplings, and consists in forming a dovetailed groove across the end of one part, with an annular recess in the bottom around the bore for a packing ring, and fitting on the other part a dovetailed projection for engaging in the groove, and in arranging on one of the parts an eccentric ring to work against the head of the projection and force it tightly into the groove.

FIRE GRATES.—G. W. Everhart, Louisville, Ky.—This invention relates to improvements in that class of fire grates used for heating rooms, and consists in so arranging them as to provide a clear air space between the basket and the walls of the fire-place, both at the back and ends, for the admission of air more directly at these parts, for the better combustion of the coal and the gases arising therefrom; it also consists in providing a recess in the hearth or bottom of the fire-place under the grate, for the reception of ash pans of greater capacity than can be contained on the top of the hearth, whereby a much larger quantity of cinders and ashes may be received and retained, so that less frequent removals of the same will be required.

APPARATUS FOR SEWING SADDLERY AND OTHER LEATHER, OR STRONG MATERIALS.—Auguste Jacques Hurtu and Victor Joseph Hautin, Paris, France.—This invention relates to apparatus more especially applicable for sewing leather, saddlery, harness, and other similar work with waxed thread, and consists first, in the improved apparatus of this invention, two needles are employed, the one sewing as an awl, and the other carrying the thread; the two needles have at the same time a vertical movement and also an adjustable horizontal movement. The needles are operated alternately, so that the needle may pass the thread through the hole made just previously by the awl, before the leather has been moved forward. By this means the sewing may be carried on with great regularity, and the material be turned in any direction in order to execute small designs. Secondly, the invention relates to improvements in the arrangement of the shuttle, whereby it is caused to pass through the loops formed by the waxed thread without touching it.

PACKING AND ATOMIZING CAN.—F. L. Palmer, Sr., New York city.—This invention relates to improvements in cans for packing insect powder and other like finely powdered substances which, in use, require to be delivered in atomic jets for penetrating crevices where insects secrete themselves, and it consists in providing such cans with stoppers having nozzles, through which stoppers or nozzles the passages are temporarily closed in a way to be readily opened for use; also, in providing the cans with nozzles at or near the bottom temporarily plugged, in which tubes may be connected so that the powder may, when required for use, be readily blown out in atomic jets, whereby the said cans are made to subserve the uses of packing cans and discharging atomizing cans, with but trifling additional expense, whereas, at the present time, users of such powders are compelled to buy expensive atomizing cans, to which the powder must be transferred from the packing cans, before it can be properly used, or in the absence of such cans the powder is scattered in an ineffectual and wasteful way in or about the resorts of the insects.

REMEDY FOR RHEUMATISM.—H. H. Munroe, Louisville, Ky.—This invention relates to a new and useful improvement in a remedy for rheumatism.

NEW BOOKS AND PUBLICATIONS.

ELOCUTION AND ORATORY. Giving a Thorough Treatise on the Art of Speaking and Reading. With numerous Selections of Didactic, Humorous, and Dramatic Styles.

The author of this valuable treatise is Prof. Charles A. Wiley, of Fort Plain, N. Y. The instructions are valuable, and the selections admirable; and we can very cordially recommend it to all who would improve either in speaking or reading. Such a book is worthy a place in every family.

SPECIMENS OF FANCY TURNING EXECUTED ON THE HAND OR FOOT LATHE. With Geometric, Oval, and Eccentric Chucks, and Elliptical Cutting Frame. By an Amateur. Illustrated by Thirty exquisite Photographs. Philadelphia: Henry Carey Baird, Industrial Publisher, 406 Walnut street.

The beauty of these photographs is indescribable; they must be seen to be appreciated. The designs from which they were taken were executed by a gentleman well known to us, and who is undoubtedly one of the most expert turners on this continent. The price of the work by mail, free of postage, is $5·00.

THE NATIONAL WAGES TABLES, Showing at a glance the Amount of Wages, from Half an Hour to Sixty Hours at $1 to $37 per Week, also from One Quarter of a Day to Four Weeks, at $1 to $37 per Week. By Nelson Row, Publisher, No 149 Fulton street, New York.

This little work, which our readers will find advertised in another column, must prove an almost indispensable help in the counting rooms of establishments employing large numbers of workmen at varying rates of wages. It is one of the best things of the kind we have ever seen, and we give it earnest commendation.

DIRECTIONS FOR COOKING. By Miss Leslie. Price, by mail, $1·50.

Henry Carey Baird, of Philadelphia, has just published a new edition of Miss Leslie's "Old Standard and Renowned Cookery," being the sixtieth edition of a book which has stood the test of time and practice, and is a valuable aid in every household.

BENNY.

S. R. Wells, of this city, has published in pretty form "Benny," a Christmas ballad, by Annie Chambers Ketchum, a poem which has already appeared in the *Phrenological Journal*.

The prospectus of EVERY SATURDAY, for 1870, by Fields, Osgood & Co of Boston, promises to give us that excellent journal in a new and enlarged form, with the additional attraction of illustrations, engraved from designs by leading European artists. This publication will therefore hereafter present weekly, not only the cream of European literature, but the cream of European art. The high character of the publishers of this journal is an ample guarantee that this promise will be fulfilled in the most satisfactory manner.

LIPPINCOTT'S MAGAZINE, for January, also presents a varied and select bill of fare, containing among other things, Part XIII. of Robert Dale Owen's novel "Beyond the Breakers," "The Fairy and the Ghost," a Christmas tale, with six amusing illustrations; a curious and interesting article on "Literary Lunatics," by Wirt Sikes, "Our Capital," by William R. Hooper, and very much more excellent matter in the way of stories poems, and essays.

The "Mobile Weekly Register," the oldest Democratic paper in the South, is said to have reached a larger circulation than was ever attained by any journal South of Mason and Dixon's line. It is full of interesting varied matter, having an able agricultural department, presided over by the veteran editor and successful agriculturist, Hon. C. C. Langdon. Its general literature, poetry, stories, etc., make it highly acceptable to the ladies. The year will open with a new continued story, of deep interest, by one of the most distinguished writers of the day. The price was recently reduced to $3·00 per year, which, for so large a paper (12 pages), is extremely cheap.

WE have received the January number of "Demorest's Mirror of Fashions," a work that interests the ladies. Also "Demorest's Young America," a fine magazine for boys and girls. Both these serials are well published by Mr. and Madame Demorest of this city.

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U. S. Patent Office.

How to Obtain Letters Patent
FOR
NEW INVENTIONS.

Information about Caveats, Extensions, Interferences Designs, Trade Marks; also, Foreign Patents.

For a period of nearly twenty-five years, MUNN & CO. have occupied the position of leading Solicitors of American and European Patents, and during this extended experience of nearly a quarter of a century, they have prosecuted upward of thirty thousand applications for patents, and, in addition to this, they have made, at the Patent Office, over twenty thousand preliminary examinations into the novelty of inventions, with a careful report on the same.

The important advantages of MUNN & CO.'S Agency are, that their practice has been ten-fold greater than that of any other Agency in existence, with the additional advantage of having the assistance of the best professional skill in every department, and a Branch Office at Washington, which watches and supervises, when necessary, cases as they pass through official examination.

CONSULTATIONS AND OPINIONS FREE.

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

TO APPLY FOR A PATENT,

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

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

PRELIMINARY EXAMINATION

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

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

COST OF APPLICATIONS.

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

Without Extra Charge to the Applicant.

MUNN & CO. are determined to place within the reach of those who confide to them their business, the best facilities and the highest professional skill and experience.

The only cases of this character, in which MUNN & CO. expect an extra fee, are those wherein appeals are taken from the decision of the Examiner after a second rejection; and MUNN & CO. wish to state very distinctly, that they have but few cases which can not be settled without the necessity of an appeal; and before an appeal is taken, in any case, the applicant is fully advised of all facts and charges, and no proceedings are had without his sanction; so that all inventors who employ MUNN & CO. know in advance what their applications and patents are to cost.

MUNN & CO. make no charge for prosecuting the rejected claims of their own clients before the Examiners and when their patents are granted, the invention is noticed editorially in the SCIENTIFIC AMERICAN.

REJECTED CASES.

MUNN & CO. give very special attention to the examination and prosecution of rejected cases filed by inventors and other attorneys. In such cases a fee of $5 is required for special examination and report, and in case of probable success by further prosecution, and the papers are found tolerably well prepared, MUNN & CO. will take up the case and endeavor to get it through for a reasonable fee, to be agreed upon in advance of prosecution

CAVEATS

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

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

REISSUES.

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

DESIGNS, TRADE MARKS, AND COMPOSITIONS

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

PATENTS CAN BE EXTENDED.

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

INTERFERENCES

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

FOREIGN PATENTS.

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

A Pamphlet, containing a synopsis of the Foreign Patent Laws, sent free. Address MUNN & CO., 37 Park Row, New York.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING DEC. 14, 1869.

Reported Officially for the Scientific American

SCHEDULE OF PATENT OFFICE FEES:

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

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

For copy of Claim of any Patent issued within 30 years $1
A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from $1
upward, but usually at the price above-named.
The full Specification of any patent issued since Nov. 20, 1866, at which time the Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views. $1 25
Full information, as to price of drawings, in each case, may be had by addressing MUNN & CO.,
Patent Solicitors, No. 37 Park Row, New York.

97,751.—FLUTING MACHINE.—Henry B. Adams, New York city.

97,752.—ELASTIC WASHER FOR CARRIAGES, ETC.—George W. Billings, Chicago, Ill. Antedated December 4, 1869.

97,753.—ADJUSTABLE WAGON BOTTOM AND CHUTE.—Abraham Bitner, Jr., Lancaster, Pa.

97,754.—MODE OF TREATING CONGLOMERATES OF CAST IRON.—Thomas Schoenberger Blair, Pittsburgh, Pa.

97,755.—ANIMAL TRAP.—John Blume, Mount Pleasant, Md.

97,756.—ELECTRO-MAGNETIC ADVERTISING FRAME.—Joshua Brooks, (assignor to himself and Benjamin E. Corlew), Boston, Mass., Antedated December 1, 1869.

97,757.—LAMP EXTINGUISHER.—Wm. I. Bunker, Yankton, Dakota Territory.

97,758.—MACHINE FOR POLISHING THE EDGES OF BOOT AND SHOE SOLES.—Robert F. Burns, Albany, N. Y.

97,759.—BEEHIVE.—Peter Campbell, Carrolltown, Pa.

97,760.—RAILWAY GATE.—Peter Campbell, Carrolltown, Pa.

97,761.—REDUCING ORES.—Thomas J. Chubb, Williamsburg, N. Y. Antedated June 14, 1869.

97,762.—MACHINE FOR BENDING AND FOLDING SHEET METAL.—James B. Clark and Lucas C. Clark, Plantsville, Conn.

97,763.—SAW SWAGE.—Joseph S. Clark, New York city.

97,764.—SASH HOLDER.—Nelson C. Cole (assignor to himself and Leverett H. Marvin), Beaver Dam, Wis.

97,765.—MACHINE FOR CRIMPING AND FORMING THE FRONT OF BOOTS.—Christopher Day, Mineral Point, Wis. Antedated November 30, 1869.

97,766.—WATER HEATER FOR CULINARY PURPOSES.—Royal E. Deane, Brooklyn, N. Y.

97,767.—PUMP.—Joseph W. Douglas, Middletown, Conn., assignor to W. & B. Douglas.

97,768.—DEPURATOR.—S. C. Frink and L. D. Harlan, Indianapolis, Ind.

97,769.—SHUTTER FASTENER.—Charles B. Goodrich, Jr., Boston, Mass.

97,770.—Suspended.

97,771.—MANUFACTURE OF GLUE.—George Guenther, Chicago, Ill., assignor to himself and E. H. Heymann, New York city.

97,772.—SHADE RINGS FOR LAMP BURNERS.—Hiram W. Hayden (assignor to Holmes, Booth & Haydens), Waterbury, Conn.

97,773.—LAMP.—Hiram W. Hayden (assignor to Holmes, Booth & Haydens), Waterbury, Conn.

97,774.—FLUTING MACHINE.—Frederick Hewitt, Bloomfield, N. J.

97,775.—WAGON BRAKE.—Abram C. Jaques, Levenworth, Kansas.

97,776.—WICK-TRIMMER FOR LAMPS.—E. C. Jenkins, Jr., Worcester, Mass. Antedated December 11, 1869.

97,777.—LUMBER DRYER.—Jesse B. Johnson and Thomas E. Johnson, Indianapolis, Ind.

97,778.—TURBINE WATER WHEEL.—Julius H. Jones, Charlton, Mass.

97,779.—HYDRAULIC ENGINE.—Henry J. King and Benton L. Beebe, Middletown, N. Y.

97,780.—BREECH-LOADING REVOLVING FIREARMS.—François Alexandre Le Mat, New Orleans, La., assignor to Charles Pietroni, London, England.

97,781.—COMPOSITION FOR COVERING STEAM BOILERS AND FOR OTHER PURPOSES.—Ferdinand Leroy (Ferdinand Leroy, administrator), of Commercial Road, London, England, assignor to himself and P. A. Victor Le Lubez, England.

97,782.—WINE AND CIDER MILL.—Edward C. Lewis, Benton Harbor, Mich.

97,783.—EXCAVATOR.—John R. Lewis, Piper City, Ill.

97,784.—BAND TIGHTENER.—Francis M. Lottridge, Portland, Ind., assignor to himself, James M. Templer, and James C. Jay. Antedated December 14, 1869.

97,785.—CLOD FENDER.—Francis M. Lowden and John D. Lowden, Lawrence, Ind.

97,786.—SHAFT TUG LUG FOR HARNESS.—T. J. Magruder, Marion, Ohio.

97,787.—SHIPS OR VESSELS FOR CARRYING LIQUID CARGO.—John W. Marshall, Gilman Joslin, and Nelson Curtis, Boston, and Oliver Edwards, Brookline, Mass.

97,788.—FASTENING FOR CORSETS.—Frank W. Marston, Boston, Mass. Antedated November 30, 1869.

97,789.—CART SADDLE.—W. B. McClure, Alexandria, Va.

97,790.—POTATO DIGGER.—Philip C. McManus, Troy, N. Y. Antedated December 7, 1869.

97,791.—WASHING MACHINE.—J. S. Merchant, Hopedale, Ohio.

97,792.—RAILWAY RAIL.—James Montgomery, Croton Landing, N. Y.

97,793.—WASHING MACHINE.—Wm. Morgan, Middlebrook, Va.

97,794.—COMPOUND FOR TREATING RHEUMATISM.—H. H. Munroe, Louisville, Ky.

97,795.—SCRIBE HOOK.—John Nester, Portland, Oregon.

97,796.—ROOFING.—H. G. Noble, Selma, Ala.

97,797.—DEVICE FOR FASTENING PISTONS TO PISTON RODS.—Anthony T. Norgan, Palo Alto, Pa. Antedated December 7, 1869.

97,798.—ATTACHABLE AND REMOVABLE CALKS FOR HORSESHOES.—G. S. Norris, Baltimore, Md.

97,799.—HARNESS FOR HORSES.—John Palen, Lockport, assignor to Nathan T. Healy, Medina, N. Y.

97,800.—RAILWAY CAR BRAKE.—Thomas Payne, Detroit, Mich.

97,801.—SAW MILL.—A. Perin, Paris, France.

97,802.—SPOKE SHAVE.—Joseph A. Perley (assignor to himself and Wm. H. Perley), Lynn, Mass.

97,803.—ORGAN BELLOWS.—J. R. Perry, Wilkesbarre, Pa.

97,804.—APPARATUS FOR SETTING CAPS IN METALLIC CARTRIDGES.—William C. Pickeregill (assignor to Providence Tool Company), Providence, R. I.

97,805.—CAP-EXTRACTOR FOR CARTRIDGES.—William C. Pickeregill (assignor to Providence Tool Company), Providence, R. I.

97,806.—APPARATUS FOR SETTING BULLETS IN CARTRIDGES.—William C. Pickeregill (assignor to Providence Tool Company), Providence, R. I.

97,807.—SMOKE AND SPARK CONVEYER FOR RAILROAD TRAINS.—Lemuel Powell, Milford, Conn.

97,808.—CONVERTIBLE END-BOARD AND PLATFORM FOR WAGONS.—Thomas T. Powell and John F. Burroughs, Lawn Ridge, Ill.

97,809.—MACHINE FOR MAKING FLY NETS.—A. Prutzmann, Canton, Ohio.

97,810.—BURGLAR PROOF SAFE.—George W. Putnam, Boston, Mass. Antedated November 27, 1869.

97,811.—HORSESHOE BEVELER.—Ephraim Quinby, Comstock, Mich. Antedated Dec. 1, 1869.

97,812.—PADLOCK.—J. S. Rankin, Ann Arbor, Mich.

97,813.—SHIP WINDLASS.—Elisha R. Ritch, South Boston, Mass.

97,814.—REIN-GUIDE FOR HARNESS.—Lemuel Richmond, Derby, Vt.

97,815.—CHURN.—Stacy Risler, Locktown, N. J.

97,816.—PAPER-CUTTING MACHINE.—T. C. Robinson, Boston, Mass., assignor to G. H. Sandborn, New York city.

97,817.—STONE-POLISHING MACHINE.—Henry Schofield (assignor to himself and C. D. Clarke), Philadelphia.

97,818.—TWIST DRILL.—Socrates Schoffield, Providence, R. I.

97,819.—SMOKE-CONSUMING FIRE BOXES.—G. H. Smith, Galesburg, Ill.

97,820.—CHURN.—Samuel Smith, Yohogany, Pa.

97,821.—REPEATING FIRE-ARM.—William Sidney Smoot, Washington, D. C.

97,822.—PNEUMATIC ENGINE.—Robert Spear, New Haven, Conn.

97,823.—MACHINE FOR POLISHING WOOD.—W. F. Spear, Worcester, Mass.

97,824.—CARPET BEATER AND CLEANER.—Alexander Stevenson, New York City.

97,825.—MODE OF FORMING "BURNER CONES" OF LAMPS.—C. St. John and C. E. Marston, Charlestown, Mass.

97,826.—LOOM.—Lyman Stone, Nelson, N. H.

97,827.—COFFIN HANDLE.—Clark Strong, Winsted, Conn.

97,828.—PLOW.—Z. W. Sturtevant, Dunstable, Mass.

97,829.—SAFE.—T. J. Sullivan, Albany, N. Y.

97,830.—AUGER HANDLE.—James Swan, Seymour, Conn.

97,831.—STOVE SHELF.—G. L. Swett, Leominster, Mass.

97,832.—RAILWAY RAIL.—J. F. Tallant, Burlington, Iowa.

97,833.—TOOL FOR CABINET MAKERS.—R. W. Tanner (assignor to himself and Samuel J. Davenport), Albany, N. Y. Antedated Dec. 11, 1869.

97,834.—TICKET BOX FOR RAILROAD PASSENGER TRAINS.—Asahel Todd, Jr., Pultneyville, N. Y.

97,835.—HYDRANT.—T. Van Kannel, Cincinnati, Ohio.

97,836.—RETICULE WICKER BASKET.—Joseph Venet, New York city.

97,837.—VELOCIPEDE.—Wm. Volk, Buffalo, N. Y.

97,838.—SILVERING GLASS, AND PROTECTING THE SAME.—H. B. Walker, New York city.

97,839.—STEELYARD.—P. H. Walker (assignor to himself and J. L. Trowbridge), Boston, Mass.

97,840.—BARREL.—D. H. Waters, Grand Rapids, Mich.

97,841.—BARREL.—D. H. Waters, Grand Rapids, Mich.

97,842.—CAR SPRING.—Cyrenus Wheeler, Jr., Auburn, N. Y.

97,843.—METALLIC CARTRIDGE.—Rollin White, Lowell, Mass.

97,844.—APPARATUS FOR PURIFYING IRON.—S. M. Wickersham, Allegheny, Pa.

97,845.—MAKING PIANO LEGS.—Henry Willoghs, New York city.

97,846.—DUMPING WAGON.—Daniel Willson, Ishpeming, Mich.

97,847.—HARVESTER KNIFE GRINDER.—Edwin L. Yancey, Batavia, N. Y.

97,848.—CANDLESTICK.—H. Zahn, San Francisco, Cal.

97,849.—MONKEY WRENCH.—Samuel Zarley, Niantic, Ill.

97,850.—HUMMING-WHEEL TOY.—A. F. Able, New Orleans, La., assignor to himself and A. D. Finley.

97,851.—IRONING TABLE AND CLOTHES DRYER.—W. P. Adams, Brooklyn, N. Y.

97,852.—SAWSET.—Daniel Agnew, Vincennes, Ind.

97,853.—MODE OF PROTECTING THE ENDS OF VULCANIZED RUBBER HOSE.—H. A. Alden, Matteawan, N. Y.

97,854.—LAMP BURNER.—Joseph Bell Alexander, Washington, D. C.

97,855.—GATE FOR SWINGING BRIDGES.—Lauritz Anderson, Chicago, Ill.

97,856.—BUTTONHOLING ATTACHMENT FOR SEWING MACHINES.—S. J. Baird, Staunton, Va.

97,857.—OIL BLACKING FOR LEATHER.—J. L. Baumer, Columbus, Ohio.

97,858.—HEAD BLOCK FOR SAW MILLS.—C. B. Beall, Hamilton, Ohio.

97,859.—CHURN DASHER.—A. Belt, Newton, Iowa.

97,860.—COMBINED SHOVEL AND SIFTER.—F. S. Bidwell, Mystic Bridge, Conn.

97,861.—STOVEPIPE THIMBLE.—Horatio N. Bill, Willimantic, Conn.

97,862.—DIVING BELL.—H. C. Billings, Brooklyn, N. Y.

97,863.—HOE.—Lewis Billings, Gallipolis, Ohio.

97,864.—STEAM GENERATOR.—Edward Bourne, Pittsburgh, Pa.

97,865.—STEAM GENERATOR.—Edward Bourne, Pittsburgh, Pa.

97,866.—RIVETS AND WASHERS.—Edward Bourne, Pittsburgh, Pa.

97,867.—WAGON BRAKE.—William H. Bradt, New Scotland, N. Y.

97,868.—DRILL FOR BORING POLYGONAL HOLES.—J. C. Broadley (assignor to himself and Jas. Stout), Franklin, N. J.

97,869.—WATER WHEEL.—J. D. Bryson and J. H. Hartsuff, Newcastle, Pa.

97,870.—COTTON CULTIVATOR.—I. W. Burch, Fayette, Miss.

97,871.—BUCKLE.—I. W. Burch, Fayette, Miss.

97,872.—CLAMP.—Mathias Burkhardt, Cincinnati, Ohio.

97,873.—DINNER PAIL.—N. C. Burnap, Argusville, N. Y.

97,874.—BOLT CUTTER.—O. E. Butler and S. P. Dunham, Marshalltown, Iowa.

97,875.—PADLOCK.—S. G. Cabell (assignor to F. B. Cabell), Quincy, Ill.

97,876.—RAILWAY CAR COUPLING.—S. O. Campbell, Tipton, Mo.

97,877.—WRENCH AND SAW SET COMBINED.—G. J. Capewell, West Cheshire, Conn.

97,878.—MACHINE FOR DRESSING MILLSTONES.—J. S. Carr, Alliance, Ohio.

97,879.—CAR TANK COVER.—L. C. Cattell, Cleveland, Ohio.

97,880.—MANUFACTURE OF RUBBER SPONGE.—Edwin Chesterman, Tremont, N. Y. Antedated Nov. 17, 1869.

97,881.—VALVE FOR WATER ENGINES.—Abraham Coates (assignor for one half, to James Martin Hunt), Watertown, N. Y.

97,882.—SHUTTLE FOR LOOMS.—John H. Coburn, Lowell, Mass.

97,883.—WAGON SEAT FASTENING.—Charles Collins, Vernon Centre, N. Y.

97,884.—HARVESTER.—Robert Conarroe (assignor to himself, H. Young, and A. C. Stauffer) Camden, Ohio.

97,885.—MOP.—Philip Cook, Jr., Sioux City, Iowa. Antedated Dec. 10, 1869.

97,886.—RAILWAY SWITCH.—J. B. Cox, James O'Connor, and Michael Cahalan, Columbus, Ga.

97,887.—SLIDE VALVE.—Isaac Craft (assignor to himself, T. J. Williams, and C. M. Greve), Cincinnati, Ohio.

97,888.—WATER WHEEL.—G. W. Cressman, and Bert Pfleger, Barren Hill, and Nice Keely, Roxborough, Pa.

97,889.—TREATING WHISKY AND OTHER ALCOHOLIC SPIRITS.—J. C. Crossman and Obadiah Marland, Boston, Mass., assignors to themselves and A. E. Tilton, New York city.

97,890.—DISINTEGRATING MILL.—G. B. Davids (assignor to himself and Talbot Denmead), Baltimore, Md.

97,891.—MACHINE FOR COMPOSING AND DISTRIBUTING TYPE.—Isidore Delcambre, Paris, France.

97,892.—SOAP-HOLDING ATTACHMENT FOR SEWING MACHINES.—Mary Dewey, New Albany, Ind. Antedated Dec. 10, 1869.

97,893.—CONCRETE FOR PAVING AND FOR OTHER PURPOSES.—J. E. Dotch, Washington, D. C. Antedated Oct. 14, 1869.

97,894.—APPARATUS FOR EXTINGUISHING FIRES BY MEANS OF CHEMICAL AGENTS.—J. W. Douglas (assignor to W. Douglas and B. Douglas), Middletown, Conn.

97,895.—LOOM TEMPLE.—Warren W. Dutcher (assignor to Dutcher Temple Co.), Hopedale, Mass.

97,896.—VENTILATING HORSE COVER.—C. P. Eager (assignor to P. B. Eager), Boston, Mass.

97,897.—MANUFACTURE OF IRON AND STEEL.—Wm. Ennis, Philadelphia, Pa.

97,898.—SEEDING MACHINE.—James Finlayson, Albany, Oregon.

97,899.—CLOTHES WRINGER.—M. M. Follett, Lake City, Minn.

97,900.—BLOTTING PAD.—C. A. Gale, Demopolis, Ala.

97,901.—MANUFACTURE OF NUTS.—J. W. Gaskill and Jas. Christie, Phillipsburg, N. J.
97,902.—FIRE PLACE.—E. H. Gibbs, New York city.
97,903.—GRAIN DRILL.—Jacob F. Gibson, Chestnut Level, Pa.
97,904.—CARTRIDGE MACHINE.—Jabez H. Gill, Philadelphia, Pa.
97,905.—FIELD ROLLER.—Robert Glover, Tonawanda, N. Y.
97,906.—CORN PLANTER.—Henry Gortner, Nashport, Ohio.
97,907.—HINGE.—D. R. Gould (assignor to himself and O. H. Green), Chestertown, N. Y.
97,908.—RADIAL DRILLING MACHINE.—G. A. Gray, Jr., Cincinnati, Ohio.
97,909.—BUCKLE.—F. F. Greenwood, Horsney, England. Patented in England, Sept. 16, 1869.
97,910.—TOOL FOR CARVING WOOD.—L. L. Gunther, Chicago, Ill.
97,911.—PORTABLE DERRICK.—James R. Hammond, Sedalia, Mo.
97,912.—COAL STOVE.—B. R. Hawley, Normal, Ill.
97,913.—GAS STOVE.—W. J. Hays, New York city.
97,914.—CONDENSING COLUMN FOR STILLS.—A. Hazzard, St. Louis, Mo.
97,915.—STOVEPIPE DRUM.—W. Hearle, Beamsville, Canada, assignor to C. L. Spencer, trustee, assignor to Wm. Hearle and A. B. Johnson.
97,916.—MEANS FOR ATTACHING MUSQUITO BARS TO WINDOW BLINDS, DOORS, ETC.—James Hebron, Buffalo, N. Y.
97,917.—WASHING MACHINE.—Edward Heim, Pittsburgh, Pa.
97,918.—RAILWAY CAR COUPLING.—Noah Hill, Leavenworth City, Kansas.
97,919.—FIFTH WHEEL FOR CARRIAGES.—Richard Hoadly, Toulon, Ill.
97,920.—FRUIT JAR.—D. I. Holcomb, Henry county, Iowa.
97,921.—CORN CULTIVATOR.—J. C. Holmes, Wyoming, Pa.
97,922.—FRUIT JAR.—Thos. Houghton and H. H. Houghton, Philadelphia, Pa.
97,923.—CONDENSER.—John Houpt, Springtown, Pa.
97,924.—PROPELLING APPARATUS. — Robert Hunter, New York city.
97,925.—HEDGE TRIMMER.—A. H. Hussey, Mount Pleasant, Ohio.
97,926.—FENCE.—Daniel Johnson, Cranberry, Ohio.
97,927.—SAW SET.—J. M. Jones, Commerce, Mo.
97,928.—RUBBER SPRING FOR USE IN SHIPS, CARS, AND FOR OTHER PURPOSES.—J. A. Joyner, New York city.
97,929.—CARPET STRETCHER AND TACK HOLDER.—F. W. Judd, New Britain, assignor to himself and E. M. Judd, New Haven, Conn. Antedated Dec. 9, 1869.
97,930.—PUBLIC URINAL.—William M. Kepler, Cincinnati, Ohio.
97,931.—WASHING MACHINE.—John J. Kimball, Naperville, Ill.
97,932.—GRAIN STRIPPER.—J. O. King and Hiram A. Rice, Louisiana, Mo.
97,933.—BEEHIVE.—W. T. Kirkpatrick, Tamarva, Ill.
97,934.—LATCH.—G. W. Large, Yellow Springs, Ohio.
97,935.—SEWING MACHINE.—L. W. Lathrop, Nyack, N. Y.
97,936.—MANUFACTURE OF DRY WHITE LEAD.—G. T. Lewis, Philadelphia, and E. O. Bartlett, Birmingham, Pa.
77,937.—CHURN.—F. A. Lindal, Stockton, N. Y.
97,938.—SEEDING MACHINE.—M. F. Lowth and T. J. Howe, Owatonna, Minn.
97,939.—FERTILIZER OR GUANO.—Orazio Lugo, Baltimore, Md.
97,940.—FURNACE FOR THE MANUFACTURE OF ULTRAMARINE.—H. A. Ludwig, New York city.
97,941.—MANUFACTURE OF ULTRAMARINE.—H. A. Ludwig, New York city.
97,942.—WARDROBE.—A. G. Mack (assignor to himself and George Shelton), Rochester, N. Y.
97,943.—UPRIGHT PIANO.—G. C. Manner, New York city.
97,944.—BOOT CRIMPER. — F. P. Marcy, Keokuk, Iowa. Antedated Dec. 4, 1869.
97,945.—MECHANISM FOR DRIVING COTTON GINS.—Wm. L. May, Linwood, Ala., assignor to W. J. May.
97,946.—MEAT CHOPPER.—Arthur McCarter, Salem, Ohio.
97,947.—GATE.—F. H. McGeorge, Corning, N. Y.
97,948.—CONSTRUCTION OF BUILDINGS.—Alexander McPherson, Santa Cruz, Cal.
97,949.—GALVANIC BATTERY.—J. R. McPherson, Beloit, Wis.
97,950.—GAGE FOR CIRCULAR SAW TABLE.—R. N. Meriam, Worcester, Mass.
97,951.—SEWING MACHINE FOR SEWING BOOTS AND SHOES.—Daniel Mills, New York city, assignor to Charles Goodyear, Jr., New Rochelle, N. Y.
97,952.—PROPELLER.—S. B. Morey, San Francisco, Cal.
97,953.—CAST-STEEL TUBE OR INGOT.—C. B. Morse, Rhinebeck, N. Y. Antedated Dec. 8, 1869.
97,954.—PACKING CASE FOR OIL CANS.—J. McLeod Murphy (assignor to J. L. Graham), New York city.
97,955.—TIGHTENING AND GUIDING BELT.—C. K. Myers (assignor, for one half, to Peter Weyhrich), Pekin, Ill.
97,956.—FIRE-PLACE FUEL MAGAZINE STOVE.—J. J. Myers, (assignor to B. C. Bibb), Baltimore, Md.
97,957.—CORN PLANTER.—J. B. Parker, Knob Noster, Mo.
97,958.—SAWING MACHINE.—Archibald Perry (assignor to himself and Jacob Fisher), Richland, Ind. Antedated Dec. 3, 1869.
97,959.—MECHANICAL MOVEMENT.—Osgood Plummer, Worcester, Mass.
97,960.—TEACHERS' REGISTER.—W. S. Poulson and W. N. Poulson, Cadiz, Ohio.
97,961.—SIDE-SADDLE TREE.—J. H. Preston, Jefferson City, Mo.
97,962.—PROCESS OF PREPARING PLANTS TO BE USED IN CIGARS, SNUFF, ETC.—P. V. Ramel, Paris, France.
97,963.—PIPE COUPLING.—L. W. Reed, East Cambridge, Mass.
97,964.—FRUIT JAR.—S. B. Rowley, Philadelphia, Pa.
97,965.—CLOTHES WRINGER.—E. P. Russell, Manlius, N. Y.
97,966.—COAL STOVE.—Watson Sanford, New York city. Antedated Sept. 3, 1869.
97,967.—BASE BURNING STOVE.—Watson Sanford, New York city. Antedated Sept. 15, 1869.
97,968.—JOURNAL BOX.—A. H. Sassaman, Scranton, Pa.
97,969.—HOOK AND LADDER TRUCK.—Jacob Schmidlapp, New York city.
97,970.—Suspended.
97,971.—SNOW PLOW FOR RAILWAYS.—T. L. Shaw, Omaha, Nebraska.
97,972.—COMPOSITION METAL FOR TUBING, PIPES, AND SHEETING.—W. A. Shaw (assignor to Peter Naylor), New York city.
97,973.—PRUNING SHEARS.—J. H. Shehan, Lima, Ind., assignor to himself, G. W. Edgecomb, and T. J. Bull.
97,974.—PRICE-CALCULATING DEVICE.—Albert Sinclair, West Waterville, Me.
97,975.—CONSTRUCTION OF BRIDGES.—C. S. Smith, C. H. Latrobe, and F. H. Smith, Baltimore, Md.
97,976.—CHURN.—Simon Smith, Clarksburg, N. Y.
97,977.—COTTON BALE TIES.—W. M. Smith, Augusta, Ga.
97,978.—GRAIN MEASURING ATTACHMENT TO THRASHING MACHINES.—W. A. Workman, Fairfield, Iowa.
97,979.—SCAFFOLD FOR GATHERING FRUIT, AND FOR OTHER PURPOSES.—A. J. Wright, Cleveland, Ohio.
97,980.—REVOLVING CUPBOARD.—Wendell Wright, Bloomfield, N. J.
97,981.—BARRACK OR HOSPITAL BEDSTEAD.—Chas. S. Snead, Louisville, Ky.
97,982.—PIANO FORTE.—C. F. Th. Steinway, New York city.
97,983.—WATER-PROOFING FABRICS.—John Stenhouse, 17 Rodney street, Pentonville, London, England, assignor to Arthur Cheney and Alonzo Milliken, Boston, Mass. Patented in England, Jan. 8, 1862.
97,984.—RAILS FOR ORNAMENTAL FENCE.—Elizabeth Mary Stigale, Philadelphia, Pa.
97,985.—LATCH FOR DOUBLE DOORS.—J. W. Still, San Francisco, Cal.
97,986.—LATHE FASTENING.—J. G. Stowe, Providence, R. I.
97,987.—VINEGAR APPARATUS.—A. D. Strong, Ashtabula, Ohio.
97,988.—WRENCH.—G. C. Taft, Worcester, Mass.
97,989.—BARK MILL.—William Tansley, Salisbury Centre, assignor to "Starbuck Brothers," Troy, N. Y.
97,990.—CLEVIS FOR PLOWS.—J. H. Tarpley, Greensborough, N. C.
97,991.—HANDLE FOR KNIVES.—A. L. Taylor, Springfield, Vt.
97,992.—MAKING BRICKS, TILES, ETC.—Daniel Thackara, Woodbury, N. J.
97,993.—FOOT AND KNEELING STOOL FOR CHURCHES.—J. P. Tibbits, New York city.
97,994.—RAILWAY CARRIAGE WHEEL AND AXLE.—C. D. Tisdale (assignor to himself and J. H. Clepp), Boston, Mass.
97,995.—SUSPENDERS.—C. Van Hoesen, Catskill, assignor to himself, J. H. Burtis, Brooklyn, and M. W. Staples, Catskill, N. Y.
97,996—BUTTONHOLE CUTTER.—F. H. Walker, Boston, Mass.
97,997.—BED BOTTOM.—C. E. Walkes, Elyria, Ohio.
97,998.—STILL FOR OIL, ETC.—John Warner, Flushing, N. Y.
97,999.—PAPER FILE.—C. W. West, Shiloh, assignor to himself and O. A. Douglas, Bridgeton, N. J.
98,000.—HOISTING APPARATUS.—T. A. Weston, Ridgewood, N. J., assignor to William Sellers and John Sellers, Jr., Philadelphia, Pa. Patented in England, Aug. 28, 1868.
98,001.—COKE WAGON.—Corydon Wheat and Alfred Catchpole, Geneva, N. Y.
98,002.—MACHINE FOR MAKING CARRIAGE CLIPS.—Darius Wilcox and R. McChesney (assignors to D. M. Bassett and Darius Wilcox), Derby, Conn.
98,003.—DOOR FOR FIRE-PLACE STOVE.—W. E. Wood, Baltimore, Md.
98,004.—INTERCHANGEABLE BOOT AND SHOE HEEL.—J. C. Woodhead, Pittsburgh, Pa.
98,005.—CAMEL FOR RAISING VESSELS.—Samuel Woolston, Vincentown, N. J.

REISSUES.

60,192.—STEAM ENGINE GOVERNOR.—Dated Dec. 4, 1866; reissue 3,759.—R. K. Huntoon, for himself and J. A. Lynch, assignee, by mesne assignments, of R. K. Huntoon, Boston, Mass.
72,114.—VARIABLE CRANK FOR BORING MACHINES.—Dated Dec. 10, 1867; reissue 3,760.—Theodore Mace, New York city, assignee of G. C. Taft.
68,782.—SLIDE FOR EXTENSION TABLE.—Dated Sept. 10, 1867; reissue 3,761.—H. Olds, Syracuse, N. Y.
89,167.—NOZZLE FOR CANS.—Dated April 20, 1869; reissue 3,762.—Charles Pratt, New York city.
84,766.—HORSE POWER.—Dated Dec. 8, 1868; reissue 3,763. —Cyrus Roberts and J. A. Throp, Three Rivers, Mich.
44,117.—COMPOSITION FOR CONCRETE PAVEMENTS.—Dated Sept. 6, 1864; reissue 3,764.—Edward Seeley, Scranton, Pa.
49,207.—CARPET BAG LOCK.—Dated Aug. 1, 1865; reissue 3,765.—Bernard Steinmetz, Paris, France.
91,800.—STEAM GENERATOR FURNACES.—Dated June 22, 1866; reissue 3,766.—A. J. Warren and D. W. Wilson, assignors to themselves and Noah Shaw, West Eau Claire, Wis., and U. M. Stone, Augusta, Wis.

DESIGNS.

3,784.—STOVE.—D. P. Beckwith, Dowagiac, Mich.
3,785.—PLOW CLEVIS.—Geo. Johnson, administrator of the estate of G. P. Darrow, deceased, (assignor to J. L. Hayen & Co.), Cincinnati, Ohio.
3,786.—STOVE.—S. S. Jewett and F. H. Root, Buffalo, N. Y.
3,787.—MASONIC ORNAMENT.—Daniel Keefer, Attica, Ind.
3,788.—PAPER COLLAR.—W. F. Mosely, Brooklyn, N. Y.
3,789.—FLOWER STAND.—C. H. Waters, Groton, Mass.

EXTENSIONS.

CLOTH-STRETCHING ROLLERS.—Seth Simmons, of Providence-R. I., administrator of Nathan Simmons, deceased.—Letters Patent No. 13,888; dated Dec. 4, 1855.
BUCKLE.—S. E. Booth, of Orange, Conn., administrator of S. S. Hartshorn, deceased.—Letters Patent No. 13,907; dated Dec. 11, 1855.

PATENTS ISSUED FOR THE WEEK ENDING DEC. 21, 1869.

98,006.—MANUFACTURE OF THE METALLIC PARTS OF FIRE ARMS.—Isaac Adams, Jr., Boston, Mass, assignor to United Nickel Company.
98,007.—TOY VELOCIPEDE.—H. C. Alexander, New York city.
98,008.—MACHINE FOR MAKING WROUGHT NAILS.—Daniel Armstrong, Chicago, Ill.
98,009.—WASH BOILER.—James Armstrong, Bucyrus, Ohio.
98,010.—REFRIGERATOR.—Samuel Ayers, Danville, Ky.
98,011.—HYDRANT.—G. C. Bailey, Pittsburgh, Pa.
98,012.—WASHING MACHINE.—Joseph Balsley, Bedford, Ind.
98,013.—SAW MILL.—A. P. Barlow, Kalamazoo, Mich.
98,014.—BORING MACHINE.—E. C. Barton, Bloomsburg, Pa.
98,015.—PADLOCK.—Thomas Bernhard, Hartford, Conn.
98,016.—FENCE.—Inmon Blackaby, Civer, Ill.
98,017.—PLOWING MACHINE.—Albert Bondeli, Philadelphia, Mo.
98,018.—CARRIAGE BRAKE.—A. S. Boyer, Bernville, Pa.
98,019.—LOW-WATER INDICATOR.—William A. Bradford, Cincinnati, Ohio, assignor to C. G. Pease, trustee for Malone Safety-Valve Company.
98,020.—MACHINE FOR MAKING FERRULES.—Robert Briggs, Philadelphia, Pa.
98,021.—STEAM GENERATOR.—M. S. Bringier, Ascension parish, La.
98,022.—FIRE AND WATER-PROOF PAINT.—Theodor Brinkmann, Greeneville, Tenn.
98,023.—ANIMAL TRAP.—Adam Brown, Bridgeport, Oregon.
98,024.—HAIR-SPRING ADJUSTMENT FOR WATCHES.—Augustus Brown, Dryden, N. Y.
98,025.—EXPANDING MUFF BLOCK.—C. F. Butterworth, Troy, N. Y.
98,026.—SAP SPOUT.—G. L. Cady, Lowell, Mass.
98,027.—HAY LOADER.—James Capen, Charlton, Mass.
98,028.—GRINDING MACHINE.—George T. Chattaway, Brooklyn, E. D., and John Dickinson, New York city, assignors to G. S. Chattaway.
98,029.—COOPERS' TOOL.—John Christy, Clyde, Ohio.
98,030.—NAIL AND PEG DRIVER.—F. O. Claflin, New York city. Antedated Dec. 18, 1869.
98,031.—SELF-CANCELING POSTAL AND REVENUE STAMP.—S. M. Clark, Washington, D. C.
98,032.—CAPSTAN WINDLASS.—D. N. B. Coffin, Jr., Newton, assignor to himself and I. D. Spaulding, Boston, Mass.
98,033.—METAL-CLAD ARTIFICIAL STONE.—François Coignet, Paris, France.
98,034.—MAKING ARTIFICIAL STONE AND CONCRETE.—François Coignet, Paris, France.
98,035.—MALAXATOR FOR THE PREPARATION OF PLASTIC MATERIALS FOR ARTIFICIAL STONE, AND FOR OTHER PURPOSES.—François Coignet, Paris, France.
98,036.—HASP LOCK.—E. R. Colver, New London, Conn.
98,037.—DEVICE FOR CONVEYING SAWDUST FROM SAWS.—W. S. Colwell, Pittsburg, Pa.
98,038.—COMBINATION OF PIANOFORTE AND CABINET.—Edward Cotter, Boston, Mass.
98,039.—CURTAIN FIXTURE.—J. P. Crawford, Carmichaels, Pa.
98,040.—VISE. — Edwin Crawley and T. L. Baylies, Richmond, Ind.
98,041.—CLOD FENDER.—W. L. Dearth and G. P. Rondebush, Jefferson, Ind.
98,042.—HAY AND GRAIN ELEVATOR.—John Dennis, Oswego, N. Y.
98,043.—DYNAMOMETER.—J. Emerson, Lowell, Mass.
98,044.—DUMPING WAGON.—John Esch, Milwaukee, Wis.
98,045.—FIREPLACE GRATE. — George W. Everhart, Louisville, Ky.
98,046.—VAPORIZING PETROLEUM, ETC.—H. R. Foote, Boston, Mass.
98,047.—TOY GUN.—C. T. Ford and E. Trask, Salem, Mass. Antedated Dec. 7, 1869.
98,048.—SHIFTING RAIL FOR BUGGY.—Harlow French and Robert Meyer, Buffalo, N. Y.
98,049.—RAILWAY-CAR TRUCK.—Perry G. Gardiner, New York city.
98,050.—CAR SPRING.—P. G. Gardiner, New York city.
98,051.—RAILWAY SWITCH.—M. J. Gaskill, Wm. Yost, and John Ferris, Pleasant Plain, ohio.
98,052.—MILLER TRAP FOR BEEHIVES.—T. L. Gray, Thomasville, Tenn.
98,053.—STUFFING BOX.—Chas. Green, Philadelphia, Pa.
98,054.—SUSPENSION CLIP.—H. S. Griffiths and J. C. Cary, New York city.
98,055.—TOY SAFE OR BANK.—John Hall, Watertown, Mass. Antedated Dec. 7, 1869.
98,056.—LOUNGE AND BEDSTEAD.—A. R. Harper and C. B. Dake, Robart, Ind.
98,057.—MACHINE FOR UPSETTING TIRE.—A. S. Hart, San Francisco, Cal.
98,058.—RAILWAY CAR COUPLING.—A. S. Hart, San Francisco, Cal.
98,059.—STOVE GRATE.—David Hathaway, Troy, N. Y.
98,060.—HOLDING DEVICE FOR LAMP CHIMNEYS.—John F Hechtle, Waterbury, Conn.
98,061.—STEAM AND CALORIC ENGINE.—Alexander Hendry, Victoria, British Columbia.
98,062.—REIN HOLDER.—Davis Hurd, Lockport, N. Y.
98,063.—SPRING SEAT FOR WAGONS.—A. L. Hurtt, Monticello, Ind.
98,064.—SEWING MACHINE.—A. J. Hurtu and V. J. Hautin, Paris, France.
98,065.—ROOFING COMPOUND.—C. B. Hutchins, Ann Arbor, Mich.
98,066.—DENTAL IMPRESSION CUP.—R. V. Jenks, Paterson, N. J.
98,067.—PUMP.—A. C. Judson (assignor to himself and E. O. Judson), Grand Rapids, Mich.
98,068.—LEATHER-SPLITTING MACHINE.—Charles Keniston, Somerville, Mass.
98,069.—SPRING BED BOTTOM.—E. S. Kimball, Springfield, Mass.
98,070.—WHIP SOCKET.—C. P. Kimball, Portland, Me.
98,071.—FLOOD GATE.—A. L. King, Farmersville, Ohio.
98,072.—MANUFACTURE OF SCOOPS.—J. Geo. Knapp, Woodhaven, N. Y., assignor to the Lalance & Grosjean Manufacturing Co., New York city.
98,073.—DRIVE WELL TUBES.—D. R. Knight, Akron, Ohio.
98,074.—DEVICE FOR PREVENTING LEAKAGE ABOUT CHIMNEYS.—Abraham Lang, Buffalo, N. Y.
98,075.—HARVESTER DROPPER.—T. F. Lippencott, Conemaugh, Pa.
98,076.—CAR COUPLING.—Joseph Long, Mechanicsburg, Pa.
98,077.—HEAD REST.—C. B. Loveless, Syracuse, N. Y.
98,078.—BURGLAR ALARM. — Moses Lunt, Cambridgeport, Mass.
98,079.—FOLDING AND EXTENSION TABLE.—G. Mayer, Sullivan, Ill.
98,080.—LANTERN.—I. C. Mayo, Gloucester, Mass.
98,081.—WATER WHEEL.—H. W. McAuley, De Soto, Wis.
98,082.—LET-OFF MECHANISM FOR LOOMS.—Ephriam McDaniel, Lowell, Mass.
98,083.—LAMP.—J. K. Mentzer, New Holland, Pa.
98,084.—SURVEYOR'S MARK.—C. C. P. Meyer, Yankton, Dakota Territory.
98,085.—TAILOR'S CRAYON SHARPENER.—R. R. Miles, Wabash, Ind.
98,086.—COOKING STOVE.—J. H. Mitchell and T. S. Mitchell, Pittsburgh, Pa.
98,087.—PRINTING PRESS.—Charles Montague (assignor to C. C. Child), Boston, Mass.
98,088.—PRINTING PRESS.—Chas. Montague (assignor to C. C. Child), Boston, Mass.
98,089.—STEAM GENERATOR.—Jas. Montgomery, Sing Sing, N. Y. Antedated Dec. 17, 1869.
98,090.—HARVESTER DROPPER.—Ephraim Myers, Creagerstown, Md. Antedated Dec. 4, 1869.
98,091.—COTTON BASKET.—R. L. Myers, Washington, N. C.
98,092.—VELOCIPEDE. — Robert Neale, Brooklyn, N. Y. Antedated Dec. 4, 1869.
98,093.—STOVEPIPE THIMBLE.—Thomas Newell, Oskaloosa, Iowa.
98,094.—CURTAIN AND SHAWL STRETCHER.—James Nicklin, Cleveland, Ohio.
98,095.—RAILROAD CAR VENTILATOR.—E. Norton, Brooklyn, N. Y.
98,096.—ILLUMINATING STOVE. — Benjamin Nott, Albany, N. Y.
98,097.—HAY ELEVATOR.—J. W. Odaniel, Cloverdale, Ind.
98,098.—PASSENGER REGISTER FOR VEHICLES.—Thos. Ollis, Netherfield Road South, Liverpool, England. Patented in England, March 31, 1868.
98,099.—RAILWAY CAR WHEEL.—J. T. Owen, Philadelphia, Pa.
98,100.—HARROW.—George Paddington, Springville, Iowa.
98,101.—PACKING AND ATOMIZING CAN FOR INSECT POWDER.—F. L. Palmer, Sr., New York city.
98,102.—COMBINED OYSTER KNIFE AND ICE PICK.—Wm. Pattberger, Philadelphia, Pa.
98,103.—Suspended.
98,104.—TRUNK.—T. B. Peddie, Newark, N. J.
98,105.—BOLT CLAMP.—Charles E. Phillips, South Deerfield, Mass.
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98,114.—ELECTRO-MAGNETIC LOCK.—J. C. Smith, Brooklyn, N. Y.
98,115.—BRICK MACHINE. — Thomas Smurfit, Davisville, Mich.
98,116.—FLOOR CLAMP.—Joseph B. Spencer, Norwich, Conn. Antedated Dec. 17, 1869.
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98,135.—MACHINE FOR SPINNING AND CURLING HAIR.—Philip Wisdom, Brooklyn, N. Y., assignor to John Sickles, trustee, and John Sickles, trustee, assignor to John Wisdom and J. H. Wilcox, New York city.
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98,137.—HARROW.—George Workman, Rochester, N. Y.

98,138.—RAILROAD SWITCH.—Edmund Yardley, Pittsburgh, Pa.

98,139.—APPARATUS FOR THE MANUFACTURE OF IRON AND STEEL.—Charles Adams (assignor to himself and Charles Sharpe), Philadelphia, Pa.

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98,213.—SEED DRILL.—Orrin A. Wheeler, Doniphan, Kansas.

98,214.—EXPANDING TRIPLE SHOVEL PLOW.—Edward Wiard (assignor to B. F. Avery), Louisville, Ky.

98,215.—HEAD-BLOCK OF SAW MILLS.—Franklin J. Staley (assignor to himself, George W. Joseph, Isaac S. Long, and George H. Carter), Indianapolis, Ind.

REISSUES.

97,293.—MACHINE FOR CLIPPING HORSES' HAIR.—Dated June 20, 1868; patented in England, April 24, 1867; reissue 3,767.—Patrick Adie, of the Stand, London, England.

23,033.—HOSE COUPLING.—Dated February 22, 1859; reissue 3,768.—William H. Bliss, Newport, R. I., assignee of himself and Robert H. Lawton.

52,135.—SEEDING MACHINE.—Dated January 23, 1866; reissue 3,769.—Henry Bundel, Dayton, Ohio.

26,475.—BREECH-LOADING FIREARM.—Dated December 20, 1859; reissue 3,770.—Bethel Burton, Brooklyn, N. Y., and Wm. C. Ward, New York city, assignees of Bethel Burton.

94,486.—EXTENSION SLIDE FOR TABLES.—Dated September 7, 1869; reissue 3,771.—S. J. Gennng, Waterloo, N. Y.

71,624.—ELECTRIC CLOCK.—Dated December 3, 1867; reissue 3,772.—The Kennedy Electric Clock Company, New York city, assignees of Samuel A. Kennedy, S. W. Holt, and Joseph Gerlach.

82,705.—SCRUBBING BRUSH.—Dated October 6, 1868; reissue 3,773.—B. F. Koller, Shrewsbury, Pa., assignee of Samuel Gibson.

42,617.—PUMP.—Dated May 3, 1864; reissue 3,774.—Henry R. Sensenig and Moses W. Martin, Earl township, Pa., assignees, by mesne assignments, of Martin W. Zimmerman and John Zimmerman.

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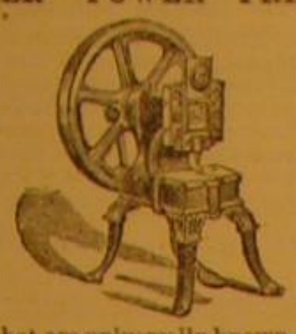
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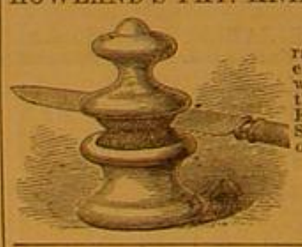
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SCIENTIFIC AMERICAN

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

Vol. XXII.—No. 2. [NEW SERIES.] NEW YORK, JANUARY 8, 1870. $3 per Annum [IN ADVANCE.]

The Corliss Steam Engine.

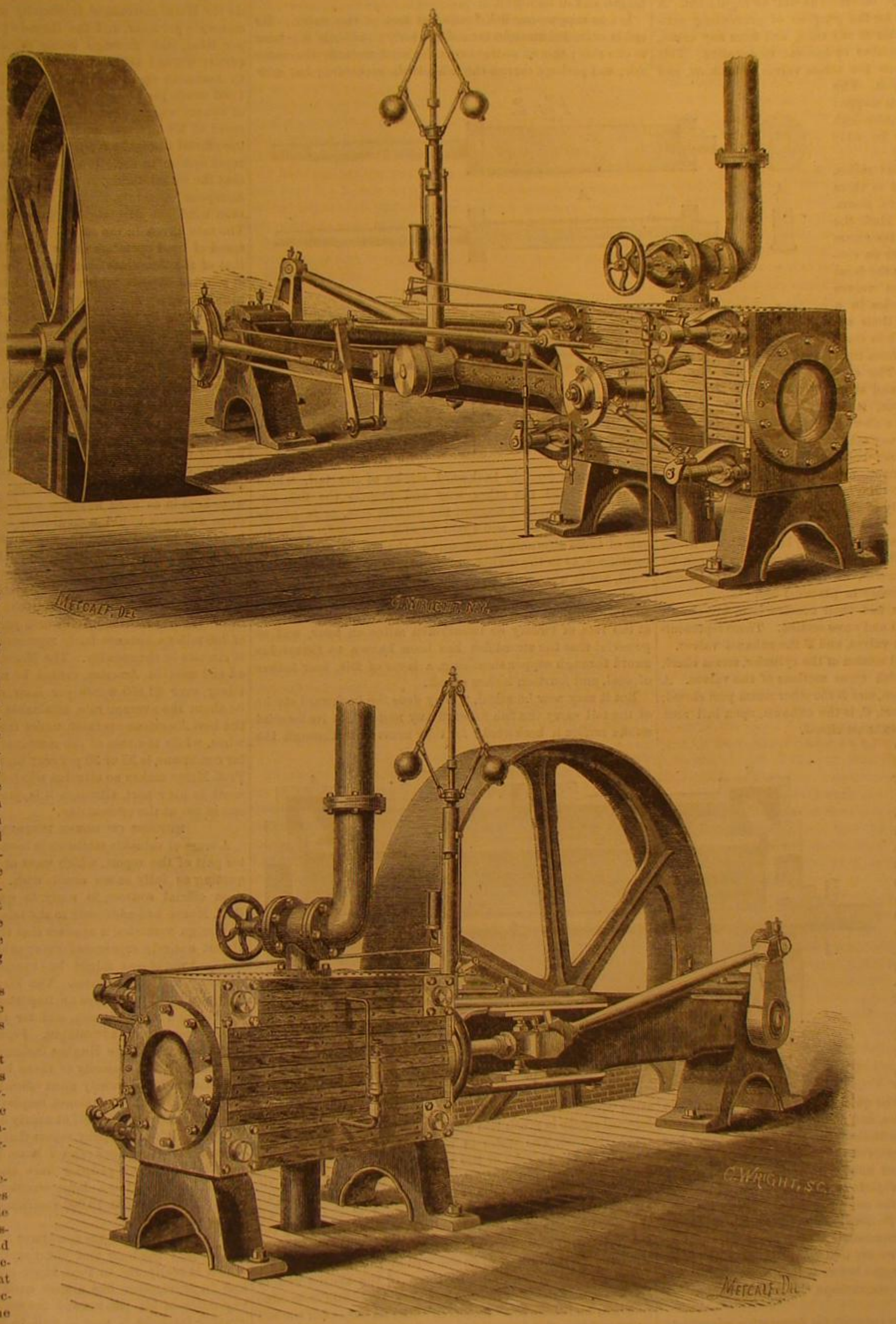
Probably no engine ever constructed has achieved a more enviable and widely extended reputation than the one we this week illustrate. It received the first competitive gold medal by unanimous vote of the International Jury at the Paris Exposition. It also took the first premium at the Fair of the American Institute, for 1869, and the inventor of the valve gear which constitutes the peculiar and distinguishing feature of the engine, and from whom the engine takes the name by which it is so widely and favorably known, has received a Rumford medal from the American Academy of Sciences in consideration of the merit of his invention.

The engine was exhibited for competition at the late Fair of the American Institute, and a test was made with the results of which our readers have been made acquainted through these columns. A statement of the results, based upon the amount of coal consumed, and the useful work performed—the only reliable basis upon which a computation can now be made—will be found in our advertising columns, and we call particular attention to this statement as furnishing a more minute account of the tests than any thing else yet published.

The peculiar merits claimed for this engine may be summed up as follows:

A most prominent and valuable feature is the accessibility of every part, which will be at once seen upon inspection of the engravings.

All parts of the mechanism which moves the valves are outside of the steam chest, visible to the eye, and therefore any derangement can be seen at once. One simple eccentric moves all the valves; no complication of gearing being used for that purpose.



THE CORLISS STEAM ENGINE, BUILT BY W. A. HARRIS, PROVIDENCE, R. I.

The same valve admits and cuts off the supply of steam; no auxiliary valve riding on its back being necessary. This valve is placed on top in close proximity to the bore of the cylinder of the engine—say one inch—and opens directly into the clearance space; therefore there are no long passages to fill with live steam at each end of the cylinder.

The exhaust valve is situated *under* the cylinder, at the clearance space, and can therefore free the cylinder of water without the use of other devices, in the most thorough manner. This valve is also situated in close proximity to the bore of the cylinder of the engine, and therefore has no long passages there to fill with live steam.

The steam valve commences to open its port at one end of the cylinder when the eccentric is producing its most rapid movement, and as the motion of the eccentric is declining toward the end of the throw, an increasing speed is obtained by means of the wrist plate, which compensates for the slow motion of the eccentric. At the same time the steam valve, at the opposite end of the cylinder, commences to *lap* its port, by the motion of the eccentric, but by a reverse or subtraction of speed produced by the same wrist plate, which speed is constantly decreasing till the throw of the eccentric is completed. Or, in other words, the lapping and opening of the steam ports require, *each*, the same amount of throw of eccentric, producing, for instance, a lap of half an inch at one end of the cylinder, while the opposite end has an opening of one inch and one eighth. The exhaust valves are moved by the same eccentric and by the same wrist plate before spoken of, but they have a much greater travel, for the purpose of ridding the engine of the exhaust steam easily through the exhaust ports, which are as long and twice as wide as the steam ports, and therefore back pressure on the piston of the engine is avoided. The rapid opening and slow lapping of the exhaust ports are obtained, as in the case of the steam ports, but much faster, as the travel is greater on the opening of the exhaust than on the opening of the steam port, to get a full and free opening. The lap on the exhaust port of this engine is about three quarters of an inch; opening one inch and three quarters.

The constant variations of load upon this engine, are communicated to the steam valves instantly by the governor; the valves being moved by a force distinct from it yet subjected to its regulation. Thus, the regulation is not only adjusted according to every momentary change in the demands of the engine, but is also effected with absolute precision by agencies purely automatic.

The governor in no case performs any labor; on the contrary, it only indicates the change required to the levers which move the valves. This does not task its powers. It puts forth only the force necessary to move a small *stop*. This movement is attended with the least possible friction, and the *stop* presents absolutely no resistance to the governor, except at the very instant when it is in actual contact with the lever constituting its fulcrum.

This momentary resistance, by the bearing of the lever on the stop as a fulcrum, occupies in an engine making sixty revolutions per minute, so small a space of time, that, compared with that during which the governor is left free to move the stop, it is practically nothing.

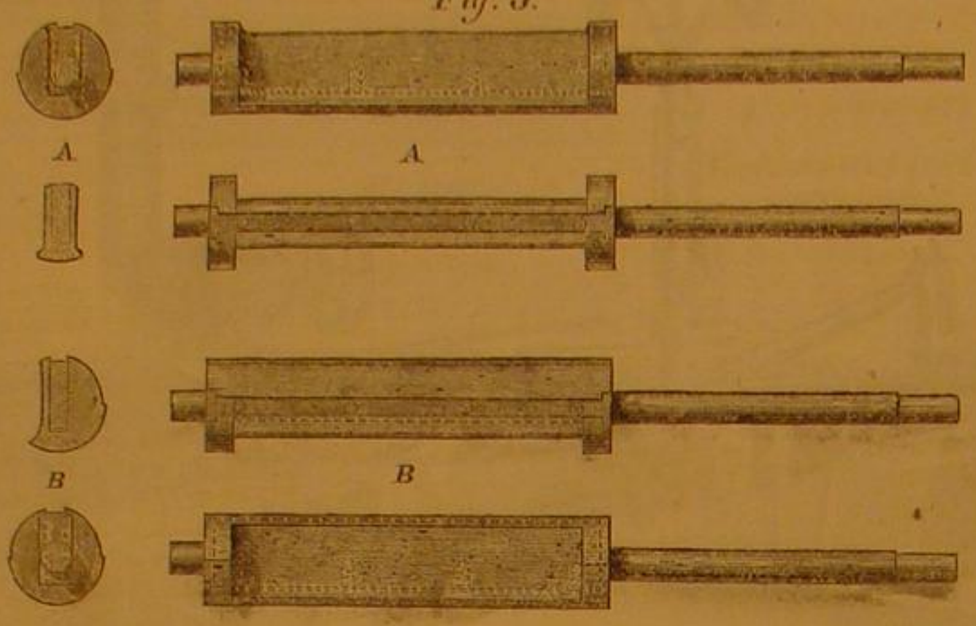
When the governor is combined with an auxiliary valve cut-off, as in some other engines, it is in fact converted into a connecting medium, and made not merely to indicate the

point of adjustment but also to perform the labor of moving the valve to a certain degree; and it has to perform this duty after reaching through steam-tight packing or stuffing boxes. The packing in these stuffing boxes by use becomes hard, when new packing becomes necessary; or it leaks and it is necessary to screw up a little tighter; all of which must be done by hand, thereby putting the regulator under subjection or friction, variable, according to the judgment of the engineer. There is also the friction on the regulator in the auxiliary valve arrangement necessary to overcome the power required to move such valve through all its bearings, stuffing boxes, guides, etc., and under the pressure of steam. These distributing elements do not exist in the Corliss engine valve gear.

The governor is therefore extremely sensitive, as it is not saddled with two duties, *actuation* as well as regulation. A stop motion is provided for the purpose of preventing accidents should the regulator at any time, and from any cause, cease to perform its functions or become inoperative. This mechanism does not allow the steam valves to hook on, and therefore they cannot open. The result is that the engine is stopped by this mechanism *alone*, although the screw valve may be wide open.

The valves are circular slides, motion being imparted to them by levers keyed to valve stems. These stems have a flat blade the length of the valve in the steam chest, and they oscillate on centers or fixed bearings in the front and back bonnets. The valves are fitted to these blades in a manner that admits of their adjusting themselves to their seats as the valve and seat from time to time become worn. The construction of the valve and stem is such that a valve can, it is claimed, be taken out in a shorter space of time than in any other engine, by taking out four bolts to remove the back bonnet, and drawing one key where keyed to the valve lever. Having four valves, either one can be adjusted independently of the other with great precision, and with the greatest of ease.

Fig. 3.



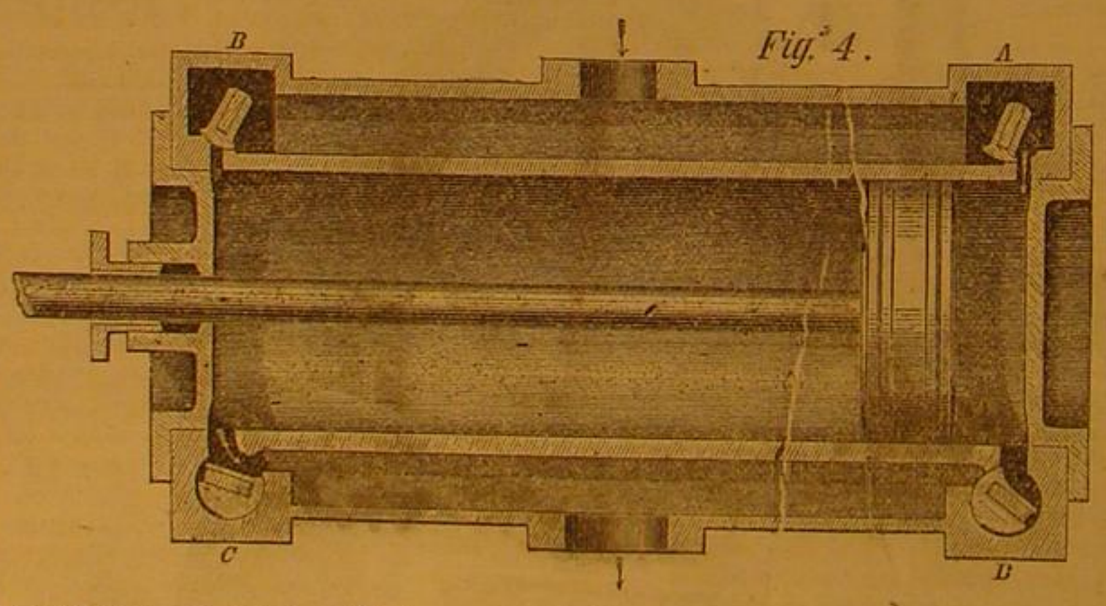
The valve gear can also be worked by hand with the greatest ease, and with 80 lbs. pressure of steam, can be run by hand, *backwards* or *forwards*, at the will of the engineer, which oftentimes is necessary in practical use.

The valves and blades, and their construction, are shown in Fig. 3, in longitudinal and cross section. Those represented by A show the steam valves, and B the exhaust valves.

Fig. 4 is a longitudinal section of the cylinder, steam chest, and exhaust passage, with cross sections of the valves. A shows one steam port open, and B the other steam port closed; the valves lapping the port, C, is the exhaust, open full area of port, and D the other exhaust closed.

It will be noticed also that the circumference of the exhaust valves, C and D, is partially cut away, thus reducing friction and allowing the acting portion of the valve to seat itself as it gradually wears. These devices are observed in the transverse sections of Fig. 3 as well as in the longitudinal section, Fig. 4. It will also be observed in the longitudinal section, Fig. 4, that the piston has traveled a very small part of the stroke, while the steam valve, A, and exhaust valve, C, have been opening the full area of their ports. The quick opening and closing of the steam and exhaust valves, and at the proper time (see Tredgold), with a positive mechanism for closing the same, has been a subject that has received the greatest amount of attention and thought from our most scientific engineers, and it is one of the principal subjects of the Corliss patent.

Fig. 4.



The workmanship of the engine is exquisite; that of the engine exhibited at the National Fair of the American Institute, which elicited commendation from every person competent to judge, was, as we are told by the builder, the same as that given to every engine before it leaves his works.

In style, as seen by the engravings, the engine must satisfy the most exacting taste.

Orders for machines, or requests for descriptive pamphlets, or for further information, should be addressed to W. A. Harris, corner of Park street and Promenade avenue, Providence, R. I., or at 49 Murray street, New York. [See advertisement on another page.]

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Now, how does it swim? We have found that the successive or simultaneous removal of the dorsal, anal, pectoral, and ventral fins, only renders the fish's position unsteady; but he could swim as well as before. But if the end of the caudal fin be snipped off, its speed is diminished; if the entire fin is removed, it moves still slower, and with evident exertion, but bravely keeps it up until the tail itself has been cut off up to or beyond the anal fin; then at last the poor victim to science succumbs, rolls over and over like a log upon the water, gasps convulsively, makes a few desperate but ineffectual struggles with its abbreviated tail—and dies.

The sight appears more cruel than it is, for the successive cuts seem to disturb the fish very little; and as the whole is over much sooner than the dying struggles of a hooked fish, we may claim the right to make the sacrifice for our intellectual dinner—especially as it occurs by no means every Friday.

We have learned that a fish cannot swim without its tail. Let us now inquire how it swims with it. Very much as you scull a boat with an oar; but with the difference that in this case the oar is a part of the boat, and is flexible both in its length and in its hight.

Let us suppose our fish floating at rest in the water. Its tail is extended straight behind the body; suddenly it is bent to one side; this of course turns the head towards the same side, and perhaps carries the fish a little backward; but now comes a more forcible backward stroke of the tail, which turns the head the other way and propels the fish forward. Then, having reached the middle line, it is gently bent to the other side, and again forcibly extended. The result of these alternate movements of the tail in opposite directions is, as in the sculling of a boat, to propel the fish forward, not in a straight, but a zigzag direction. But the successive movements are so rapid that we notice only the resultant forward motion, which is in some species, as the salmon, at the rate of twenty or twenty-five miles an hour, and so powerful that the sword-fish has been known to thrust his sword through copper sheathing, a layer of felt, four inches of deal, and fourteen inches of oak.

But it may now be asked, "Why does the backward stroke of the tail carry the fish forward any more than its forward stroke carries it backward? for they must pass through the same space." There are four different reasons: First. The forward stroke is much less forcible and rapid than the backward. Second. The water is already moving; for the previous backward stroke of the tail from the other side to the middle line has forced the water in all directions out of its way, so that the the further stroke forward meets comparatively little resistance; but the backward stroke meets all the more and is therefore the more effective in sending the fish forward. Third. This and the fourth reason depend upon the form of the tail, or upon the will of the fish.

There are some tails, such as those of the sharks and of the sea-snakes, which are long and narrow and stiff from edge to edge; and these are "feathered" like an oar. But the tail or an ordinary fish is not only much wider, but flexible in every direction, and capable of being spread out or narrowed by the action of little muscles attached to the bony rays which support it. Now such a tail may be feathered, and probably is, when the fish is moving slowly; but for more rapid movements it is probable that the whole tail is spread out and hollowed backward for the backward stroke; but that upon reaching the middle line it is narrowed and made convex for the forward stroke, so as to offer the least resistance to the water.

Those fishes which have scales overlapping each other are aided in still a fifth way; for in the forward stroke the scales upon that side of the tail would be flattened closely together so as to present a plane surface; but in the backward stroke the edges of the scales would be raised a little from the bending of the tail, and would offer a roughened surface to the water.—*From "Beast, Bird, and Fish," by Burt G. Wilder, in Harper's Magazine for December.*

PROFESSOR MORSE'S OFFICIAL REPORT UPON THE TELEGRAPHY OF THE FRENCH EXPOSITION.

COMPARATIVE SPEED OF INSTRUMENTS.

In the comparison of the speed of transmission by the different telegraphic systems now in use, the anxiety of Prof. Morse to properly set forth the merits of his own invention in this report has led him to some conclusions which we cannot but regard as inaccurate. He states, that in France and Prussia the Morse instrument is officially rated at twenty to thirty messages per hour, and the Hughes printer at fifty messages per hour, each message being calculated as equivalent to twenty words; but, in the table given of the results reached by American operators in special trials, the minimum rate is 1,600 words per hour, which is equivalent to eighty messages of twenty words each; therefore, Prof. Morse claims that the speed of his own instrument has been greatly underrated in the official European reports, and that it is actually the most rapid system in use. It should be borne in mind, however, that the actual discrepancy between the skill of American and European operators, though very considerable, is much less than would, at first sight, appear from the above showing. The rate given in the official reports represents the average speed of good operators under favorable circumstances, while that of the American operators is the result of special trials of selected experts, which as might be expected, give a very high average. A much nearer approximation to the true rate is that given by taking the average of a week's regular work in the New York office. This was done about two years since, and the results, as far as "through wires," or principal circuits are concerned, was as follows:

The Morse instrument transmitted, in a day of ten hours, an average of 300 messages of twenty words each, or thirty messages per hour.

The combination (improved Hughes) printer transmitted, per day of ten hours, an average of 325 messages of 20 words each, together with 4,000 words of press news, the whole being equivalent to 52 messages per hour. If the American lines were kept in as good working condition as those of Europe, these averages would undoubtedly be much higher, as may be proved by comparing the maximum speed per hour which has actually been obtained and officially verified:

The Morse apparatus in England, 1,476 words.
" " " " America, 2,704 "

The combination instrument, in the hands of an expert operator, has transmitted 2,700 words per hour through a circuit of 240 miles, a distance fairly representing the average length of circuits in the country. The Morse apparatus, as constructed and used in America, cannot be made to record, with certainty, over $1,800 words per hour, and this we consider to be about the average rate attainable in continuous work by the best American operator, under favorable conditions of the wires, while the rate of the combination printer, under similar conditions, is 25 or 30 per cent higher. Singularly enough, Prof. Morse makes no allusion whatever to the latter instrument in his report, although it is, practically, the most rapid one in use at the present day.

NUMBER OF MORSE INSTRUMENTS IN USE.

A mass of valuable statistics is brought together in the latter part of the report, which want of space prevents us from quoting as fully as we could wish. From reports received from official sources, in reply to questions propounded by Prof. Morse, and addressed to the telegraphic administrations of foreign countries, it appears that the Morse instrument has almost entirely superseded every other one throughout the civilized world—as might be expected from its simplicity, economy, and effectiveness. The Hughes printer is considerably employed in Europe on important through lines, as the combination is in America, and for this class of work it possesses incontestable advantages. From the returns, it appears that about 200 of the Hughes instruments were in use in Europe in 1867, the majority of these being in France. A careful estimate, based mostly upon official reports, puts the whole number of Morse instruments, employed in Europe, Asia, Africa, and Australia, in 1867, at nearly 12,000. In America, the Western Union Company report that they employ 4,000, and the various other lines cannot have less than 2,000 in daily use, including the railway lines and those of competing companies, as well as a large number in Canada, making a grand total of about 18,000 instruments of this kind in use at the present time.

MORSE'S TELEGRAPHIC INVENTIONS.

Now that the long and bitter controversy, as to the credit which is really due to Prof. Morse for his various inventions and improvements, has almost entirely died away with the expiration of his patents and the consolidation of rival telegraphic interests, it may be well to impartially examine the claims of Prof. Morse, as set forth in this report, as well as in the little pamphlet published by himself in Paris, in 1867. The inventions or discoveries here claimed as his own, by Prof. Morse, may be briefly summed up as follows:

1. The recording or generic telegraph, operated either electro-magnetically or electro-chemically.
2. The telegraphic relay circuit, or the opening and closing of a secondary circuit by means of a primary circuit.
3. The dot and line alphabet.
4. The use of sounds as a medium of receiving telegraphic communications.

5. The system of automatic transmission by the use of metallic type, or of the embossed paper strip from the register, as a means of opening and closing the circuit.

6. The use of a printing wheel and ink as a mode of recording, generally known as the "ink writer."

It must be admitted by the unprejudiced reader that, in the report under consideration, Prof. Morse has, in most cases, brought forward sufficient and satisfactory evidence of his having been the inventor of the apparatus and devices above named. In regard to the electro-chemical system of recording and the mode of transmission by the embossed paper strip from the register, although very probably first suggested by Prof. Morse, they do not appear, by the evidence, ever to have been put in practical form, and this fact, therefore, in our opinion, does not detract from the credit due to Bain, who made the electro-chemical system a practical reality, or from that of Edison and Westbrook, who, at a more recent date, independently invented and put in operation, unknown to each other, modes for transmitting, by the embossed paper strip, which, although upon the same general principle, differ widely in the details of their construction.

The line of argument which has been adopted by some writers upon this subject—that of resolving the invention into its elementary parts, and showing that each detail was before known, and that, therefore, no credit was due to the man who combined them in such a manner as to produce a new result—is an exceedingly unfair one. Almost every great invention is a combination of devices previously well known, and, indeed, it is almost impossible that it should be otherwise.—*The Telegrapher.*

For the Scientific American.

ON MANGANESE AND SOME OF ITS COMPOUNDS.

BY PROFESSOR CHARLES A JOY.

It is difficult to trace the origin of the word manganese, the ores containing it were variously styled lemale magnets, black magnesia, alabandicus, from the City of Alabanda; mangadesum by the glass makers, and later manganesium, and finally manganese. But notwithstanding the antiquity of the name, it is safe to say that even at the present time very little is known about the properties of the metal, and it is for this reason that we have chosen to speak of it, in order to put together for convenience of reference, the various methods of its preparation, and the properties of the metal as accepted by the best authorities.

For a long time iron and manganese were confounded together, but after the Swedish chemist, Gahn, proved the existence of a new substance in the mineral pyrolusite, the analogy between the new metal, manganese, and the old metal, iron, at once suggested that the former could be reduced in the same way as the latter.

The oxide of manganese was heated with charcoal, and a complete reduction followed. The heat required was the same as that for the reduction of iron. The metal obtained in this way, like pig iron, was found to contain considerable silicium and carbon, and to be very brittle. Whether it could be made malleable by burning off the carbon and squeezing out the silicium in a puddling furnace has never been ascertained, as no one has ever manufactured sufficient metallic manganese to make the trial. If the first chemist who reduced an ounce of iron from the oxide by means of charcoal could see to what uses the brittle, easily rusting, unmalleable metal as described by him, is now applied, he would be slightly surprised, for in small quantities or in the form of powder, every chemist would be forced to say that iron would have to be kept hermetically sealed, or protected by naphtha from the action of the air. It may be that manganese in larger quantities and properly refined, purified, and annealed, would be capable of being hammered into thin foil or drawn into fine wire, but at present we have no positive knowledge on the subject.

Another method for the reduction of manganese is to fuse the chloride with an equal weight of fluor spar, and one fifth its weight of metallic sodium. When obtained in this way it has the color of cast iron; is very brittle and very hard. It will take a fine polish, cannot be scratched by a file, cuts glass easily, does not change in moist air, is not attracted by a magnet, and has no effect upon the magnetic needle; it cannot be wrought, but can be cast the same as iron, and its specific gravity when prepared in this way is 7·16.

This method has been severely criticised by our best chemists, and it has been objected that the metal obtained was in no way pure, and ought not to be accepted as disclosing the true properties of manganese.

Deville fused the metal to a crystalline mass, the powder of which decomposed water rapidly; its color very much resembled that of bismuth. The fluoride of manganese has been reduced by metallic sodium, and we have ourselves reduced the amalgam of manganese to a fine powder, but were unsuccessful in fusing it to a button.

Some authorities say that metallic manganese decomposes water at ordinary temperature; that its color is reddish white; that it oxidizes in the air, and must therefore be kept under naphtha the same as potassium and sodium; that it is slightly magnetic, and that it readily combines with silicium and carbon, and that its specific gravity is 8.

The metal is said to be easily attacked by acids. In reference to the alloys of manganese, not so much is known as could be desired. Its effect upon iron is, however, becoming more familiar, and has been made the basis of several patents. In this country, especially, the use of franklinite iron, containing a large proportion of manganese, is well understood, and the iron produced is valuable for many purposes. In England there are thirty-six patents involving the use of manganese in iron and steel, the earliest of which was taken out in 1799.

Dr. Prieger, of Bonn, has prepared alloys of manganese and iron, and manganese and copper. An intimate mixture of black oxid of manganese, powdered charcoal, and iron filings or turnings, is made in a black lead crucible holding thirty to fifty pounds. A covering is made of charcoal, fluor spar, and common salt, and the contents of the crucible exposed for several hours to a white heat. On breaking the crucible, the alloy of manganese and iron will be found as a perfectly homogeneous button. Two equivalents of manganese and one equivalent of iron, afford an alloy containing thirty-six per cent of manganese; four of manganese and one of iron, give about eighty per cent of manganese. Both alloys are harder than the hardest steel; they are capable of a high polish, fuse at a red heat, do not oxidize in the air, and only partially so in water; their color is between that of steel and silver. These alloys could be used for journal boxes or bearings of machinery, and would be useful in affording a method for the introduction of manganese to iron or steel castings.

The alloy of manganese and copper is prepared in a similar way, and is very hard. Its properties have not been sufficiently studied by our workers in metal, and it would seem to offer a good field for investigation. It will thus be seen that our knowledge of manganese is very limited. The specimen of the metal in the cabinet at Columbia College is very hard and brittle, and has a distinctly red color. It has been kept in a loosely stoppered bottle for several years without any signs of oxidation or absorption of moisture. It probably contains some carbon and silicium.

In reference to the applications of the compounds of manganese to the arts, it may be well to mention a few of them in this connection.

VIOLET COLORS.

A very rich violet color is prepared by fusing finely pulverized pyrolusite and phosphoric acid in proper proportions, digesting in ammonia, filtering, evaporating to dryness, and treating with water; a violet powder remains, called Nuremberg violet.

GREEN COLOR.

Manganese green is the manganate of baryta, and can be represented by the formula $3\,BaO, 2MnO_3$. It possesses a fine green color, and is much safer than arsenic pigments.

PERMANGANATE OF POTASH.

This valuable salt can be prepared by passing chlorine gas through a solution of the simple manganate. This is said to be a more economical way for its manufacture than the old methods.

PERMANGANATE OF SODA.

This salt is made on a large scale, by heating together 12 parts anhydrous caustic soda, 36 parts soda lye of 1·337 sp. gr., 10 parts chlorate of potash, and 18 parts finely pulverized pyrolusite. This, and the preceding salt are of great value in chemistry, on account of the fact that they contain oxygen gas in a condition suited to the rapid oxidation of substances; a property that renders them available as disinfectants to destroy all bad odors, to be substituted for ozone in bleaching, and, in general, to be employed as powerful oxidizing agents. The salts are also valuable for the preparation of perfectly pure oxygen.

IN GLASS.

The use of manganese compounds in glass manufacture is one of the earliest applications of this element; but the fact that glass which has been bleached by it afterwards undergoes a marked change, and in the course of a few months has entirely different optical properties, is not generally known. The oxide of manganese is put in to counteract the effect of oxides of iron, but, in course of time, the oxide is acted upon by the light and air, and colors the glass red. Many a photographer has been puzzled to know why the glass of his skylight no longer lets light through so as to give him good pictures, and many a gardener has been troubled by the parched appearance of the grape vines in his conservatory, and by the decrease in the yield of grapes; both of these phenomena are due to the fact of the presence of manganese in the glass and the consequent red color. Red glass will not permit any chemical rays to pass, and hence the photographer can take no pictures. The same color will let heat through to parch and dry the vines, but the life-giving rays are cut off. Thus as our knowledge increases, we must order our glass to be made according to the laws of light as well as of chemistry.

SULPHURIC ACID.

When water impregnated with sulphurous acid is treated with sulphate of maganese, the sulphurous acid is changed to sulphuric acid. Here is a use of the oxidizing property of a compound of manganese that may offer a way to important manufactures. It works on a small scale, and probably would on a large one, if any one would try it.

OXYGEN.

The mineral pyrolusite, or black oxide of manganese, has long been employed to make oxygen, but the recent method of converting it into manganate of soda, and afterwards expelling the oxygen by heat, is less familiar to us. A better method than the manganate of soda is said to be the employment of the corresponding lime salt. By heating lime and binoxide of manganese in a current of air, the manganate of lime is formed, which is less likely to fuse than the soda salt, and hence is more readily made. If the air be passed over the lime for a considerable time, the permanganate of lime will form, and this bids fair to afford us the permanganates in a ready and cheap way, and also offers a method for isolating pure permanganic acid by decomposing the lime salt with sulphuric acid.

By mixing the permanganate with the binoxide of barium, we shall be able to prepare oxygen gas in the cold, by simply pouring an acid upon the salts in a flask, just as we make hydrogen by means of zinc and sulphuric acid.

We have gone far enough in our sketch to show that the applications of manganese are very numerous, and we may recur to the subject again at some future time, particularly as we have said nothing about its most important use in the manufacture of chlorine.

Improvements in Salt Making.

The old and usual mode of taking salt, when made, out of the pans is by a man standing on what is called a "hurdle" up each side of the pans, and with a long shaft, having a rake at the end, drawing the salt to the side of the pan, and then with a perforated spade lifting the salt out and putting it on to a bench, into carts, or into the stove-house. For the men to be able to do this work, the place being very hot from the steam and heat of the brine, they have to work nearly in a nude state, and to render the place a little colder they have to burn down the fires from under the pans for several hours before and during the time this work is going on; and when the quantity of salt has been taken out there has to be put into the pan a large amount of cold brine, which then renders it necessary to push the fires very much to get up the heat again. This causes a loss of time in making salt, and is very destructive to both pans and the brickwork surrounding the fires. Salt having to stay so long a time in the pans between the times of emptying them, and being a substance so naturally inclined to fasten itself to anything that is hot, a scale, from two to four inches in thickness, will form in a fortnight on the bottom of the pans, and requires to be hammered to break it. This scale often adheres so fast on the plates of the pans that they are twisted into all shapes and forms, causing breakages. They are also often burned into large holes, the leakages from which allow the brine to run into the fires and flues, and injure and destroy the brickwork so much that the repairs often amount to one-fifth of the value of the salt made. The work being so very unpleasant for the men and the repairs such a serious item of expense, Messrs. Hamer and Davies, having set up extensive new salt works at Wincham, England, determined to find out means to obviate these defects as far as possible, and they have, it is thought, succeeded, and have taken out letters patent for their improvements. They have now three pans at full work so successfully as to quite equal all their expectations. The salt is taken out of the pans by steam power instead of by men, and continued night and day alike. The salt being taken out so regularly prevents the formation of the scales, so that the pans need no hammering, and, therefore, no twisting of the plates, and also obviates the leakage and consequent destruction of the brickwork and filling up of the flues, as in the old method. All these improvements combined, more salt is made from the same quantity of fuel, and in less time, from the same dimensions of pans.

The mode in which this work is performed is by having a railway up each side of the pan, or by making the pan slide into a railway, and having a carriage across the pan, constructed with a shaft through the center, to which rakes are attached by one end; the other end of the rakes travel on the bottom of the pan. The carriage has a flanged pulley or wheel on each end, the same as a railway carriage, and travels from front to back of the pan, with the rakes that cover the whole width of the pan. The machinery is so arranged that the carriage is drawn backwark and forward by wire ropes. When the rakes are at the front end of the pan, and begin to be drawn towards the back, they take the salt as it is made with them at the rate of about 20 ft. per minute until they arrive at the foot of an incline upon which the rakes travel, and on arriving at the top the salt drops into carts standing to receive it. The travel of the rakes at the foot of the incline changes, the speed being reduced to about two feet per minute while ascending the incline, so that the brine runs from the salt down into the pan, instead of in the old way on to the hurdles, and wasted, and it is quite hot when it gets into the pan again. The rakes having dropped the salt into the carts, the machinery is so arranged that the carriage is raised on one side, lifting the rakes up, and being held up by a leg or catch on each end of the carriage; a return motion takes place and the carriage and rakes go back to the front of the pan, at which place the catches or legs are set at liberty, and the rakes go down into the pan and commence another journey. Each double journey is made in nine minutes on a pan of 70 feet long and 26 feet wide. By this process the salt made is put into the carts every nine minutes, and when these are filled the stages on which they stand are so arranged that one man can take all the salt away from three pans and put it either into railway wagons, boats, or into the store-house, as may be required.

At this time the salt being made is the butter salt of the finest quality, and the advantages of the machinery employed in its production over the old plan are the following: The color is much better than that of the salt made in the usual way; there is very little scale formed on the pan bottoms, therefore the repairs needed are much less. In addition, it would appear that more effective control can be obtained over the flues, so that the smoke consuming principle can be much more effectively applied than previously.

IT is said that a new description of lava is being thrown from the crater of Vesuvius since the last eruption, consisting of crystallized salt. This beautiful phenomenon has hitherto been unknown in volcanic natural history.

AVOID bathing in cold water or in a cold room, unless there is a full and quick reaction. Chillness after a bath is a sure indication that it was not properly taken.

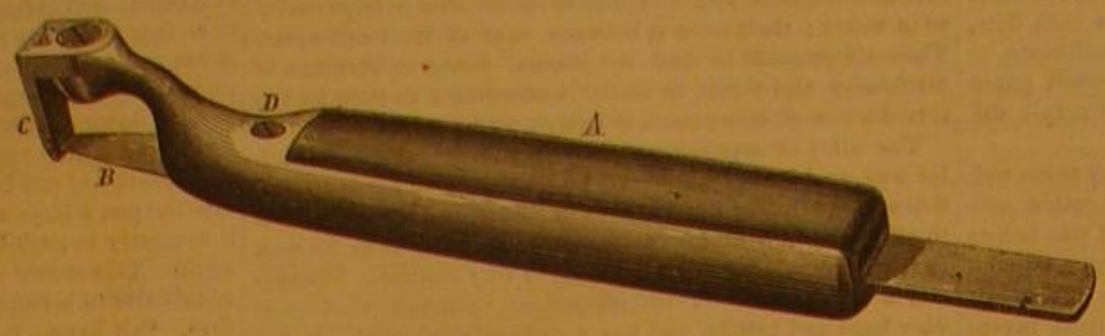
Improved Shoemaker's Trimming Knife.

This is a very neat and useful tool, designed to obviate all danger of cutting the "uppers" of boots and shoes while paring off the edges of the soles, and also to provide for paring off the edge, at a uniform distance from the stitching, by unskilled hands.

It consists of a handle, A, having a knife passed longitudinally through its body; the protruding point, B, meeting an adjustable guard, C. This guard not only prevents the cutting of the "uppers" by accident or carelessness, but the point of the guard which extends beyond the point of the knife also acts as a gage to keep the knife at a constant distance from the stitching.

Very few have not at times found their uppers prematurely breaking away from their soles owing to the carelessness of the shoemaker while paring; but many have been led to believe they had, by accident, cut the upper in walking. The truth is, that in a large majority of cases, the shoemaker is solely at fault. By the use of this simple tool all danger of cutting the uppers may be avoided.

The knife is withdrawn from the handle to sharpen it by simply loosening the screw, D, and the guard may be set to any required angle to suit the operator by means of the screw, E.



REIST'S PATENT TRIMMING KNIFE.

The testimony of a large number of practical workmen who have used the knife is unanimous in its favor as a time-saving and efficient tool.

Patented, January 21, 1868, by John Reist, of Philadelphia, Pa., who may be addressed, for further particulars, at 531 Race street.

An Enormous Canal Basin to be Built Between Piers One and Five, East River, New York.

There is at present a very important movement on foot among the great grain merchants of this city, which as soon as it assumes a tangible form will not only prove a great benefit to the metropolis, but will be of vast benefit to the shipping interest of the country. By a Legislative act certain basins and slips have been set apart on the East River side of the southerly end of the island for the exclusive use of the canal interests. This area commences at Pier No. 1 and terminates at Pier No. 5., and embraces within its limits Coenties and other large slips, but the space thus occupied is considered wholly inadequate for the wants of the grain traffic of this city, which, of late years, has assumed gigantic proportions, and has no other depot or harbor for its reception save the space mentioned. The company under whose auspices the improvements are to be made have secured the services of General Egbert L. Viele, who, after having taken a thorough survey of the locality and its requirements, submitted his plans for improvements to the directors of the Board, and they are deemed highly satisfactory.

The new basin will take in the same water frontage from Pier No. 1 to Pier No. 5 as formerly, but the projecting piers will be removed, and the bottom dredged to a greater depth to admit canal boats laden with grain during both high and low tide. Beginning at Pier No. 1, a solid granite wall two feet in width will be built, extending to the terminus at Pier No. 5, and thence out into the East River a sufficient distance to afford a secure berth for the accommodation of at least five hundred canal boats. At the upper extremity of the basin, it is designed to have erected one of the largest elevators in the country—surpassing even the mammoth elevators of Chicago and Buffalo. The structure will be of a hight sufficient to discharge grain from canal boats into ships. It will be composed entirely of iron and slate.

When this great basin is completed—it will require two years' time, as work will not be commenced until a few preliminaries are arranged—it will be the first of its kind in the United States, and it will prove a great blessing to the canal boat fleets, as well as an incentive to the city authorities and men of wealth to commence the building of docks and piers of solid masonry, instead of the present dilapidated wharves, which are a disgrace to a city so populous and wealthy as this great commercial mart of the Western hemisphere.

The necessity of this basin is shown in the fact that two thirds of the vast crops of the cereals grown in the West find their way to this city in canal boats from Buffalo, and from this port are shipped partially in bulk to Liverpool and Havre. Persons standing on the banks of the Hudson during the season of navigation cannot fail to notice the great fleets of canal boats under tow proceeding to their destination on the East River side, loaded down to their guards with grain.

A Step in the Right Direction.

The Chicago *Railway Times*, states that on the Pensylvania Railway uniformity of design and style in machinery is now the inflexible rule in every department and class of equipment and manufacture. The reform in this respect, begun ten years since in the car department, now extends to, and is very nearly realized to all the departments of the road. The end arrived at was, as then explained, "to get our entire equipment in each class uniform;" and what particularly commended it was, that it would dispense with a superfluous variety of patterns and duplicate work on hand for repairs. A larger view of late has presented itself, expressed by the superintendent of motive power and machinery, in his report for 1868, who says that its importance, "both as a measure of economy and increased efficiency cannot be too highly estimated; for, with such a system only can the cost of repairs of locomotives and proportions of engines out of service be reduced to a minimum." The superintendent of motive power and machinery is assisted by a mechanical engineer, in charge of the drafting room, after whose designs all work is made; and gages and templets are placed in the hands of all manufacturers for the company, with drawings of every portion, even to the seats for firemen and engineers in locomotives. As old stock wears out, it is cut up; and the numbers reappear on "standard" engines and cars of uniform pattern throughout. No deviation is permitted, at any one's will or caprice; all changes must be adopted generally. The system is not a novel one; it is only peculiar to the road in the extent of its application. When the new car shops are completed, the company will manufacture all its own cars; and the time is not distant when it will replace all failing engines, and make all necessary additions to motive power, after a system equally comprehensive. Indeed, it is calculated that in five years, instead of the *forty* different classes of engines now in use (456 at this writing; additions every week), there will be but *three* main classes—standard 8-wheel passenger, standard 10-wheel freight, and standard shifting. Each of the first two classes will have a "modification," the difference, however, consisting only in the diameter of the driving-wheel and the size of the boiler. An obvious result of the system will be the fact that many of the most important pieces of car or engine, being common to their class, will be *interchangeable*—in locomotives, for example, among castings, the driving-boxes, eccentrics, eccentric straps, etc., etc. The standard locomotive of the road is no less admirably adapted to its work and condition in style than in construction. Devoid of all the brass ornaments with which superfluous outlay it is customary to overload engines; painted a plain black, with number in gilt and a few neat gilt traceries, it is easily kept clean and its entire look is in keeping with the character of its work. The engineers who at first parted reluctantly with the brass and fancy painting would not now have them back. Their mistresses are admired not for adventitious charms, but for unpretentious, solid worth; for the relations "she" sustains to her lord and master are by no means without the refinements of sentiment and affection.

Running Street Cars with Tanks of Compressed Air.

The New Orleans *Commercial Bulletin* says a company has been organized in New Orleans to utilize several inventions for the application of condensed air, as a motive power for cars on city railroads, and is soon about to bring the design to a test.

The idea is that each car shall have two cylinders, or tanks, to contain the compressed air, which is to be used as a motor. These cylinders are to be on the top of the cars, and are to be be charged at the depot by an engine worked with steam. Metallic cylinders were first tried, but they were found to be too heavy, and the difficulty of the company has been to find a lighter material, available for the purpose. Paper cylinders have been determined on, and Capt. Roberts is engaged in making four to be used on the cars, two on each. They are made of strong sheets of paper, laminated to a thickness sufficient to bear the great pressure required to contain the air condensed into them. The several lamina are laid up with glue, and the paper fabric is strengthened with an envelope of cordage. In connection with these cylinders there is to be an engine, for which a special patent has been taken out, to receive the condensed air and rotate the wheels of the car.

One of the cylinders is finished, and has been subjected to a trial of three hundred pounds to the square inch without yielding. Three hundred pounds to the square inch, the inventor states, will suffice as a motor. He says he has with a platform car, experimented on a street railroad with far less power than that, and the experiment resulted satisfactorily. He used two old iron cylinders, weighing sixteen hundred pounds, which leaked through the riveting, and there were twenty-eight persons on the car.

Starting with but ninety pounds of pressure to the square inch, and with the weight of cylinders and men mentioned, he made three miles and a half in seven minutes and fifteen seconds. And as to curves, when the motor was reduced to fifteen pounds, to use his own words, he went around a street corner "as smoothly as a ball would roll on a billiard table."

On the Time Required to Discriminate Color.

In a recent number of Pfluger's *Archives of Physiology*, MM. Burckhardt and Faber describe an apparatus consisting of a pendulum of wood with a movable leaden weight attached, which has a slit at its lower end. While this slit vibrates behind a second narrow fissure, a momentary transmission of light occurs, the duration of which can be varied by raising or lowering the weight of the pendulum, or by increasing or diminishing the width of the slit. The source of light consisted of a milk-white glass plate illuminated by a petroleum lamp, and colored glasses of various tints were introduced into the slit of the pendulum. The intensity of the light was regulated and modified by the withdrawal of the lamp from the white plate, or by the interposition of smoked glasses, and in each experiment the observer was required to state what color shot across the slit. In the first series of experiments the intensity of the illumination required, when permanent, to enable the observer to state with accuracy the color perceived, was investigated; as well as the degree at which all perception of color ceased. In both series bright yellow occupied the first position; red and violet the last. It was also observed, that, with transient illumination, bright yellow gave the most distinct sensation with the smallest amount of light and the shortest duration. After this color, there followed with Burckhardt, yellow, bright blue, blue, green, grass-green, violet, red; and with Faber, yellow, blue green, grass-green, clear blue, red, violet. Experiments were then made to determine the intensity of the light requisite for the accurate perception of color, the duration of which was only ·0029 of a second, together with that required when the impression was persistent. They found the relation for all colors nearly equal in the same individual, though widely different for the two observers, the proportion being with Burckhardt as 173 to 1, and with Faber as 513 to 1. They conclude thence that the various colors must have the same or nearly the same brightness, in order, with a minimum duration, to yield a minimum sensation of color. The experiment with more protracted duration of the impression showed that the intensity of the excitation necessary to produce the least possible sensation of color, does not diminish proportionately with the increase of the duration of the stimulus.

Anvils.

The face or table of anvils as at present made is often defective, having frequently hard and soft places after hardening, which face should be equally hard all over its surface, and the steel in some instances not being properly welded to the iron part or butt which forms the lower part, the anvil is thereby rendered unsound and not fit for use. Some improvements recently patented by an inventor of Sheffield, England, have for their object the removal of such defects, and consist in so making anvils that the face may be equally hard all over when finished, and in so casting or welding the butt to the head or upper table that the parts may be thoroughly amalgamated and the anvil made more durable at a less expense than hitherto.

He first prepares a model of the size and shape of the anvil to be produced. He then places it in a box, covers it with composition, and fills up the box with sand in the ordinary manner. After the model is removed and the sand perfectly dry (this being done in the usual way), he first pours in the molten steel to form the face or table, then, through the same aperture (after the steel on the table is sufficiently cool), he pours in a very mild molten steel, which flows over the table and gives the requisite toughness and solidity to the steel beck. After a proper time has elapsed, he pours in through another opening the iron or metal, which also runs upon the steel and forms the lower part or butt of the anvil, and a perfect amalgamation takes place between the iron and steel. The casting being complete, it is then finished in the ordinary manner for castings.

To harden the work, a large metal bosh or trough, 6 in. or 8 in. deep, is formed, in which is inserted a number of perforated sharp-edged bars of metal, on which the anvil is allowed to rest on its face or upper surface, either flat or slanting. A sluice communicationg with a reservoir of water is then opened, and a force of cold water is allowed to flow upon the face by an upward cast and to pass under the anvil and over the bars to any depth required. By these means a much harder and more regular surface is obtained than by the present mode of manufacture. After this the surface is ground in the ordinary way.—*Mechanics' Magazine.*

Quicksilver and Iron.

The difficulty of imparting to iron a complete and uniform coating of mercury by dipping it in a solution of mercury is well known. The process may, however, be very easily accomplished by cleaning the iron first with hydrochloric acid, and then immersing it in a diluted solution of blue vitriol mixed with a little hydrochloric acid, by means of which it becomes covered with a slightly adherent layer of copper, from which it must be freed by brushing, or rubbing with sand-paper, and washing. It is then to be brought into a diluted solution of mercurial sublimate, mixed with a few drops of hydrochloric acid. The article will now be covered with a layer of mercury, which cannot be removed even by hard rubbing. This layer of quicksilver protects the iron from rust, especially it be washed with spirits of sal ammoniac after the amalgamation. Articles for the laboratory, and for other purposes, coated with quicksilver in this way, and allowed to lie exposed with similar articles not so protected, retain their luster perfectly, while the others become covered with rust. This same process is especially applicable to the coating of the steel or iron instruments for which oil is generally employed, and will probably be found to resist the injurious effect of moisture much more perfectly than the oil.

EUROPEAN artificers have not hitherto been able to imitate with success the gongs and cymbals made in China; but it has recently been found that the secret of their manufacture consists in the bronze of which they are made being hammered into shape at a red heat, at which temperature it is as malleable as soft iron. A bronze containing 20 per cent of tin is very brittle when cold, but is tough and malleable when hot.

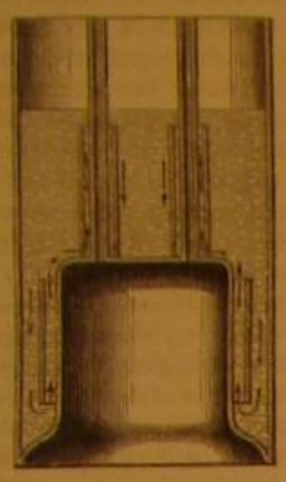
Correspondence.

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

Design for a Vertical Boiler.

MESSRS. EDITORS:—I beg permission to draw the attention of the readers of your valuable paper to an improvement in vertical boilers, which I designed several years ago, and which I believe will be of some interest to others engaged in boiler construction.

The annexed sketch represents the idea, only two of the vertical tubes being shown, and these out of proportion to the size of the boiler, in order to show the construction. The figure represents an ordinary fire-tube vertical boiler, with the following additions: each of the small tubes, of which there need be less in this than ordinary boilers, is surrounded by another tube, which terminates below the water line. These outer tubes are open at their upper end, and fastened in such a way to the top crown-plate of the firebox as to leave space for the water to enter below. The action is at once understood by everyone familiar with the subject. The water in the annular space being hotter than the outside of it, rises in the way shown by the arrows, and the colder water from the outside takes its place. In such a way a constant circulation is kept up in this boiler, which is actually the vital question of every good boiler construction.



Considering the firebox as a tube of large dimensions, the same system is followed out here; and it is here of much importance, as the circulation of water and consequent disengagement of steam prevents the burning of these plates. The only place in which the water is comparatively at rest is in the lowest part of the firebox, where the solid matter will be deposited, to be removed through the manholes.

I believe that this construction has some merit, and as I do not intend to take out a patent for it, anybody who thinks fit is at liberty to use it; but I would like to hear the opinion of others about it.

A. BERNSTEIN.

Chicago, Ill.

Solar Spots.

MESSRS. EDITORS:—I addressed a communication to you a few days since upon the subject of solar spots; it was my intention at the commencement of that communication to give what I thought to be some of the proofs of the theory I offered in explanation of these spots; but fearing the article on the subject would be too long, I then deferred giving these proofs. I desire now to offer a few proofs of the above theory, which will, at least, seem as plausible as the theory itself.

First, to go back to the year 1777, nearly one hundred years ago, and note the appearance and progress of the spots on the sun's surface, and the various terrestrial phenomena attending the prevalence and absence of them, as observed from that time to the present. We find that during the greatest prevalence of these spots, a corresponding disturbance of the electrical condition of the earth was observed and made manifest in the magnetic needle by its variations, and also by the increase or decrease in frequency and magnitude of the auroral display, corresponding exactly to the increase or decrease of the solar spots. The variation of the needle and the unusual auroral exhibitions are both owing to a disturbed condition of the earth's electricity. Some of the auroral displays during the past summer have been unusually large and attractive. If the accounts are true, the magnetic needle is more sensibly disturbed than in other years. The spots on the sun are also larger than heretofore, and, consequently, the season of 1869 has been a season of lower temperature than usual—sensibly so. The electrical condition of the earth is more sensibly disturbed than in other years; the disturbance will probably be more marked next year than this.

These phenomena are owing to thermo-electrical causes; the larger the masses of solid matter on the surface of the sun become, the more the radiation of heat is diminished; and as electricity accompanies heat, a smaller supply of electricity is derived from the sun, which may materially affect the electrical condition of the earth. The earth must be regarded as a thermo-electric pile of large dimensions, but small intensity, and receiving a large supply of its electricity from the heat of the sun. Astronomers tell us that these solar spots are of large dimensions, at least in the aggregate 30,000 miles broad by 50,000 miles long, consequently must cover an area sufficiently large to very materially affect the radiation of heat from the sun to the earth.

Regarding the earth as an immense thermo-electric pile, it must be admitted that it cannot be otherwise than very sensitive to heat and cold, and, on parting with its heat, will therefore part with a corresponding amount of electricity, and in the present case, probably enough to account for the electrical disturbances on the earth. These unusual phenomena attending the electrical arrangement of the earth at the present time are owing to a reduced supply of heat and electricity from the sun. This supply owes its diminution to the increase of solid, condensed, or opaque matter on the surface of the sun consequent on its cooling. This solid matter obstructs the radiation of heat from the sun.

Another fact which may properly be considered as proof of the "Spot Theory" in question, is the glacial epoch, known to have existed on the earth; evidences that the earth once experienced a greater degree of cold than now, are abundant. There must have been several such epochs on the earth—in fact, a number corresponding to the number of planets whose orbits range within that of the earth, or nearer the sun. All these epochs may not have been properly "glacial," but periods of lower temperature corresponding to the accumulation of solid matter on the surface of the sun necessary to form successively all the planets whose paths are nearer the sun than that of the earth.

The increase of the spots on the sun of late indicate that another "glacial epoch" may not be an impossibility some future day.

I do not claim that this theory offered in explanation of solar spots is the correct one—so of the proofs; but I have been induced to offer them because I believe them to be new; and should this hypothesis fail to be established by further research, it may be of some value in provoking deeper investigations in the matter, but should it be of no practical value whatever, and wholly untenable, I shall be quite ready to abandon it.

C. A. HOFFIN.

Loss of Life in Coupling Cars.

MESSRS. EDITORS:—A few days ago an old and faithful engineer was killed at Goldsboro, N. C., while coupling cars. A wife and children were thus suddenly deprived of a husband and father, their sole support.

It is safe to say that a man is killed or injured every day in the year on an average upon the railroads in the United States while coupling cars. Among the list of patents published in your paper for several years past may be seen a number for coupling cars without the necessity of endangering life and limb by going between the cars. Why are not some of them in general use? Will none answer the purpose? If not, then let the public make it known through the press that they require such an invention, and American ingenuity will be sure to meet the demand. Have the class of men who work on railroads no friends to champion their cause, or is it "only a private" killed? The law provides for the safety of passengers and crew on the sea, but sadly neglects them on the railroads.

I was for years a passenger train conductor on one of the trunk lines between New York and Chicago, and have seen so many good men killed by useless man-traps that I feel it a duty to write to you in the hope that I may induce you to call attention to this subject.

G. T. NUTTER.

Newbern, N. C.

Singular Ice Formation.

MESSRS. EDITORS:—I inclose a photograph of a remarkable ice formation to you, which, perhaps, will be of interest to you and many others.

On the nights of December 10th and 11th, when we had a temperature of 10° below zero in Springfield, Mass., a gentleman, Mr. Lester F. Sikes, of West Springfield, placed, as usual, a pail of water in his kitchen to be used in the morning. At 7 A. M., Dec. 11, this pail of water was found frozen over about one inch in thickness, and in the center of the ice surface was left standing a perfect prismatic column 5 inches high, 1¼ inch in diameter, with a flat top.



The white part marked *a b* on the photograph was the perfect image of a fountain jet. The pail was brought to me on Saturday; I cut the ice surface out and had it photographed because I thought it was a phenomenon worth preserving.

If any scientific man would undertake to explain how this remarkable formation took place, I am satisfied he would receive the thanks of many interested in nature and her doings.

EDWARD WIEBE, Pres. Humboldt Institute.

Springfield, Mass.

Cause of Typhoid Fever.

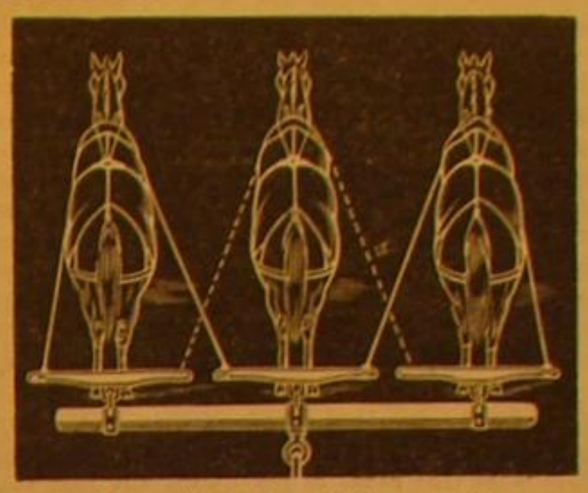
MESSRS. EDITORS:—In your number of Nov. 27th, 1869, I have seen an article on the necessity of cleaning the sewers in order to avoid typhoid fever. There is something to add to your article. Dr. Hepp, druggist of the hospital and Medical Faculty of Strasbourg (France) found last year that typhoid fever is appearing as an epidemic in that city with the rain, or rather by the disappearance of the rain, and his observations of about twenty years taught him the following facts: There is a subterranean water layer, communicating with the rivers and fountains, at a pretty short distance under the soil, that increases with the rains, and when these are ceasing decreases in the same way, leaving organic substances in a state of decomposition which communicates a certain degree of impurity to the drinking waters. Epidemic typhoid fever always made its appearance in Strasbourg and in the surrounding places, when such was the case.

A. VEITH, M. D.,
of the University of Strasbourg, France.

Natchez, Miss.

How to Hitch Three Horses to One Plow.

MESSRS. EDITORS:—I notice in a recent number a communication from a St. Louis correspondent, in regard to hitching three horses to one plow. I will inform your readers how to do it. The sketch I send you explains itself. Instead of a double-tree I use a triple-tree, having three single trees attached, as shown.



The "lead horse" is in the middle, to which are attached "jockle-sticks" connecting the leader with the other horses to guide them; that is, if the driver wishes to use what teamsters call a single line. This method equalizes the draft perfectly.

ARTHUR CUNNINGHAM.

Cincinnati, Ohio.

Effect of Steam Pipes on Wood Placed in Contact With Them.

MESSRS. EDITORS:—I send you a piece of common pine wood. Upon examination you will see the effects of steam heating pipes (for *two* winters) when brought into close connection with wood. We could send other specimens, showing a still greater "charring."

Whether or not steam pipes are dangerous is not for the writer to say, although he has taken the precaution of enlarging all openings for the passage of such conductors of heat. Thanks to you for agitating the question.

Pittsburgh, Pa. SUBSCRIBER.

[The wood mentioned varies in color from the natural tint of the wood through gradations from brown to black, although the black portions are very thin and lie wholly on the surface. The browned portions penetrate to some depth and the wood is so far charred that portions of it are easily crushed into powder by the fingers. An experiment shows it to be most easily ignited. In fact, it is nearly as combustible as tinder. On the whole, we are inclining to the belief that pipes carrying high steam cannot be placed in contact with wood without a risk. Our correspondent omits to state what pressure of steam is carried in the pipes which produced this effect. This is an important point, as it is desirable to ascertain at what temperatures these effects are produced.—EDS.

Who Get The Patent Office Reports?

MESSRS. EDITORS:—The 25th number, last volume, of the SCIENTIFIC AMERICAN failed to come to hand, the first failure in the present year; will you please send me one? I would as soon do without a new coat as my SCIENTIFIC. Can you tell me why so many of the Patent Office reports are sent to men who do not care anything for them, and so few to inventors, the very men who need them?

My lock is finished, and no man has been able to open it with the key in his hand. I have just sold the New England States for my patent heel cutter for twenty thousand dollars. My motto is "Never despair." J. H. BEAN.

Marietta, Ohio.

[The reason why so many get the Patent Office reports who do not value them, and that so many inventors, and persons who would prize and be benefited by having them, cannot obtain them, is that a proper distribution is not made by Congress. The members vote themselves too large a number for distribution among their constituents, and not half enough for the use of the Patent Office. The Commissioner should have the distribution of the bulk of each year's issue, that every patentee and applicant for a patent might be supplied from the Patent Office. Inventors are the persons most interested in these reports; it is their money that is appropriated for the payment of them, and they should be first served with them. The Commissioner has the names and addresses of many thousands of persons who would be glad of his annual report, and he has the facilities for the proper distribution of all that are published.

We hope Congress, in their next appropriation, will largely increase the number for the Patent Office, if the members are somewhat curtailed in the distribution. We are glad to know your good success in disposing of your patent. We like your motto.—EDS.

Curious Phenomenon in Artillery Firing.

MESSRS. EDITORS:—In your Dec. 11th issue of the SCIENTIFIC AMERICAN, under head of "Curious Phenomenon in Artillery Firing," I would say that the resistance of the atmosphere on the lower half of the projectile was greater

the upper half; also, the displaced air would have a tendency upwards, where it could make room for itself much quicker than downwards, as firing under water parallel with the surface, the bullet will come out of the water into the lighter air.

J. WHITEFORD.

Junction City, Kan.

Law of Attraction.

MESSRS. EDITORS:—In a recent number of the SCIENTIFIC AMERICAN appeared two brief, but interesting articles in relation to the phenomenon of rapidly revolving bodies overcoming the force of gravitation. The first was a communication from R. H., setting forth the reasons why rail-cars can be easily thrown, or even blown by heavy gales from the track when the locomotive is running at a high rate of speed.

The second was a paragraph from the London *Globe*, in which it was asserted that a cannon-shot after leaving the muzzle of a rifled gun, sensibly rises above a horizontal line. In both the above named instances the revolving bodies have been raised, or thrown above the horizontal line by reason of a temporary suspension of the earth's attraction upon the *atoms* of those revolving bodies. A solution of this singular problem may be easily obtained by carefully observing the movements of that curious toy known as the gyroscope, or "Philosopher's Puzzle." Some years ago, mainly for my own amusement, I set to work in order to discover if possible how it was that a rapidly revolving wheel of iron could, by mere momentum, completely set at defiance the law of gravitation. My experiments were extremely simple and can be readily repeated by any one; but simple as they were, they were ample enough to satisfy my mind at least, that *magnetic attraction* is the true cause of gravitation and that the rapid reversion of the polarized atoms of bodies temporarily disturbs, or in other words, cuts off the earth's magnetic current thus producing such phenomena as we have seen in the car-wheel, rifled cannon-shot, and revolving gyroscope.

Now for the experiment. I started out with the assumption that the earth is a constant magnet, and that all bodies are attracted towards its surface by reason of magnetic polarity; that the only power which can overcome the earth's magnetic force, is motion; that revolving or gyratory motion as seen in the bearings of fly wheels, in whirlwinds, and even in the little gyroscope, is the most effective in bidding defiance to the force of gravitation. By moving a magnet near either of the poles of a common pocket compass, the needle can be made to oscillate according to the movement until, by increasing the motion, it can be induced to revolve rapidly on its axis and will so continue to gyrate independent of the attracting point until its momentum it exhausted when it will again obey the magnetic influence. In this it is quite apparent that the rapid reversion of the polar, or positive and negative points of the needle, for the time being completely disturbs or cuts off the attracting current of the magnet and that the motion must proceed until friction has reduced the momentum below the attractive power of the magnet. It must be borne in mind that the magnet is a *constant* force, while momentum, by reason of friction and other resistance, is constantly decreasing and must ultimately obey the superior power of attraction.

The same is true of the whirling rifle-shot, and revolving gyroscope. Each for the time has its rapid rotary motion, reversing the polarity of its particles and overcoming the attraction of the earth. But the earth is a powerful and constant magnet and ultimately asserts its control over the disturbing object.

In my experiments with the gyroscope, I found that the wheel could be made to revolve at any angle to the pedestal upon which the staff rested, but that, at ordinary velocity, it revolved better when the staff was placed horizontally. I further noticed, however, that when very great velocity was imparted to the wheel (it weighed one pound avoirdupois) it would immediately rise above the horizontal line, and so continue to rise gradually until it would attain a vertical position and fall upon the pedestal.

I think this may tend to explain the phenomenon of the rapidly revolving rifle shot rising in the air the moment it leaves the muzzle of the gun.

W. F. STEWART.

San Jose, Cal.

Latent Heat of Metals.

MESSRS. EDITORS:—In an article copied from "Pynchon's Chemical Forces," under the above title, in the SCIENTIFIC AMERICAN of December 18, the old theory of latent heat is still adhered to, as explaining the phenomenon of the rise in temperature which takes place when a mass of metal or other matter is subjected to condensation, or to the lowering of temperature when subject to liquefaction or evaporation.

In the light of advanced science as laid down by such men as Prof. Tyndall and others, the whole theory of latent heat has been greatly modified; for while all bodies contain a certain amount of latent heat, it by no means follows that because a body rises in temperature upon being subjected to any mechanical force, the heat developed was previously stored up in the mass as "latent."

To say, therefore, that the quantity of heat which is given out by a metal when it is compressed is simply making apparent that which was before "latent," is an absurdity. Fortunately for us the researches of science at the present day have cleared up, to a great extent, the mystery which enveloped the study of the forces of nature and the universe, and the former theory of latent heat has been displaced by that of the undulatory or vibratory conditions of matter. It is now universally accepted that light and heat are but "modes of motion," or, rather, that the particles of "ether" which pervades all bodies and all space are in a state of oscillation, the oscillations being of different degrees of velocity and length, one condition resulting in that which, to our senses, is perceived as "light," another manifesting itself to us as "heat," with various intermediate degrees. Some of greater and some of less velocity, light itself being divisible into the prismatic colors, actinic and caloric rays, each particular class of rays resulting from a greater or less number and length of vibrations per second.

Therefore, in the phenomenon of the flash of light which is emitted by a bullet when striking a target, instead of its being an emanation of that heat which was before "latent" in the bullet or target, the true explanation would be, that the force exerted by the combustion of the powder against the ball is suddenly changed at the moment of contact with the target, from that of the *mass*, in a given direction, to that of moving the *particles* of the mass among themselves; or, in other words, the velocity of the mass has been changed to the velocity of the atoms composing the mass, and this velocity of the atoms is propagated and communicated to the ether and particles of the atmosphere, which motion gives us the sensation which we call "heat." Should the vibratory action thus generated be sufficiently energetic, not only heat but light will be evolved; and should the ball be projected with a motion equal to that imparted to a meteor before it enters our atmosphere, not only would heat and light be evolved at the moment of contact, but the particles of the ball would be set in such violent oscillation that the atoms would be torn asunder and dissipated in vapor.

All this is entirely consistent with the theory of the "conservation of force"—that nothing is lost, either in "motion" or force; so in the experiment of the Dahlgren guns, which was referred to in the article in question, instead of the heat being previously stored up in the iron projectile and made sensible by compression, it is simply the change in the mode of motion of the ball against the iron wall of the monitor.

So in the matter of friction, the heat which is given out by a rope rapidly running out over the side of a vessel, is really a leakage, as it were, of the force with which the rope is being dragged from its position, and this leakage is caught up by the particles of wood in contact with the rope, and they are set to vibrating. If the force or velocity—for velocity is power—be great enough, the side of the boat will speedily burst into flame.

The passage of a meteor through our atmosphere is another illustration of the same phenomena, the meteoric mass, moving with immense velocity, impinges upon the particles of the atmosphere, and it is at once retarded in its flight; but the original force is not lost, it only takes on another form, and the atoms of the meteor are set in motion with such violence that they burst into flames of dazzling brilliancy, and in many cases the whole mass is dissipated into thin vapor.

But it is needless to multiply examples, all the foregoing are but exhibitions of one and the same force under different degrees or conditions of vibratory action, and easily demonstrable according to the now accepted theories as laid down by scientists of the present age.

J. P.

Cincinnati, Ohio.

Setting and Filing Mill Saws.

MESSRS. EDITORS:—In your valuable paper of December 11th, I see a communication from J. R. P., of Alabama, in regard to filing and setting mill saws, which conflicts with my views, based on twelve years' experience.

I file all splitting saws straight across, holding the file at right angles with the saw, on the under and upper side of the tooth; because, in the first place, if you file the teeth on an angle or bevel, it is very difficult to get them all alike, and if you do not, one tooth draws off more and works against the other, the saw runs harder, and is also more liable to knock the set out of the teeth. And, again, I contend that it takes more power to run a saw, filed in that way, because if a tooth is filed on an angle it has a longer cutting edge than when filed straight across. When filing square across, the file is held constantly in one position, and after a little practice it is easier to see when it is at right angles with the saw.

I swedge the teeth, of course, so they need but very little set; and to get that, I spring the tooth near the plate of the saw to get all the strength of the tooth, and set it to a gage on each side. When I start my saw it always points straight ahead, the tooth being swedged makes it wider at the point, and the saw always runs perfectly free, and if it dodges in striking a hard knot, the corners being sharp on the opposite side, it will work its way into line immediately instead of crowding further off.

In running saws in this way, I have less trouble, and make more and better lumber than those that file their saws flaring.

S. P. WILLIAMS.

Rutland, Vt.

Two Driving Wheels vs. One for Harvesters.

MESSRS. EDITORS:—It is neither practically nor philosophically true that two driving wheels for harvesters are better than one, as the following facts will show: Two driving wheels on one axle must turn independently of each other, and the wheel that turns fastest must of necessity do all the driving. Consequently, when the machine moves on ever so small a curve, the outside wheel turns fastest, and not only does all the driving but must make a heavy side draft as the draft pole is then all on one side of the center of draft, so the wheel that runs over a stone or knoll, while the other runs on a level, turns faster and does all the driving, which, on rough or uneven ground, causes the side draft to be continually changing from one side to the other. Any one can satisfy himself of this by looking at the front end of the draft pole. He will see it knock first one way and then the other, as I have described. These are by no means all the difficulties; for while the driving is changing from one wheel to the other, the knives must stop until the lost motion caused by the room for play in the cogs, bearings, and boxes, is all taken up, and this, when they become much worn, will frequently be so much that the knives will not cut at all in tough lodged grass. It is like stopping and starting in the grass without backing the machine.

These are important objections which farmers and manufacturers should well understand, as they apply to all two driving wheel machines; but none of them applies to one driving wheel machines. It is only when two driving wheel machines are drawn in a straight line on smooth ground that both wheels drive at the same time, and this is the very time when they are least needed. The driving wheel of one-wheel machines is made a little heavier, with more face and more corks, so as to drive strong enough on any ground. I know many farmers are very much prejudiced in favor of two-wheel machines, as they call them, but I presume it is not because both wheels are drivers, but simply because they run on two wheels, in opposition to the old one-wheel machines with a rigid finger bar dragging on the ground.

All harvesting machines, when cutting grass, should run on three wheels, two besides the driver, and the axis of these should be in a line, or nearly so, with each other, so as to run and back easily, and to turn about without the necessity of lifting up the finger-bar, or tearing up the sod or turf, and also to prevent the finger-bar from dragging on the ground. If the draft pole be placed in the center of draft alike on both machines, the side draft will be far less in the one driving wheel machine than in the two. It will run easier for the team, turn about with less trouble for the driver, and do its work as well when cutting grass, all other things being equal. It is also far better in almost every respect as a combined machine or as a reaper.

S. HULL.

Poughkeepsie, N. Y.

Curious Phenomena.

MESSRS. EDITORS:—Let me lay before you really curious phenomena witnessed in this vicinity on the morning of Nov. 25, and ask you, or some of your able contributors, to give us an explanation.

Mr. Hamilton, who owns the grist mill here, found his gate fast in the morning and sent for me to see what could be the matter. We soon got the gate open and the mill running He not long after sent me word that he could not shut the gate, and in one hour his mill stopped entirely under a full gate. The rack filled up with ice. He cleared this out again and again, and it as often filled up again. The ice accumulated on the rack and slides of the flume a foot or more thick. It appeared to accumulate on the gate, right in the current, under nine feet head. It filled the wheel all full and stopped it with power enough on it to drive two run of stones. There is a hole through the dam, the lower end at least seven feet under water, five feet by one and one half feet, with a timber running through the center, made to enable us to finish repairs. This filled up. The water ceased running over the dam and very perceptibly fell off till the ice disappeared, when it immediately rose again to its usual hight. This ice was a porous substance fibrous in formation; such as we see thrown up by the side of the road in the fall. In the hand it felt like crust snow. At about noon it all disappeared at once and the mill started at full speed. During this time the water seemed to have no power of motion. It changed to ice in a manner contrary to all the laws of ice formation. All up and down the sides of the channel, in the current the most as in the hole in the dam, on the rack, on the gate, and in the wheel.

Such are the facts. The phenomena are new to the old mill owners here. We would like an explanation.

Week s Mills, Me. REV. W. H. LITTLEFIELD.

[For the Scientific American.]

ARTIFICIAL LIGHT FROM THE PINEWOOD CHIP TO THE GAS CHANDELIER.

BY I. CANTINI.

Ere long we shall not be able to imagine to ourselves a city or town without gas light, or a country farm house without its petroleum oil lamp. The present generation is swimming in a sea of light. But these acquisitions are of recent date, and the remembrance of smoking lamps, dripping candles, candle snuffers, etc., is still fresh in our memory.

Dark and gloomy centuries lay between the pinewood light and the gas chandelier. Chips of pine wood afforded the first lights, but as soon as the combustibility of animal fat was discovered, the idea of filling it into a vase and putting a wick to it, almost suggested itself. This crackling, flickering light was transmitted from father to son, until the introduction of oil, which soon threw animal fat into oblivion.

Orientalists and antiquarians agree that the Assyrians, the Egyptians, the Jews, the Greeks, and the Romans, all used the oil lamp. Most wonderful designs for these utensils, made of stone, iron, and brass, have been discovered in the Pyramids, in the old temples of India, and among the ruins of Jewish cities. Of the lamps used among the Greeks and Romans, the excavations at Pompeii have furnished a rich assortment. Gold, silver, marble, precious stones—nothing was considered too costly an ornament for this necessary household article. Most of these lamps were works of art of the first order, and even the more common kind used by the lower class of inhabitants, made of *terra cotta*, are tasteful in form and artistic in execution. Even our modern industry has not been able to excel their workmanship. Yet these ancient lamps were not as practical as they were beautiful. A common lantern of our day affords a better light than the elaborately wrought vessels of ancient Rome and Egypt.

The art of refining oil was unknown to the ancients. As an especial luxury they mixed their oils with the essence of roses and with sandal-wood, which, however they disguised the bad odor of the oil, only diminished the strength of the light. The historians mention that Lucullus, and others, spent large sums for these perfumed oils, and yet the illumination of our most modest of shops and stores is of course far superior to that of the most magnificent of the palaces of ancient Rome. The gold and silver lamps were hung on fine worked chains from marble pillars, but the flame was small, and, besides smoking excessively, it flickered or went out entirely in a slight current of air.

From Rome the oil lamp passed into France, Germany, and England, where the pinewood chips, and wicks soaked in fat, were still in use. The inhabitants of Denmark, Scandinavia, and Scotland, when in want of pine wood, caught some fat bird, or other greasy animal, and set fire to it, and patiently endured the smell emitted from the burning carcass until it was burned to ashes.

The Roman lamp underwent but little change until the discovery of the tallow candle. The spare illumination explains in some measure the sober habits of our ancestors. They arose with the break of day, and retired when the present generation begins to get ready to go to places of amusement. The "curfew bell," derived from the French word *couvre-feu*, was not without its signification. Under William the Conqueror, every light had to be extinguished at eight o'clock, and no one was much incommoded by this law, for the people were generally too poor to pay for an extra quantity of oil.

The first step to introduce the tallow candle, was taken in the twelfth century, when the tallow torches came into use; during the following century the tallow candle was brought before the public, much in the same form and shape which it bears at the present day, only they used a flaxen wick, cotton being unknown at that age. These candles were, however, considered a great luxury, and used only by persons of high rank. Some fifty years later the wax candles were manufactured for the courts and royal palaces. When they were first used in churches their cost was enormous. A wax candle offered on the altar to the praise of God was considered a royal gift.

The price was still high up to the sixteenth century. The anecdote related of Oliver Cromwell, who one day found two wax candles burning upon his wife's toilet table and extinguished one, shows that even among the rich illumination formed an important item in the household budget.

The eighteenth century brought an essential change in this necessary household article, caused by the discovery of rape oil; olive oil had till then been used in Italy and France, and whale oil in the North; but rape oil was much cheaper, and thus afforded an opportunity to the poorer class to enjoy the the comfort of an oil lamp.

In the year 1783, the first great reform in the construction of oil lamps was devised. A Swiss, named Argand, who had been adopted by an Englishman in London, was the inventor of the cylinder-formed wick, which moved like a tube between two metallic pipes. This mechanism allowed an even current of air to feed the flame, the smoking of which was obviated by the addition of a glass cylinder, which latter not only prevented smoke, but also diminished the disagreeable smell of oil, and more than all, caused an increase in the strength of the light.

This new invention soon came into general use. The Gerard Brothers improved it greatly by placing the oil receptacle below instead of above the flame, which gave to the lamp a much more graceful form. They also introduced the milk-glass shades to break the glaring light. The next improvement appeared in the "Carcel" lamps; the "moderators" soon followed, which latter is still in use in many places where oil is burned.

With the improvement of lamps refining of oil also under went an essential change. In 1790, vitriol was used in purifying oils, an invention which was made almost simultaneously in France and England. With every year the number of substances from which oil could be obtained was increased by new discoveries; but all these inventions were left far behind after the discovery of petroleum wells in America in 1845.

But tallow and wax, and even the most refined oils, are far surpassed by the gas light. The first attempts to burn gas were made by an Englishman named Murdoch, who distilled gas from coals and with it illuminated his house. In 1804, Mr. Murdoch introduced it into a factory at Manchester. A few years later the first gas company was organized in London, where it has been in use ever since. The fast progressing civilization of America did not tarry long in adopting this new invention, and the improvements in the art of illumination, which in America are almost a daily occurrence, prove that this western hemisphere will never have to pass through such an ordeal of darkness as that which for centuries has been allotted to the eastern world.

In the days of Shakespeare the theaters were illuminated by tallow candles, and the actors had to come forward between the acts and themselves perform the work of snuffing the candles. This always occasioned a great deal of merriment among the audience, who, having a moment before been moved to tears by their tragical speeches, were made to witness such a menial performance. To such Hamlet's and Othello's, our sperm candles and petroleum lights, not to speak of the gas, would doubtless have appeared as a gift from Heaven.

Some fifty years have passed since gas was first introduced and already dangerous rivals threaten to take its place. The electric and calcium lights, and various kinds of gas have been tried with very considerable success. Nobody believes, however, that the art of illumination has arrived at its climax of perfection. Undoubtedly the time will yet come when our city streets, bridges, and tunnels, will be lighted in a style scarcely inferior to daylight, a *desideratum* which might even now be attained were our officials as anxious to serve the public as to fill their pockets.

[For the Scientific American.]

THE CALABASH TREE.

BY JOHN RAMSAY GORDON.

The calabash tree is of the *genus* known to botanists as *Crescentia*. It grows in the tropical countries of South America, and also in the West Indies, in which parts it flourishes profusely. This tree attains a hight of thirty feet and arrives at a moderate age. The trunk and branches of it are very tough and ligneous, and the bark is very irregularly distributed on them, being found thicker in some parts than in others. As the branches are, in comparison with the trunk, disproportionately thick, they thus have a clumsy appearance, which is increased by their being studded with irregular protuberances throughout their entire length. They have a tendency to bend in the opposite direction to that from which the wind blows. Thus in the West Indies, where the prevalent wind is from the east, the branches of this plant are mostly curved towards the west. The leaves are of an oblanceolate form and of a dark green color. They do not grow in clusters like most others, but proceed separately from the branches, and even from the trunk, at almost regular distances on them. The flowers are of a pink shade streaked with lines of a bownish tinge. After the decay of these, nuts appear on the same stalk. The nuts are ellipsoidal in shape and are of a woody consistency. They extend in size from that of a walnut to that of a large pumpkin.

These nuts contain a pulpy kernel, in which there is an innumerable quantity of small flat seeds. When they are young they are perfectly green, but as they become older they assume a darker hue; and, although when unripe they can be penetrated by a penknife, yet they can only be divided by means of a saw, or some other forcible alternative, when they have attained maturity, as they are then of the woody consistency before mentioned; and, indeed, they are so hard, that the instrument employed in cutting them is very often blunted during the process.

In the West Indies, the natives convert the nut of the calabash tree into household utensils of many kinds. Of them they make drinking cups, sugar pots, baskets, divers ornaments, and dippers for water, and such are procured from the small nuts; of the large ones they make bath tubs for their infants and wash tubs for their clothes. The manner of preparing these nuts employed by them is as follows: They obtain a saw and cut out the shape of the article they require; then they extract the pulpy kernel, which they generally reject, and with a knife they scrape the inside of the nuts until they have cleared it of moisture; next, they scrape the wood of the interior with a piece of bottle-glass and polish it with sand paper. After this process has been completed they place them in boiling water, which they assert prevents them from becoming black within. If the exterior of the nut be required to be scraped, it is done before the hot water is applied.

Some of the aforenamed articles are painted with a variety of colors, but such consist only of the ornamental kind. Those that are intended for drinking purposes are not colored. The drinking vessels are formed by sawing off one end of the nut or by dividing it longitudinally, and, in the latter case, two vessels are obtained from one nut. The sugar pots are formed by sawing off the end of the nut and employing the piece which is cut off as a cover to the vessel, and it is attached to it by means of a bit of string. These articles they call their "Gobis" or "Govis." The dippers are formed by taking away a portion of the end of the nut, and inserting a wooden rod in a small hole in the side of the nut, to serve as a handle.

Some of these articles of household furniture are very tastily manipulated to captivate the eye. In the absence of a saw the negroes employ a piece of string and a stone to divide these nuts, and this is effected by tying the string round them and tapping gently with the stone on it till it enters; it is a tedious process but is often successful.

The kernel of the calabash is boiled into sirup by the natives, and it is asserted that this sirup is very beneficial to consumptive invalids, as it has a soothing quality. Occasionally the pulp is given to goats who are exceedingly fond of it and eat it with avidity.

The calabash tree is the haunt of iguanas, snakes, lizards, and all kinds of reptiles, which exist on the flowers, of which they are very fond.

On the subject of the foregoing article, the calabash tree, the works of the celebrated French writer, Pierre L'Abbat, are very interesting, and I think are worthy of perusal.

About Water Supply-Pipes.

A correspondent in the *Herald of Health* makes the following inquiries, and to which the editor sensibly answers:

"What can I use as a water supply-pipe? Is gutta-percha the best? How is galvanized iron? Is there not mischief in it, or in the zinc used to whiten it? Pure block tin is not to be had, for they will mix lead with it when the pipe is drawn, in order to make it more ductile. Is rain water, running through lead goose-necks from a roof, with sheet lead round the chimney (as is usually the case), preferable to well water as a drink?"

It yet remains for some one to achieve fame and fortune and confer an incalculable amount of good upon the race, by inventing water supply-pipes which shall possess the following requisites: 1. Entire freedom from corrosion by any and all kinds of natural waters. 2. Exemption from the action of air and moisture and a moderate degree of heat. 3. Flexibility, strength, and ease of joining. 4. Cheapness. The nearest approach to this standard, at present, is the tin-lined pipe. The objections to the tin-lined pipes are: 1. Where joints are made, the tin and lead come in contact with the water, and then, owing to galvanic action, the corrosion of the lead is more rapid than if tin was not present. 2. The tin lining is liable to cracks and flaws, which allow the water to come in contact with the lead, with the same result as at the joints. 3. There are some waters that rapidly corrode the tin itself, when it is not in contact with lead or other metal. If, as this correspondent states, lead is mixed with the block tin to make it more ductile, this is still another and more serious objection. Gutta-percha will not withstand the action of air and moisture, and is consequently useless. Iron rusts, and if galvanized, the water dissolves the zinc coating. [Pure water oxidizes, but does not dissolve the oxide of zinc. The expression, water dissolves zinc coating is calculated to mislead. Galvanized iron pipes may be used with safety under proper circumstances, and when the water is free from free acids, alkalies, chlorine, etc.—EDS. SCIEN. AMERICAN.] The answer to the last question depends upon circumstances. If the well water is pure and soft, then it is preferable. If it is hard, choose the rain water, and filter it. If we adopt the rule not to use water which has stood or been long in contact with metal, we shall escape with slight injury.

The Hartford Steam Boiler Inspection and Insurance Company.

This company makes the following report of its inspections for the month of November:

During the month 510 visits of inspection have been made; 909 boilers examined, 822 externally and 144 internally; 57 have been tested by hydrostatic pressure. The number of defects in all discovered are 294, of which 57 are regarded as dangerous. These defects in detail are as follows: Furnaces out of shape, 20—4 dangerous; fractures in all, 19—6 dangerous; burned plates, 35—4 dangerous.

Mr. Fairbairn finds that the strength of iron plates diminishes one fourth at a red heat, and it is not difficult to understand that, at a very high heat, no reliance whatever could be placed upon iron when subjected to a strain; and although portions of the crown sheet from exploded boilers do not always indicate that they have been subjected to an injurious temperature, still this is true in some instances, and must be reckoned among the causes which operate to weaken steam boilers, and they are consequently in a condition inviting explosion.

Blistered plates, 51—2 dangerous; cases of incrustation and scale, 59—5 dangerous. Of cases of sediment and deposit several have been found, generally the result of exhausting into the heater. This difficulty has been especially true in certain cases where manufactured oils were used for lubricating the engine cylinders, and where there was considerable carbonate of lime in the water used in the boiler. Either use pure oils for lubricating or else run the exhaust somewhere besides into the well or tank from which the boilers are filled.

Cases of external corrosion, 52—7 dangerous; cases of internal grooving, 4; water gages out of order, 23—10 dangerous; blow-out apparatus out of order, 8—1 dangerous; safety valves overloaded, 15—4 dangerous; steam gages out of order, 15—3 dangerous; boilers without gages, 3; cases of deficiency of water, 6—1 dangerous; cases of insufficient or broken stays, 4—2 dangerous. One inspector reports that in one case nearly all the braces were broken from one boiler head, and another reports that in a boiler 5 feet in diameter, under heavy pressure, nearly all the braces in both ends were either broken or very loose. This difficulty may be set down as another cause of boiler explosions.

Force, and What It Is.

Professor Youmans, in a recent lecture delivered in Steinway Hall, in this city, om the "Dynamics of Life," stated some interesting facts. The lecturer pointed out the nature of force, showing that it was indestructible, although capable of change. Thus the force acting on the very center of the sun was never lost. It went forth in the form of light and heat; it raised up the plant; the plant was food for the ox; the ox was changed into muscle and nerve, which gave men power to strike the blow; the blow produced heat: so force was convertible. Force is never lost. By an easy transition, he passed to the storing up of force. He gave some remarkable instances of this storing, which is mechanical and molecular. Thus, one pound of coal has sufficient power in it to raise one pound of matter two thousand miles high. Then referring to a pail of water changed first into ice, then dissolved into water, which in turn was changed into steam, and subsequently separated into oxygen and hydrogen, he remarked that the force requisite to make these eight parts of oxygen and one of hydrogen into water was equal to the fall of one tun down a hight of five miles, the change of steam into water was represented by a fall of one tun 2,900 feet, of water into ice by a fall of one tun 433 feet. A knowledge of this fact caused Tyndall to observe that the force which a child carried in an apronful of snow was sufficient to hurl back an avalanche precipitated down a mountain side.

PRIZE ENGRAVING.—The first large batch of engravings was mailed or expressed to all parties entitled to them, on the 29th ult., the postage and expressage being in every case prepaid. We have now a sufficient number printed and put up in pasteboard covers to meet each day's demand, and orders will hereafter be filled on the day of their receipt.

Improved Music and Book Stand.

Many an invalid will welcome the improvement we herewith illustrate; but while it is a desideratum for feeble folk, it will be found a luxury which few, either sick or well, having once enjoyed, will be willing to resign. While as a music stand it combines all the advantages required in such a piece of furniture, it enables reading to be performed without fatigue, while the person is placed in an easy reclining position.

Our artist has so well delineated the comfort it supplies, that little remains for us but to point out the distinguishing features of the invention.

A tripod with hollow stem receives the standard which supports the desk, and a set-screw enables this standard to be adjusted to any hight required. It may also be turned on its vertical axis and fixed by the set-screw as circumstances require, and this adjustment may be made without raising the person from a reclining position. A disk of wood or other suitable material supports the table of the stand, the latter being fastened to the disk by a central pivot with a thumb-nut on the under side. This gives another adjustment.

The disk which supports the table is hinged to the top of the standard at the rear portion and from the front descends an arc of a circle which passes through a slot in the standard where it is adjusted as desired by a set-screw.

These devices enable the desk to be set at any convenient angle to support a book for reading either while a person is sitting or reclining, so that the printed matter is placed directly in front of the eyes, and in such a position that no muscular effort is required to sustain the book or to keep the body in a position of constraint.

Still another great convenience is that the table may be adjusted in a level position and be used as an ordinary stand for medicines and other purposes desired.

It admits of any degree of ornament deemed desirable, is easily constructed, and durable, and hence has all the qualities calculated to secure popularity.

This invention was patented Nov. 30, 1869, through the Scientific American Patent Agency, by Edward Conley, of Cincinnati, Ohio. Address patentee at 121 Main St., as above, for further information.



CONLEY'S MUSIC AND READING STAND.

WELLS' IMPROVED ECCENTRIC FOR STEAM ENGINES.

The object of this invention is to not only enable the ordinary adjustment for angular advance to be made, but also to permit a change at will of the length of the throw, and the travel of the valve by means of the eccentric, instead of effecting it through a link or any other device heretofore employed.



It may be considered as an eccentric within an eccentric the two eccentrics A and B in the engraving being locked together—except when unlocked for adjusting—by the bolts D C. These bolts are so placed that their heads, and the nuts opposite the heads, lap over the edges of both A and B, and when the nuts are screwed home the two parts are firmly locked together. These bolts also serve to keep the parts A and B parallel to each other.

The inner eccentric, A, being held to the shaft by a set screw, the greatest throw of the eccentric is obtained by turning the exterior eccentric or ring, B, until its widest part is in the position shown in the engraving, that is, upon the line of the greatest throw of the inner eccentric, A. The figures, $\frac{3}{4}$, marked upon both eccentrics, indicate by their coincidence when this adjustment is accurately made. When the narrowest part of B is brought into the line of the greatest throw of the inner eccentric, A, the minimum throw is obtained, and accuracy of adjustment is indicated by the coincidence of the figures $\frac{1}{4}$ on both pieces.

The whole forms a compound adjustable eccentric, which supplies a complete variable cut-off, and is very much simpler in construction than other devices hitherto adopted to secure the same end. With simplicity, increased durability and diminished cost are also secured. The device is free from elongated slots in the center, the effect of which is to weaken the parts, and it is adapted to use on shafts of uniform size throughout instead of being operated by a crank pin, as has heretofore been done in other devices made to secure the same end.

The improvement will attract the attention of engineers from its simplicity, and the advantages secured by it are obvious. Patented through the Scientific American Patent Agency, Sept. 21, 1869, by J. C. Wells, whom address for further information at Warren, Pa.

The Value of Mathematics.

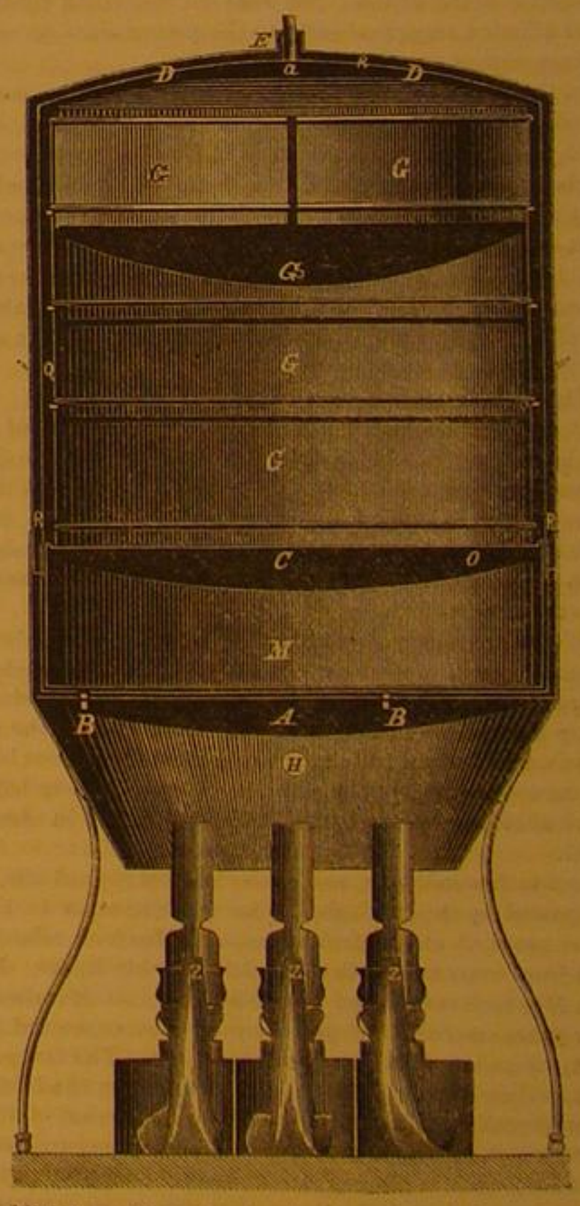
We do not recollect seeing an abler exposition of the value of mathematical study, and the use of mathematics as an instrument of investigation than the following extract from the tenth lecture of Mr. John Fiske, on the Positive Philosophy, delivered at Harvard:

"The logical utility of mathematics is not less obvious. The prevelent distaste for mathematics, coëxisting, as it does, in many persons with excellent reasoning powers, proves that the faculty of imagining abstract relations is ordinarily quite feebly developed. Not reason, but imagination, is at fault. The passage from premise to conclusion could easily be made, if the abstract relations of position or quantity which are involved could be accurately conceived and firmly held in the mind. Now the ability to imagine abstract relations is one of the most indispensable conditions of all precise thinking. No subject can be named, in the scientific investigation of which it is not imperatively needed; but it can nowhere else be so thoroughly acquired as in the study of mathematics. But the excellence of mathematics as an instrument of mental discipline by no means ends here. It is, indeed, as Comte observes, a fallacy to suppose that greater certainty is attainable in geometry than elsewhere. Not greater certainty, but greater precision, is that which distinguishes the results obtained by mathematical deduction. Dealing always with definite or determinable magnitudes, its processes are characterized by quantitative exactness. It is not obliged to pare off and limit its conclusions, to make them tally with concrete facts; but can treat of length as if there were no such thing as breadth, and of plane surfaces just as if solidity were unknown. It is thus the most perfect type of deductive reasoning; and if logical training is to consist, not in repeating barbarous scholastic formulas, or mechanically tacking together empty majors and minors, but in acquiring dexterity in the use of trustworthy methods of advancing from the known to the unknown, then mathematical investigation must ever remain one of its most indispensable implements. Once inured to the habit of accurately imagining abstract relations, recognizing the true value of symbolic conceptions, and familiarized with the process of elimination as legitimately conducted, the mind is equipped for the study of quite other objects than lines and angles. The twin treatises of Adam Smith on social science, wherein, by deducing social phenomena first from the unchecked action of selfishness, and then from the unchecked action of sympathy, he arrives at mutually-limiting conclusions of transcendent practical importance, furnish a brilliant illustration of the value of mathematical methods and mathematical discipline.

"Bearing in mind these considerations, and recollecting also the extensive scope for inventive ingenuity afforded by the various devices by which algebraic expressions are utilized in the solution of physical problems, we may appreciate the emphatic statement of Sir John Herschel—a statement which he has thought sufficiently important to be printed in italics: 'Admission to the sanctuary of science, and to the privileges and feelings of a votary, is only to be gained by one means—sound and sufficient knowledge of mathematics, the great instrument of all exact inquiry, without which no man can ever make such advances in any of the higher departments of science as can entitle him to form an independent opinion on any subject of discussion within their range'."

SWEDISH COOKING APPLIANCES.

We illustrate on this page, from *Engineering*, one of a series of cooking utensils, recently patented in Sweden, and now being introduced into England. As will be seen in the engraving, the cooking stove consists of a sheet-iron base in the form of an inverted truncated cone, which supports an iron cylindrical vessel. Upon the top of this is placed a nest of circular porcelain dishes, the one resting upon the other, and small recesses being cut at intervals around the base of each dish in order that there may be a free circulation of heat and steam. The nest of dishes is covered with a cylindrical casing of sheet iron, the lower edge of which fits upon the top of the iron vessel at the bottom before spoken of, and the whole is inclosed in an outer casing to prevent any radiation of heat. The apparatus stands upon a tripod, and occupies a very small area, the hight of the medium sizes not exceeding three feet, and the diameter being about ten inches. Either gas or oil may be employed for obtaining the necessary heat. If the former be found convenient a Bunsen burner is used, and the mixture of air and gas issues through a series of holes in the side of a circular burner, and is deflected so as to distribute the heat equally over the whole area of the vessel above. If, however, oil be employed, it is burnt in a lamp of peculiar construction with a flat wick bent in an annular form. In using the apparatus the circular iron vessel beneath the porcelain dishes is partially filled with water, and the material to be cooked being placed each in its compartment, the whole is inclosed in the inner and outer covers, and the heat being applied, steam is generated from the water, and circulates through the whole of the stove, until the food is ready. Besides the process of steaming, however, a dry heat can be obtained for roasting, baking bread, etc., by placing no water within the iron vessel.



In addition to this apparatus in its different forms, the conical base of the stove is adapted for coffeepots and other vessels required for ordinary operations on a small scale.

JET BLACK VARNISH FOR SHOES.—Dissolve 10 parts by weight of shellac and 5 of turpentine, in 40 of strong alcohol, in which fluid should be previously dissolved 1 part of extract of logwood, with some neutral chromate of potassa and sulphate of indigo. The varnish is to be kept in well-stoppered bottles.

JOHN CHINAMAN is a heavy purchaser of California produce. Thousands of barrels of flour were sent to Hong Kong during November, and the latest advices by mail say there are many orders in San Francisco yet to be filled.

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REPORT OF THE SPECIAL COMMISSIONER OF REVENUE —TINKERING THE INCOME TAX.

Protectionists, in what we regard the true meaning of that term, we do not greatly sympathize with a certain class who, styling themselves Protectionists, are purely and simply Prohibitionists. We do not wish to create monopolies, and a tariff which does this is, in our opinion, an excessive one. And while we do not regard the views of Commissioner Wells, given in his recent report, as sound either upon the tariff or on the subject of internal revenue, we have not the least shadow of sympathy with those who charge him with corrupt and unpatriotic motives.

The report bears upon its face the stamp of two things rarely combined in public office—great ability and honesty. We regard it as one of the most complete public documents ever issued from any department of the United States Government.

Conceding all this, we still must take exceptions to some of the views entertained by Commissioner Wells, and as we cannot find space to review all the points discussed in his report, we shall, in the present article, only touch upon the opinions of the Commissioner in regard to the income tax.

It is the opinion of the Commissioner, as well as that of the President, that the income-tax law, which expires in 1870 by its own limitation, should be re-enacted. No tax ever imposed in any modern civilized country has been more odious to the people than this. As a war measure it was borne with comparative equanimity; its continuance beyond the present year will be a most unpopular measure.

It will be unpopular, because, from its very nature, the burden it imposes will be, as it has been, more unequally distributed than any other the people are called upon to bear. Clerks living in humble cottages in the suburbs of large towns, and called upon by this tax, as has been ably shown in the January number of the *Atlantic Monthly*, to renounce what otherwise would constitute the sole pleasure fund of their families, do not pass, on their way to and from business, splendid mansions inhabited by men living at the rate or forty or fifty thousand dollars per year, and who have paid no income tax, without a feeling that sore injustice is committed.

The amount collected, and the number from which it is collected, show this tax to be, in the main, a tax on *small* incomes. The Commissioner remarks that only about a million of the population are interested in its removal, while thirty-eight and one half millions are interested in its continuance. The Commissioner has apparently forgotten the very large number who pay no income tax but who annually degrade themselves by artful dodging to get rid of its payment; and if he had remembered it, his knowledge of human nature would certainly have taught him that to these the tax must be even more odious than to those who, feeling the injustice, yet fulfill, honorably, the requirements of the law. But admitting that the many are interested in taxing the few, are we to suppose that Commissioner Wells considers this a good reason why the few should bear a burden from which others are exempted, while they share equally in the burdens imposed on the many? We do not believe he meant to be so understood. We think he means to convey the idea that the few who pay are more able to pay than the many who are, or have made it appear that they are, exempt. We think we could show this to be a mistake, but we must economize space.

The proposed modification of the law, reducing the tax to three per cent and at the same time reducing the amount of exemption for rent would increase the burden, and tax a great many small incomes now exempt. Commissioner Wells thinks this would favor the laboring population, by which it is supposed he means those who do heavy manual labor. If the commissioner has investigated the condition of the people employed in subordinate positions in various industries, as thoroughly as the positive tone of his opinions would warrant us in believing, he ought to know that, exclusive of the very lowest class of laborers, who live upon the earnings of small and miscellaneous jobs, etc., no class of people find it harder to make ends meet than married clerks in large cities, on salaries of from twenty-five to forty dollars per week. In the suburbs of New York, the rental of four small rooms on a second or third floor, anywhere within three or four miles of the centers of business, and in a respectable location, costs from three hundred to four hundred and fifty dollars. The necessary expenses of this class of people for clothing are much greater than those of laborers. The rental of such rooms is not a luxury, as the Commissioner seems to think, and as he would cease to think, if he should inspect a few of these homes. It is a necessity. In fact, there is nothing very luxurious about a salaried position of two thousand dollars, even in parts of the country where it costs least to live, much less in large towns where everything consumed has paid a tax, and where four or five profits have swelled the price on every article of consumption.

Something might be said upon the manner in which this tax has been collected. There is no doubt that much odium has attached to the law from the way it has been administered.

One of the last but not the least of the charges of arbitrary and unjust action which might be enumerated, is the decision of Commissioner Delano in regard to those people known under the general title of communists, including the Shakers, Oneida Communists, Rappites, etc., which refuses to grant to the individuals of such associations the one thousand dollars exemption allowed to all other taxable individuals under the existing law.

Whatever motive may have prompted this decision, it is illegal and unjust, and we do not wonder that the large number of peaceful and patriotic citizens composing these bodies feel greatly aggrieved by it. It has been argued that if the exemption were allowed no income tax could be collected from these associations; from which argument it is to be inferred that the tax must be collected by hook or crook, from somebody, and if the law will not enable the revenue officers to get it without a decision from the Commissioner then the law must be supplemented by a decision. In something of this spirit the law has been executed ever since its enactment, and in such a spirit it will be executed if Congress sees fit to reinforce it.

The law is opposed to the spirit of our institutions; the public are disgusted with it and detest it. Commissioner Wells favors a reduction of taxation; why not then remove the most repulsive feature of our internal revenue system? Congress should not attempt to tinker up a new act of the kind. Let the present law expire as intended by its framers, to be remembered as a doubtful precedent, for any future emergency that may arise. The country has long enough been disgraced and humiliated by it.

THE USE OF EYES.

A young friend of ours, about to commence a nautical career, was requested to call upon an "old salt" just previous to the sailing of the vessel in which the young aspirant was about to make his first trip to Hong Kong, in order to receive some useful advice. The call was accordingly made, and the somewhat laconic advice received, "Keep your mouth shut and eyes open." This advice followed, in its true meaning, is valuable to those who dwell on land as well as those who go down to the sea in ships.

The eyes are, perhaps, the avenues through which more information, in regard to external things, is gained than any other of the organs of special sense; but a very little observation will convince a careful student of human nature that most people are, to a certain extent, blind.

The horse dealer sees well, when he examines a horse. All the points of the animal, good, bad, or indifferent, come under review. An incipient spavin, or splint does not escape his questioning glance. He sees well, because he is interested to see. But this same sharp inspector of horses drives by trees, stones, brooks—walks about through myriad beauties without more than perceiving the outlines of objects, and

> "With eyes that hardly serve at most
> To guard their master 'gainst a post."

And he is by no means an isolated case of this kind of blindness. It may be found in all professions and trades—not even the journalist being an exception, though the full use of eyes is, to him, it would seem, if not an absolute necessity, at least something essential to highest success.

This want of power to see originates in the want of proper discipline. Men are born, if not totally blind, like puppies, yet, with eyes that, like all the other organs and faculties, need to be perfected by education. But the blindness of which we speak is mental blindness. "Men have eyes but they see not." They pass through this world of life and beauty with eyes turned inward. The marvelous panorama of nature passes before them without more than a careless and indifferent glance, now and then, and its details of beauty and grandeur are all unnoticed. The lessons of wisdom they might gain by simply looking and reflecting, are lost through neglect. The eyes will see if the mind commands them.

We presume a large proportion of our readers may convict themselves of this mental blindness, by the simple experiment of looking closely at all the natural objects presented to their notice during a single hour of their existence. Whatever these objects may be—stones, chips of metal or wood, leaves, roots, insects, bark, or what not—we venture to say, nine out of ten may see something in each they never saw before, if they will look with mind as well as eye.

Herein lies the main difference between the man with a full stored mind, and the man of little knowledge. Knowledge of natural things is mainly obtained by seeing. Humboldt was Humboldt principally through a judicious use of his eyes. One of the best habits a young man can cultivate is that of minute observation. Men, things, events, should be scrutinized, not allowed to flit by without attention.

This habit will make a man of small natural ability a match for the careless observer possessing far greater talent, and it makes the man of fine talents great. It made Bacon, Newton, Franklin, Cuvier, Linnæus, Humboldt, Faraday, Tyndall, Rumford, Helmholtz, and Huxley, great lights of science; and Watt, Stephenson, Arkwright, and others, the great mechanics whose labors have culminated in our present high civilization. In any capacity, whether in art, literature, or science, to be great, one must learn to see.

THE METRIC SYSTEM.

Our subscribers have a feeling of annoyance when, as occasionally happens, they see in our journal dimensions and weights expressed in the French metric system. We aim as much as possible to avoid this out of a consideration for the convenience of our readers, though we should, were we to consult our own feelings and convenience, be glad to give, in this manner, an impulse to the general adoption of this beautiful system in America, believing, as we do, that its great value will ultimately lead to its adoption throughout the world.

Notwithstanding, however, we thus, out of consideration for American readers, reduce, for the most part, the French notation to the English system, when we find it necessary to refer to European experiments and discoveries, we sometimes find ourselves obliged to retain it or accept the alternative of inaccuracy in recording current facts. In many cases these measures can only be approximately reduced to the English system, where an approximation will not well answer the purpose in hand.

As the metric system has been almost universally adopted now into the notation of experimental science, although in commercial transactions it has not been used to any extent outside of France, we, and all other journals of a technical character, will undoubtedly be compelled to use it more in the future than hitherto.

Enterprising and far-seeing publishers of school text-books are also adding, in new editions of works involving their use, tables of French weights and measures. They see how the tide is setting, and realize, as we do, that it is folly to attempt to stem it. We must advance with the age, or we shall be soon left out of sight. But while we shall not place ourselves in the rear of an advancing reform in this particular, we shall, as heretofore, use the metric system only where we regard it as essential to accurate statement.

THE GROWTH OF MONOPOLIES.

To the careful observer of current events, nothing in the whole category of results growing out of our peculiar system of Government seems more portentous, than the singular willingness on the part of the people to create gigantic monopolies by special enactment, and to place themselves completely at their mercy. The extent of our territory seems to favor the growth of monopolies. At least it gives scope for the organization of vast corporations who have but to ask in order to receive powers which, as circumstances have recently shown, render them almost independent of legislative control.

If these monopolies were confined to branches of business disconnected from such daily necessities as by their frequent occurrence make the public abjectly dependent upon the sources which supply them, their effects would be less grievous; but it is precisely in the supply of these daily necessities that the most giant monopolies exist, and have obtained the most unrestricted privileges; and it is such monopolies that now in the opinion of some of the most able thinkers of the age, absolutely threaten the liberty of the people.

The most formidable of these monopolies are, at present, railroad, express, telegraph, and gas companies.

In a recent article we have shown how little, as a rule, the public safety and convenience is regarded by railway corporations. Telegraph companies have hitherto laid themselves open to criticism chiefly on the score of high tariffs, but as the transaction of business, and the demands of commerce will necessarily increase public dependence on this means of intercommunication, the possibilities for encroachment upon public rights will also increase. All the elements for unrestricted imposition exist in them, and only wait for the proper time for full development. The gas companies, however, have carried the principle of receiving pay for that which they do not dispense to greater lengths than any other of the monopolies in question.

The official inquiries into the management of these companies last winter, instituted by the New York Legislature, while, as we predicted, they resulted in no relief to consumers, showed in the clearest light, and on the testimony of their officers, that the privileges granted to these corporations were such as the public can never safely grant to any individual or association of individuals.

The *World*, in a recent article reviewing the status of the

gas companies of New York, thus sums up the case against them:

"The citizens of New York to-day stand perfectly helpless before the monopolists. They are compelled to pay for what they do not receive; and the thing that is foisted upon them for their money's worth is nearly worthless. The governments of the continent of Europe, which we are accustomed to regard with such horror, are a little more careful of the people's pockets than this; and with all our boasted self-government we are no better than a prey to political and mercantile swindlers."

This condition of affairs upon which the country has unfortunately fallen, is partly due to the want of foresight in the framing of charters; but chiefly to the ease with which legislative bodies can be manipulated by vast monied interests. The history of the gas investigation last winter at Albany, proves that no ordinary means will avail to compel honesty in the dealings of incorporated companies, when they are rich enough to spend money freely. The attempt was made to fix a standard quality for gas, and to enact that when less than fourteen candle gas was delivered, a drawback should be allowed to the consumer. It is well understood how that bill was killed in the Senate, and how by a liberal use of money, and judicious distribution of shares, the gas companies procured its defeat.

How to now curtail the power of such monopolies is a question of the utmost difficulty. Every attempt to do it has thus far signally failed. We confess that we can at present see no adequate means by which the people at large can combat the power so imprudently vested in unscrupulous corporations. But this we can see; that this power is becoming a danger to the commonwealth, which it is blindness to ignore, and the consideration of which it is folly to defer.

THE PRESERVATION OF MEATS WITHOUT SALT.

There are two reasons why the use of salt for preserving meats is objectionable. The first and most important is that meats thus preserved lose important nutritive qualities, and therefore, if used constantly, give rise to scorbutic diseases, of which impaired nutrition is undoubtedly a cause.

Second, salt meats are for the most part less palatable than fresh.

It is true that in temperate climates where a great variety of food—vegetable, as well as animal—is used, salted meats are largely used without seriously bad effects, their defects being compensated for by other kinds of food; but even with the most abundant supply of vegetable food, fresh meats are preferred when obtainable, and they constitute a large proportion of the food supply of all large cities in civilized countries.

Such being the case, all attempts at preserving meats fresh during their transportation through long distances, from localities where meat is cheap and abundant, are of the highest importance, especially to the poor who find it difficult to obtain a proper supply of fresh meat.

It has been recently announced, that an eating house in London has been able to furnish a good nourishing bowl of meat soup to the poor, at the low price of two cents, and a plate of well-cooked, wholesome, fresh meat at the same price. It is also stated that a similar establishment has also commenced operations in Paris. These meats have been brought from New Zealand and Australia, and are said to arrive in excellent condition.

We have from time to time discussed various meat-preserving processes invented in this country and in Europe, and we will in this article give some particulars of more recent methods.

One of these is a method employed by M M. Tellier and Lecoq, at Monte Video. The apparatus used was a freezing machine, invented by M. Tellier. The fullest account of this apparatus we have met with is contained in the *Leader*, a journal published in Melbourne, Australia:

M. Tellier, as his means of freezing, uses the volatile gas of ammonia, or methylic ether. Under the influence of the heat contained by the liquid or the air to be cooled, the vaporization of the gases takes place; a force-pump compresses the vapors thus formed, which are condensed in a worm or or series of small tubes, surrounded by cold water, where, being again liquefied, they return to the evaporator, and reproduce the same effects. M. Tellier prefers methylic ether, as under his system he obtains from it the same results in cold, by a pressure not exceeding 50 lb. to the square inch, as he can with the pure gas of ammonia under a pressure from 120 lbs. to 200 lbs., according to the temperature of the atmosphere.

As all forms of ether, from the liability of ignition, are objected to on board ships, M. Tellier was compelled to employ the pure ammoniacal gas as his freezing agent. The meats to be preserved were suspended in a small room between decks, carefully protected by thick non-conductors. Air cooled in the machine down to 32 degrees Fahrenheit was, from time to time, circulated round the meats, the object being not to freeze them.

These gentlemen placed on board a steam packet running to London, about half a tun of fresh beef, mutton, poultry, game, and fish, inclosed in a temperature reduced to 32° by means of one of M. Tellier's freezing machines.

It seems that the machine was too complicated, and that by the time the ship reached the equator, the pump worked with difficulty, and a large escape of gas ensued. From the seventeenth to the nineteenth day out, the temperature rose from 32° to 36° Fah, and when the pump ceased to act, the meats decomposed before repairs could be effected.

An important defect in this experiment appears to have been in not freezing the meat at the outset, as in a frozen state it would have doubtless kept until the pump could have been repaired. The pump works under a pressure of two hundred pounds per square inch, and it must be therefore a matter of some difficulty to keep it from leaking during an entire voyage. On shore, as an ice-making machine, the apparatus is said to work well. One of them is at work at Marseilles in France, producing, it is stated, ten tuns of ice per tun of coal consumed.

The use of flat boxes for packing frozen meat, is said to have proved very good for the purpose, the broad sides being of sheet iron to form a freezing surface, and the narrow sides of deal to form a non-conducting surface. The boxes are about a yard square, and from five to ten inches in depth; and Mr. Julius Jeffreys, the originator of this plan, proposes to place them together in one solid mass, and to keep a double current of chilled air in constant circulation over the whole surface of the mass. Blowers or fanners will draw the currents from the chilling chamber surrounding the ether or ammonia vessel, as the case may be, and containing a series of sheet metal chilling tubes. The air will be driven along air passages traversing lengthways an air casing, surrounding everywhere the block of boxes.

An ammonia ice-making machine, invented by Mr. Rees Reece, is highly spoken of by the Australian press, and our readers will bear in mind that in no part of the world has more attention been paid to this subject than in Australia, where cold is regarded as the only means by which her vast surplusage of mutton can find a market. The details of this machine are not given; but the *Leader* states that its special superiority consists in its construction and arrangement for effecting the continuous distillation and rectification of dilute solution of ammonia upon what is known as the separative principle. By its use, it is stated, twenty-five to thirty tuns of ice can be made with a consumption of one tun of coal, and even more than this is claimed, but it is evident that these results are over-stated.

The tendency of opinion seems to be at present setting more and more strongly to freezing processes as a means for preserving meats, and we think there is more hope that success will be reached "on this line" than in any other way.

CANAL THROUGH THE ISTHMUS OF DARIEN.

There are probably few thinking men who do not foresee that, sooner or later, a ship canal must connect the Atlantic and Pacific waters. Which of the routes hitherto surveyed and discussed will be ultimately selected as most favorable to success in a work of this kind, time will show; but at present there is really too little knowledge of possible routes to form a correct and final judgment. An error in choice, easily avoided by a proper exploration at the outset, may involve unnecessary and enormous expense in construction.

Three routes have been much mooted, and our general knowledge of them obtained by former surveys is enough to give a tolerable idea of their feasibility. The Panama route involves only twenty-eight miles of construction, but there are difficulties which, although not insurmountable are of great magnitude. The Nicaragua route *via* the river San Juan and Lake Nicaragua involves only sixteen miles of construction, but it involves the improvement of the river navigation, and, without doubt, also that of the lake. The third route discussed, called the Tehuantepec route, is one hundred and thirty miles in length, and there is probably less accurate knowledge in regard to it than either of the others.

The matter standing thus the Government has acted wisely in dispatching a steamer to Aspinwall to make surveys and gain further light.

Meanwhile, and in anticipation of the presentation of the subject to Congress for definite action, the press, which will undoubtedly almost unanimously favor the project, can do much to create a popular opinion in its favor.

That the immediate construction of such a canal would result in great and lasting benefit to the commerce of the United States seems to us as scarcely admitting of dispute. The most casual inspection of the map of the world will show that many of the richest and most productive portions of the globe would be brought so near to our Atlantic ports that no nation would be able to successfully compete with us in securing their traffic. The East Indies, China, Japan, and the whole Pacific coast of South America, would naturally pour their vast products into our warehouses and freight our merchant vessels with profitable cargoes. And last, but not least, the dangerous passage of Cape Horn, hitherto the dread of navigators and the scene of untold disasters, would be abandoned forever as an avenue of commerce.

NEW FACTS ABOUT THE PRESERVATION OF TIMBER.

Mr. Charles Coisne, from Belgium, in a report on the prepared timber exhibited in Paris, in 1867, remarks, that at present only two methods for the preservation of railway sleepers seem to be in use, to wit: The saturation with sulphate of copper, and the one with oil from gas tar. Only the latter is considered as really practical and effective. The Southern French Railway Company exhibited pine sleepers that had been impregnated with sulphate of copper; but, albeit, they had been only from seven to ten years in use, some of the specimens, on examination, were found to be more or less rotten. Specimens of Dorsett and Blythe, in Bordeaux, appeared well preserved; but no date as to the time of their being in use could be ascertained. The creosotized fir sleepers from Bethell, in London, were perfectly unaltered after having been in the ground from sixteen to twenty years. Creosotized beech and oak sleepers of Dorsett and Blythe showed also no marks of rot; but they lacked data as to the time they had been in service. The first wood-creosotizing establishment, according to Mr. Coisne, was founded in Antwerp, in 1858, the second in Ostende, in 1859, and a third in Ghent a year later. 1,682,880 railway sleepers were impregnated in these establishments during the last decade, besides a great deal of timber for Belgian sea-ports. Two thirds of all the sleepers in Belgium have undergone the process of creosotizing. It might, therefore, be supposed that the cost of maintenance for ties on these lines would soon be reduced to almost nothing. However, this will probably not be the case, for some of the ties that are injected with oil from gas tar exhibit, after the first few years, marks of a more or less advanced decomposition. This cannot be attributed to the ineffectiveness of the creosote, but must be ascribed to the fact that the impregnation had not been complete. It has been taken for granted that 150 liters of creosote are sufficient for one cubic meter, but this quantity is hardly sufficient to saturate the sap-wood; the denser heart wood becomes rarely saturated. This accounts for the fact that the latter is most subject to rot. Mr. Coisne, in 1864, recommended to perforate the level part of the sleepers where the heart wood lies exposed, and also the surfaces of support of the chair. It is satisfactory to state that this process has been employed with good results by the chief civil engineer of the Department de la Vendée, France. When improper timber is selected, or when the timber is treated on wet or cold days, or when inferior creosote is employed, one may be almost certain that the hopes anticipated as to the endurance of the material will not be fulfilled. The results which Bethell obtained in England have been confirmed in Belgium. Thirty per cent of creosotized fir sleepers were found to be still unaltered, after eighteen years' service. As to the amount of creosote absorbed by them, it was ascertained to be twenty liters, which quantity was obtained in deducting the average weight of non-prepared sleepers from that of prepared sleepers. The creosote did not contain any carbolic acid, but considerable portions of napthaline; it was distilled at a high temperature, dissolving in naphtha to which it imparted a green color.

In 1862, 1,297 telegraph poles were creosotized in Ghent, Belgium; in 1863, 3,553 pieces. On the other hand, 600 were treated in 1864, in closed vessels with sulphate of copper, and 3,010 in 1865. The last mentioned process must be considered far superior to the method of Boucherie, for which the trees must be felled in the most unfavorable season. If not well executed, the impregnation of telegraph poles with creosote oil, will likewise not yield satisfactory results.

Coisne finally recommends to comply with the following requirements: 1. The injection should be carried to complete saturation, 250 liters of creosote being necessary for one cubic meter of wood. For oak, of which only the sapwood need to be saturated, 100 liters are considered sufficient. 2. The creosote employed should be distilled at a high heat. Two thirds should be gathered at a temperature exceeding 480 Fahrenheit, while one-third at most should not be collected below 390 Fahrenheit. The oil should be of a greenish color, and not contain over thirty per cent of napthaline. 3. The heart-wood, wherever it lies exposed, should be well perforated with a proper instrument so that the preservative may pass everywhere. 4. The wood should be exposed to the air for eight or ten months, before treating, and the saturation must be effected first in the vacuum and subsequently under pressure.

MADDER EXTRACTS AND THEIR APPLICATION IN TOPICAL DYEING.

In spite of the discovery of the aniline pigments, madder has retained its prominent position in topical dyeing, or calico printing. This is easily explained when we take into consideration the beautiful shades produced by means of alumina and iron mordants, and also their wonderful stability.

Since the beginning of this century great strides have been made in the preparation of extracts of madder; partly on account of the introduction of cylinder printing machines, partly because of the rapid increase of the knowledge of the chemicals employed in this art.

Let us glance over the various modes for preparing madder root. Formerly this latter was simply dried and ground, but in more recent times, great care has been bestowed upon the removal of the foreign ingredients with which madder is associated; and this eventually led to the preparation of the madder flowers, garancine, and alizarine. But as these dyestuffs are admixed with a considerable proportion of fibrous substances, their coloring power is only seven or eight times greater than that of the root, and, besides, they can serve for dyeing only, not for printing, at least not according to the old methods.

Various attempts have consequently been made for some time past to fix the madder dyes on the cloth by printing. Experiments in this direction were undertaken by Robiquet, Colin, Lagier, and Persoz in 1827; ten years later, Gastard, in Colmar, discovered a process which was improved upon in 1855 by Hartmann, and introduced into some print works of small extent. These methods were similar to each other in that the cloth was uniformly mordanted, then printed with a solution of madder extract in ammonia, soda, or soap, and finally exposed to steam. However, it was soon discovered that uniform mordanting is not practical, unless perfectly pure alumina bases are at hand, and, besides, the madder extracts at that time brought into market were too impure to yield constant results, or to allow the simultaneous fixation of mordant and pigment.

These extracts were mostly prepared by exhausting madder flowers or garancine with wood spirits or alcohol, their coloring power was fifty times greater than that of the dye root, but they contained about sixty per cent of ineffective resinous matter.

As a very excellent product for its time may be mentioned the "colorin" of Lagier and Thomas, which, however, did

not come into very extensive use; the times not being favorable for the employment of madder extracts. E. Kopp first indicated a method, admitting of practical use, by which the two principal pigments of the madder, alizarine and purpurine, could be separated. The purpurine of Kopp has found but a limited sale, but the yellow alizarine, as obtained from the green alizarine by the use of mineral oils, has become generally employed.

The difficult problem to print alizarine on unmordanted goods was solved about the same time. The conditions for the success of this operation may be enumerated as follows: 1. A very concentrated and pure extract of madder. 2. Employment of a perfectly pure acetate of alumina. 3. A proper acid solvent for the pigment. Crystallized acetic acid is generally used. 4. The use of certain substances, as tin salts, fatty acids, or lime salts, in order to impart to the dye a hygroscopic consistency and to modify its shade. The thus composed and properly thickened dye is printed on simultaneously with the other dyes; the printed goods are now hung up for some time in a warm and moist room, then steamed, and finally passed through soap-water, if required.

For violet, the acetate of alumina must be replaced by acetate of iron. As to the white spots which occur after the application of the color on immature cotton; they do not appear in this process.

Pure alizarine yields a very beautiful violet, but a red of a violet tint. A good red can only be obtained with extracts that contain both alizarine and purpurine, and a part of the yellow coloring matter in proper proportions. Such extracts, however, yield a dull violet. The colors with which red is most successfully employed are aniline-black, chrome-orange, and the genuine albumine colors.

According to our present state of knowledge, it is probable that the madder pigments pre-exist in the root in the form of soluble, readily decomposable glucosides, or sugar-yielding elements. However, there remains no doubt about the existence of the following elements: 1. The alizarine, discovered by Robiquet and Colin. 2. The purpurine, examined by Persoz, Runge, Debus, Wolff and Strecker, and Schutzenberger. 3. The pseudo-purpurine. 4. An orange color. Both of these latter were found in the purpurine of Kopp. 5. Purpuroxanthin, a yellow pigment that has also been isolated by Schutzenberger from commercial purpurine. These pigments are crystallizable, and differ from each other by their physical properties, their solubility in different neutral and alkaline solvents, their composition, and finally by their deportment in dyeing, as shown by the following:

ALIZARINE yields stable colors that resist soap and aqua regia; yields a red with a violet hue, but a very pure violet.

PURPURINE AND ORANGE COLOR are both stable dyes, resisting soap and aqua regia tolerably well; produce very bright reds, but dull and grayish violets.

PSEUDO-PURPURINE.—This color is completely decomposed by nitro muriatic acid (aqua regia); it yields a brick red and pale violet.

PURPUROXANTHIN produces shades of little stability; gives orange yellow with alumina and a pale gray with iron mordants.

This shows that the different madder colors differ considerably. Only the purpurine and the orange color, which is a hydrate of the purpurine, do not differ with regard to their dyeing properties, but the greater solubility of the latter in alcohol leaves no doubt that they are different bodies. The stability of the shades furnished by their dyes seems to be in reverse proportion to the amount of hydrogen present. The greater the percentage of oxygen the more the colors pass from violet red into a pure red, and from a pure violet into a spotted and gray violet.

In noting these differences, the manufacturer will be enabled to mix the various dyes in the proper proportions, they also account for the unequal qualities of madders of different origin. The fastness of the madder from Alsace is, for instance, not only attributable to its freedom from chalk, but particularly to a great percentage of pseudo-purpurine, which is lacking in the Avignon madder. Garancine furnishes also less enduring shades than the madder flowers. The reason for this has been searched for in the presence of traces of sulphuric acid that adhere to the fiber in spite of constant washing; but it is more probable that the coloring matter, which in the madder flowers is combined with lime, belongs to the purpurine group, and that in isolating it with an acid the color is intensified, but it is so at the expense of stability. The purpurine possesses more affinity for bases than alizarine.

AERIAL NAVIGATION.

A paper read by JOHN WISE, Aeronaut, before the Franklin Institute, Dec. 15, 1869.

Dr. James Bell Pettigrew, in a discourse before the Royal Institute, of Great Britain, on the subject of Aeronautics, said, among other things: "In order to construct a successful flying machine, it is not necessary to imitate the filmy wing of the insect, the silken pinion of the bat, or the complicated and highly differentialed wing of the bird, where every feather may be said to have a peculiar function assigned to it; neither is it necessary to reproduce the intricacy of that machinery by which the power in the bat, insect, and bird is moved; all that is required is to distinguish the power and extent of the surfaces, and the manner of their application, and this has, in a great measure, been already done. When Vivian and Trevithick constructed the Locomotive, and Symington and Bell the Steam Boat, they did not seek to reproduce a quadruped, or a fish—they simply aimed at producing motion adapted to the land and water, in accordance with natural laws, and in the presence of living models. Their success is to be measured by an involved labyrinth of railroad, which extends to every part of the civilized world, and by navies, whose vessels are dispatched, without the slightest trepidation, to navigate the most boisterous seas, at the most inclement seasons.

"The aeronaut has the same task before him, in a different direction, and, in attempting to produce a flying machine, is not necessarily attempting an impossible thing. The countless swarms of flying things testify as to the practicability of the scheme, and nature at once supplies him with models and materials. If artificial flight were not attainable, the insects and birds would afford the only examples of animals whose movements could not be reproduced. The outgoings and incomings of the quadrupeds and the fish are, however, already successfully imitated, and the fowls of the air, though clamorous and shy, are not necessarily beyond our reach. Much has been said and done in clearing the forest and fertilizing the prairie—can nothing be done in reclaiming the boundless regions of the air?"

Certainly there can, if we begin right! As the first seaships were not made to be propelled by steam and paddle-wheels, but to be drifted leisurely on the water before the winds, I propose to inaugurate a system of aerial navigation on the like unpretentious principle; namely, drifting in the currents of the trade winds to such points and places as are within the known province of the resources of aeronauts. We have, in this Northern Hemisphere, a system of trade-wind currents, at present so well authenticated and understood as to be acknowledged by the leading scientific institutions of the world as established meteorological facts, of daily recurrence; and I have practically explored them time and again for thirty years past. In the temperate zone these currents blow from the southwest and the northwest, overlapping each other and producing, between them, a compound or eddy current, blowing eastward.

In the spring and in the autumn these two great currents form conjunctions, and produce, for some days, those violent gales termed equinoctial storms, continuing until the balance is restored between the going and the coming of the trade winds, circulating between the equatorial and polar regions. The lower portion of the lower stratum of these currents—that is, the one from the northwest, is all the time, more or less, sliding off toward the south, and gradually curving round until it reaches the intertropical regions, where it is recognized by mariners as the northeast trade wind; and here, meeting the more rapid motion of the earth's surface from west to east, as well as the equatorial heat, it is whirled westward and upward, and pressed outward, as it ascends, producing the great upper current from the southwest; and thus the northwest current has become the southwest current.

On the other hand, our southwest current is all the time passing off a portion of its upper surface to the north, until it reaches the frigid zone, where it sinks down and becomes the northwest trade-wind current, underlapping the upper current, and, by its friction against the latter, producing what I term the eddy current, blowing nearly direct toward the east.

Thus, we have, within the practical capability of the ordinary air ship, the means of reaching any place east, northeast, or southeast from the place of departure in our latitude.

It is an easy matter to sail from Philadelphia, New York, Boston, or Baltimore, to St. Petersburg, London, Paris, Madrid, Lisbon, or Gibraltar, or to any point within that range of latitude, as it becomes simply a matter of constructing an aerocraft that is capable of floating in these currents of the atmosphere for a few days, and we know that air ships can be constructed that will retain a sufficient buoyancy for many days. Napoleon the First had one constructed and used, that ascended with its practicing army pupils thirty days after its inflation—time sufficient to circumnavigate the globe with an air-ship.

The change of dimension of the bulk of the inclosed gas by change of temperature between day and night, is to be compensated by a balance rope. When the sun increases the levitating power of the air float, it will soon find its equipoise in lifting from the surface of the sea, or the land its equivalent of the balance rope, and its loss by the coolness of the night by giving back to the land or water its equivalent of weight.

I have practiced this current sailing for over thirty years, more or less, made over 400 voyages—from 100 to 1,000 miles in length—and never failed to find these trade-wind currents when an altitude of 5,000 to 12,000 feet was attained although at these times currents from opposite directions frequently prevailed on the surface of the earth. An air vessel of 100 feet diameter, two thirds filled with coal gas, would have a net carrying power of 9,000 pounds, and would be all sufficient for a practicing machine with a view to sound these currents across the ocean and to test the practicability of establishing an air-line of mail and passenger conveyance from this country to Europe. Pleasure seekers and invalids would find it a swift and easy voyage from America to Europe—no sea-sickness and less than three days to make the voyage.

This is certainly a feasible plan for the inauguration of trial trips, and is seriously worthy the attention and application of the enterprise and genius of the present day and in our own nation. A little barometrical practice in the scheme would soon teach us how to lay our lines for a successful system of trans-Atlantic aerial navigation.

The First Californian Beet Sugar.

A lot of Californian beet sugar has been made, and the business may be regarded as established, with every prospect of speedy and large development. We have heretofore spoken of the experimental factory near Sacramento, intended to test the practicability of making sugar from beets grown in the State of California. There was a doubt about the soil. It was feared that the prevalence of alkali generally made it almost certain that, even where not apparent to the eye, there would be enough to prevent the crystallization of the sirup into sugar.

It has already been shown by analysis that our sugar beets are sufficiently rich in saccharine matter. The only question, therefore, being on the crystallizing of the sirup, very rude works were put up, which were considered sufficient to prove the point in controversy. With rusty iron boilers, and rivets covered with oil, the sugar was expected to be dark enough. "But," said the shareholders, "let it be as black as your hat, only so it is crystallized sugar, and the money is ready to put up the right kind of work."

On the 10th of December, 1869, all questions of doubt were set at rest by the production of 150 pounds of crystallized sugar from white Silesian beets grown on the borders of the American river—leaving an unexpectedly small portion of molasses. The experiment was conducted by W. Wadsworth, Esq., who studied in European sugar works, and who is well practiced in the various processes known in France and Germany. The process used in the experiment is very simple. A revolving cylinder washes the beets; then revolving knives cut them into very thin ribbons, which are macerated for a short time in cold water, and which extracts every portion of saccharine matter. Some lime is used to extract the bitter principle, and carbonic acid gas removes the lime by precipitation. Steam pipes and evaporating pans follow; boiler, animal charcoal, and settling vessels complete the process. The success of this first experiment will soon lead to the multiplication of sugar mills, and in a few years California may be independent of foreign supplies. The next thing the Sacramento Company will prove will be the percentage of sugar in our beets—which will be determined next week.—*Alta California.*

Immensity and Violence of the Solar Forces, as Exhibited in Recent Photographs.

The astronomer of the *Spectator* is still finding wonders in the sun. He has now been examining some photographs by Dr. Zoller, of the "colored prominences" in the solar atmosphere, and is justly amazed at the immensity and violence of the forces whose action is indicated by them.

"Here," he says, "is a vast cone-shaped flame, with a mushroom-shaped head of enormous proportions, the whole object standing 16,000 or 17,000 miles from the sun's surface. In the cone figure we see the uprush of lately imprisoned gases; in the outspreading head the sudden diminution of pressure, as the gases reach the rarer and upper atmosphere. But turn from this object to a series of six pictures placed beside it, and we see the solar forces in action. First, there is a vast flame, some 18,600 miles high, bowed toward the right, as though some fierce wind were blowing upon it. It extends in this direction some four or five thousand miles. The next picture presents the same object some ten minutes later. The figure of the prominence has wholly changed. It is now a globe shaped mass, standing on a narrow stalk of light above a row of flame hillocks. It is bowed toward the left, so that in those short minutes the whole mass of the flame has swept thousands of miles away from its former position. Only two minutes later and again an entire change of appearance. The stalk and the flame-hillocks have vanished, and the globe-shaped mass has become elongated. Three minutes later, the shape of the prominence has altered so completely that one can hardly recognize it for the same. The stalk is again visible, but the upper mass is bowed down on the right so that the whole figure resembles a gigantic A, without the cross-bar, and with the down stroke abnormally thick. This great A is some 20,000 miles in hight, and the whole mass of earth might be bowled between its legs without touching them! Four minutes past, and again the figure has changed. The flame hillocks reappear, the down-stroke of the A begins to raise itself from the sun's surface. Lastly, after yet another interval of four minutes, the figure of the prominence has lost all resemblance to an A, and may now be likened to a camel's head looking towards the right. The whole series of changes has occupied but 23 minutes, yet the flames exceeded our earth in volume tenfold at least."

The same writer begs those who consider this subject to bear in mind the enormous size of the sun; so great, that if it were represented by a globe two feet in diameter, the earth would appear no larger than a cherry stone. He says:

"We recognize in our hurricane the action of nature in her fiercest moods, but the solar hurricanes would, in an instant, destroy the whole globe on which we live. We wonder at the volcano which lays a whole city in ashes, but our earth would be swept like a mote before the rush of a solar volcano. We see, lastly, in the earthquake, which upheaves a continent, the most energetic of all the forces at work upon our earth, but the least of the throes which convulse the solar surface would toss a globe like ours as waves of the ocean toss the lightest sea drift."

A NATURAL CURIOSITY.—P. C. Mixter, of West Sandlake, New York, has kindly sent us a remarkable root of a fir tree, cut from the interior of a well. The root is a curiosity. He writes us that the tree is about nine inches in diameter, and stands about eight feet from the well. The root entered the well about three feet from the top, and ran down the wall until it reached the water. After descending about nine feet, it divides into three branches which subsequently subdivide until the extremities form a bunch resembling much the tail of a horse. The entire length of the root is not much less than eighteen feet. This power of the roots of plants to search for the water they need almost looks like instinct.

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.

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

Money to invest in some new article of real merit. Address W. P. Spence, Box 79, Stapleton, N. Y.

Cisterns prevented from overflowing and bursting by Muss' Patent Water Leader. Agents wanted. For particulars inquire of J. Muss, Box 736, Quincy, Ill., or J. R. Mitchell, Salem, Columbiana Co., Ohio.

Recipe Wanted—To enamel, japan, or varnish rusty galvanized Iron Wire Nets, which are used for drying glue on. Must be cheap and easily applied. Peter R. Lamb & Co., Toronto, Canada.

Send for circular of Oldham's Excelsior Clothes Dryer, a rare chance to make money. Address Geo. Oldham, Jr., Cuba, N. Y.

Manufacturers of Shingle Machinery please send circulars and price lists to M. A. McAfee, Talbotton, Ga.

Wanted—A situation as Sup't in a Foundery & Machine Shop. Well posted in pattern making, etc. Address C. P. W., 25 Pearl st., N. Y.

G. W. Lord's Boiler Powder for the removal of scale in steam boilers is good and reliable. We sell on condition. Send for circulars to G. W. Lord, 107 West Girard Avenue, Philadelphia, Pa.

Pyrites wanted—Containing Gold, Silver, or Copper. Address A. G. Hunter, Jackson, Mich.

Patent Rights bought and sold by R. T. Bradley & Co., 131 Fourth st., Cincinnati, Ohio.

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

Every wheelwright and blacksmith should have one of Dinsmore's Tire Shrinkers. Send for circular to R. H. Allen & Co., Postoffice Box 376, New York.

Aneroid Barometers made to order, repaired, rated, for sale and exchange, by C. Grieshaber, 107 Clinton st., New York.

Foundery and Machine Business.—Experience, with some capital, wants an engagement. South or West preferred. Address Box E. E., Catskill, N. Y.

Foreman in a Machine Shop—A person having ten years experience in that capacity is desirous of forming a new engagement. Address, with particulars, Postoffice Box 119, La Crosse, Wis.

Back Nos., Vols., and Sets of Scientific American for sale. Address Theo. Tusch, No. 37 Park Row, New York.

Mineral Collections—50 selected specimens, including gold and silver ores, $15. Orders executed on receipt of the amount. L. & J. Fenchtwanger, Chemists, 55 Cedar st., New York.

The Babcock & Wilcox Steam Engine received the First Premium for the Most Perfect Automatic Expansion Valve Gear, at the late Exhibition of the American Institute. Babcock, Wilcox & Co., 44 Cortlandt st., New York.

For best quality Gray Iron Small Castings, plain and fancy Apply to the Whitneyville Foundery, near New Haven, Conn.

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

Foot Lathes—E. P. Ryder's improved—220 Center st., N. Y.

Those wanting latest improved Hub and Spoke Machinery, address Kettenring, Strong & Lauster, Defiance, Ohio.

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

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

Send 3-cent stamp for a circular on the uses of Soluble Glass, or Silicates of Soda and Potash. Manufactured by L. & J. W. Feuchtwanger, Chemists and Drug Importers, 55 Cedar st., New York.

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

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

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

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

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

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

Answers to Correspondents.

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

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

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

W. H. K. & Co., of Pa.—You can run a boiler with salt feed water without more than the ordinary injury to it until the salt deposits upon its surface. Before this takes place, the surplus salt in the concentrated water should be got rid of by what is called "blowing off," which carries off the supersalted water. The length of time you can run without blowing off depends entirely upon the amount of evaporation and the saltness of the water. We advise you to get "Bourne's Catechism of the Steam Engine," from which you can get the fullest information on this subject.

G. B., of Vt.—Your first query is answered in an article recently published in our columns, on the injurious effects of plants in sleeping apartments. You ask further, "Is there any danger of carbonic acid descending from a flue above an open fireplace, when it is discharged into a chimney through the fireplace into the room where the fireplace is placed?" We think there would be, unless a strong draft were maintained in the chimney by a fire in the lower fireplace.

L. & Co., of Pa.—Theoretically there should be no difference in in the economy of running a one cylinder engine of eighty-horse power or a of two cylinder one of the same power.

R. S., of N. C.—Heat escapes in three ways, by convection, conduction, and radiation. Only the last two are concerned in the escape of heat from the outer surface of an inclosed tube, but both must be guarded against. Air is a bad conductor but does not resist radiation. Charcoal pulverized of course holds air in its interstices, and it has been found by experience to be excellent as an imprisoning agent for heat in hot water pipes, etc., and as a filling for refrigerators.

J. R. M., of Ohio.—It is not true that water enters a vacuum as rapidly under atmospheric pressure as when its surface is subjected to greater pressure. Of course the higher a column is carried in a pipe before reaching the vacuum chamber, the more counter resistance from the weight of the column will be experienced.

W. D. F., of Cal.—The plan of elevating the streets at crossings and allowing them to descend to the middle of the intervening blocks, has already been suggested and decided impracticable. Not impracticable in construction, but it is thought the people will not tolerate it.

S. J. T., of Ga.—The metallic appearance of the mineral you send is due to the presence of iron in the shape of pyrites. The mineral is of no value unless it also contains precious metals, which is not probable and would require analysis to determine.

E. S., of N. Y.—We think you have misunderstood the import of the article on balance wheels of watches referred to. If you wish to bring your proposition before the public, you should advertise it in our "Business and Personal" column. Your communication is respectfully declined.

F. L. C., of Ohio.—The New York Belting and Packing Co., 39 Park Row, New York, make an extra stout hose which we regard as the best flexible steam pipe to be had. It costs about fifty per cent more than the common hose.

M. S., of Mo.—We do not know positively what effect the chlorine would have upon the glue which holds ivory to wood, but we think ivory might be bleached while glued to wood without damage. You can by a slight experiment determine this for yourself.

A. M., of Vt.—It will take no more power to drive a machine at the end of a shaft remote from the main driving pulley than at any other part of the shaft, provided the shaft is perfectly lined. If out of line the case is different, and as absolute perfection is unattainable, it is probable that practically a little more is generally required to drive machinery remote from the main pulley than near to it.

D. P. C., of Md.—We do not believe in discharging exhaust steam into a brick chimney. It is liable to disintegrate the mortar and destroy the chimney. The proper way to secure a good draft is to correct the proportions of the chimney. This will also prove the most economical in the long run.

C. H., of Me., and others.—A hollow cylinder of metal of any kind is stronger than a solid cylinder of the same weight and length. Although a hollow cylinder might be, in some instances, as strong or stronger than a solid one, the same diameter and length, it would not do to make such a proposition general.

C. D. M., of Oregon.—To find the proper weight for a safety valve, multiply the number of pounds pressure per square inch you wish to carry in the boiler, into the area of the inner side of the valve in square inches; then multiply this product by the distance from the center of the valve stem to the fulcrum of the lever, and divide the product thus obtained by the distance the weight is to be suspended from the fulcrum; the result will be the weight in pounds.

J. H. S., of Ohio.—Your views are, in our opinion, altogether wrong; but whether correct or not, they do not affect the question of the relative ease of draft between wooden and iron axletrees. The position taken in this matter was that all the circumstances should be equal or similar. You consider them as dissimilar.

A. S. R., of Texas.—You can change cider to vinegar quite rapidly by leaching it slowly through beech shavings, birch twigs, or corn cobs, a proper temperature, 90° to 92° Fah., being maintained. We can not answer your second query about horseshoes. We find none advertised in our paper.

T. D. H., of N. Y.—The throat of your fan wheel should have sectional area equal to that of one third the diameter of the fan. It may be somewhat larger without injuring its working qualities.

S. H. W., of Oregon.—It requires a hot fire to melt the glazing for pottery. Furnaces capable of producing intense heat are usually employed. There is no difference chemically between the terms "sea salt" and "common salt." Both mean chloride of sodium.

E. P. L., of Wis.—One stick of timber used as a stringer eight inches by twelve is better and stronger, in our opinion, than two eight by six, with keys eight feet apart and bolted at each key, provided the timber used is of equally good quality in both cases.

W. B. G., of Mass.—The gyroscope was noticed in our journal many years ago. We refer you to the back volumes. We do not wish to resume the discussion of this subject at the present time.

W. J. A., of N. Y.—A round bar of wrought iron one inch in diameter is stronger than a wire rope of the same size.

A. M., of Ky.—If by your query you wish to ascertain whether we think it economy to work steam expansively, we answer—Yes.

A. E. G., of Wis.—An engine of 5-horse power over and above friction, will raise 182 gallons of water 29 feet per minute.

Recent American and Foreign Patents.

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

STEAM GOVERNOR.—C. D. Allen, New York city.—This invention relates to a new and useful improvement in governors for steam engines whereby such governors are made more useful than they have hitherto been.

ANTI-FRICTION JOURNAL BEARINGS FOR HOISTING MACHINES AND OTHER PURPOSES.—Robert G. Hatfield, New York city.—This invention relates to a new and useful improvement in machines for raising weights and moving bodies in any direction, and consists in mechanism for diminishing friction on the journals.

PROPELLING BOATS.—Daniel J. Ross, Havre de Grace, Md.—This invention relates to a new and useful improvement in the mode of propelling boats through the water, more especially designed to be applied to small boats, or those which are usually propelled by oars.

TUBE CUTTER.—John Peace, Camden, N. J.—The object of this invention is to provide a tool for cutting tubes of all diameters by hand and with great facility.

SPRING-BED BOTTOM.—Andrew Cole, Mishawaka, Ind.—The object of this invention is to provide a durable, simple, and highly elastic bottom for beds.

AXLE GAGE.—Gottlieb Luedke, Princeton, Wis.—The object of this invention is to provide improved gages for easily determining the pitch for the arms of the wood axles, by which to be guided in dressing down the said arms for the reception of the skeins, so that when the wheels are placed therein the spokes of dished wheels will, when at the under side of the hubs, stand perpendicular.

SCREW CLAMP FOR SHIPWRIGHTS.—Wm. H. Phillips, Bridgetown, N. J.—The object of this invention is to furnish a simple and effective screw clamp for shipwrights' use. It is to be employed in planking the hulls of vessels, in which operation each successive plank must be forced down firmly against the upper edge of the preceding one, before it is fastened with treenails, bolts, or spikes. This forcing of the two planks together requires an apparatus capable of developing great power, owing to the edgewise curve or "snye," so-called, which the form of the hull requires of the planks.

VAPOR CANDLE.—L. Chandor, St. Petersburgh, Russia.—This invention relates to new and useful improvements in vapor candles.

SLEEVE BUTTON.—John Kenmuir, Leavenworth, Kansas.—This invention relates to improvements in fastening devices for sleeve buttons, and consists in the application to the back of the button of a hinged hook and spring catch, the said hook being bent into the proper form to be passed through small holes in each part of the sleeve, and then through a hole in the back of the button, for engagement with the spring catch.

SKATE.—Charles T. Day, Newark, N. J.—This invention consists in pivoting the clamping levers which carry the jaws together, and in forming a curved nut on each pair of such levers, so that the right and left hand adjusting screw can be fitted through both the said nuts in a diagonal position.

SUN DIAL.—Ludwig Ignatius Trueg, St. Vincents, Pa.—This invention relates to a new sun dial which is so constructed that it can be correctly set in accordance with the several degrees of latitude, and to be in conformity with the actual time of correct clocks. The invention consists chiefly in the employment of a graduated arc which is pivoted at its ends and which receives the shadow from the indicator plate.

REVERSIBLE CHAIR.—William H. Joeckel, New York city.—This invention has for its object to provide a simple device whereby, on such chairs which have reversible backs, the seat will be inclined backward whenever the position of the back is changed. The invention consists in the application of a cam to the pivot of the back, working between forked ears that project from the pivoted seat. Whenever the back is turned over the cam will be turned over with it to change the position of the seat.

BUTTON.—A. P. Critchlow, Northampton, Mass.—This invention has for its object to so construct buttons of all kinds, that the same can be readily fastened to garments or other articles, and that they may be constructed at a small cost.

WATER WHEEL.—R. W. Trude, Clearfield Bridge, Pa.—This invention has for its object to furnish an improved water wheel, simple in construction, effective in operation, and which will not be impeded in its operation by back water.

CULTIVATOR.—Jesse A. Wilson, Hamburgh, Iowa.—This invention has for its object to furnish an improved cultivator, which shall be strong, simple in construction, and effective in use, being so constructed that the frame work of the cultivator will readily pass over the rows of plants without injuring them.

SEED PLANTER.—J. L. Strait, Cooksville, Mich.—This invention has for its object to furnish a simple, convenient, effective, and inexpensive machine for planting cotton seed, corn, peas, etc., which shall be so constructed as to be conveniently adjusted to plant the seeds in hills or drills and in greater or less quantities, as may be desired.

HARROW.—Charles R. Macy, Bedminster, N. J.—This invention has for its object to furnish an improved harrow, which, while operating as an ordinary harrow to stir up, loosen, and pulverize the soil, will, at the same time, crush and break up the clods and lumps, and scatter the parts and fragments of said clods and lumps over and mix them with the loose soil.

HAME FASTENER.—William W. Tillou, LeRoy, N. Y.—This invention has for its object to furnish an improved fastener, by means of which the ends of the hames may be conveniently drawn into place and securely held and locked.

HAIR CUTTER.—George A. Harley, New York city.—This invention has for its object to improve the construction of an improved hair cutter, patented by the same inventor, September 14, 1869, and numbered 94,820, so as to make it more convenient in use by adapting the slotted comb to be used with an ordinary razor blade.

TRACE FASTENING.—William W. Mallery and Charles H. Sage, Copenhagen, N. Y.—This invention relates to a new and useful improvement in a fastening for the traces of harness, and consists in applying a spring slide to the end of the trace, by which slide the trace is held to the whiffletree.

PULLEY BLOCK.—C. H. Knapp, Lawrenceville, Pa.—This invention relates to improvements in pulley blocks, and consists in an improved construction of divided blocks, for being automatically opened by blocks on the rope for discharging the same, when the weight is raised to the required hight, for allowing the latter to fall in a lateral direction, as in elevating hay and delivering over the mow, or on the top of the stack.

PROPELLING APPARATUS.—E. Averill, Sacramento, Cal.—This invention relates to improvements in feathering paddles for boats, and operating devices for the same, having for its its object to provide an improved arrangement of means for feathering the paddles, and for operating a pair for one side of a boat alternately; also for reversing them for propelling in either direction.

PISTON.—O. Collier, Sacramento, Cal.—This invention consists in an arrangement of the piston, of two end disks and a grooved central ring, one of the disks having a tubular extension, to which the other is fitted, and through which the piston rod passes, receiving a nut at the end, screwing the one disk on the extension of the other, and against the central ring; also screwing the whole against a collar on the rod. The invention also comprises a mode of packing by which the piston may be centered.

TABLE.—Heber F. Learnard, Mazo-Manie, Wis.—This invention relates to improvements in the construction of tables for house, office, and other uses, and consists in an improved mode of joining the side rails of the frame to the posts by dovetail or beveled rebates, and detachable metallic clamps, to provide a more durable construction, and an arrangement whereby the legs and frame may be readily detached for packing and transportation. The tops and leaves are also detachably connected to the side rails of the frame. The invention also consists in an improved arrangement with the leaf supporting arms of fall leaf tables, of springs to throw the arms out when the leaves are raised.

BRAKE FOR VEHICLES AND MACHINERY.—Benj. F. Leet, Dayton, Nevada.—This invention relates to new and useful improvements in brakes for car, wagon, and other revolving wheels, and consists of brake shoes suspended in advance of the wheels upon arms jointed to supports above the horizontal axis of the wheels, and arranged to be let down by strong suspending devices against the faces of the wheels, the friction of which on the said brake shoes, will cause the shoes self-actingly to arrest the motion of the said wheels, the said brake shoes being so suspended that in swinging downward in the plane of the wheels, their course will cross that of the periphery of the wheels. The invention also comprises a mode of suspending and operating the brake shoes, or the arms on which they swing, by knuckle-jointed links, to the middle joint of which a sliding bar is attached and operated, either by a toothed pinion and hand shaft, or by an oscillating shaft, hand lever, and eccentrics, for imparting the reciprocating motion for working the said knuckle-jointed links; the said links, as also the jointed arms by which the brace shoes are suspended, are arranged for adjustment for varying the position of the shoes relatively to the periphery of the wheels.

SPUR.—Seth Craig, Philadelphia, Pa.—This invention relates to a new manner of securing spurs to the heels of boots, and has for its object to provide a simple and reliable fastening, which need not have any catch provided in the heel, and which allows the ready removal of the spur.

DETACHABLE HEAD REST FOR CHAIRS, ETC.—D. R. V. Goetchius, Little Falls, N. Y.—This invention has for its object to provide a head rest which can conveniently be secured to the backs of railroad chairs, common chairs, sofas, etc., and which can as conveniently be detached.

HORSE HAY FORK.—James Dampman, Lebanon, Pa.—This invention relates to improvements in locking devices for horse hay forks, and consists in a sliding block on the elevating rope, having a fixed and a pivoted jaw for engaging and holding the upper end of the tine not connected to the hoisting rope; the said upper end being provided with an eye which, when brought up to the locking position, will receive the hooked end of the pivoted jaw, which is then closed up against the fixed jaw by pressing the shank into the space between the sides of the movable block, where it is secured by a spring catch having a trip cord connected to its free end, and passing out laterally through a hole in one of the sides of the block, so that when pulled it will disengage the spring catch, and trip the holding jaw, to permit the opening of the tines of the fork for discharging.

AUXILIARY PROPULSION OF VESSELS.—John Bourne, London, England.—The object of this invention is to provide a propelling mechanism for sailing ships in calms or light winds, which mechanism, while of average efficiency, shall be capable of being readily put into or out of operation, so that it will, when not used, leave the ship in all other respects the same as if it had not been applied.

HOLLOW GRATE BAR.—George E. Turner, Chicago, Ill.—This invention has for its object to so construct the hollow grate bars which conduct air from below the fire to the products of combustion, that the unequal temperature to which it is subjected at different hights may not injuriously affect the same.

LAMP EXTINGUISHER.—S. W. Perkins, Geneso, Ill.—This invention consists of a case capable of being slipped on over any ordinary lamp tube, and bearing two jaws, each provided with a weight and having a tendency to fold together upon the wick, so as to completely cover it when turned down, and thus extinguishes the flame; said jaws being readily separable by the wick as it is turned up by the ratchet wheel to be lighted.

STEAM ENGINE.—C. C. Waggoner, St. Johns, Ohio.—This invention consists in a novel and peculiar mechanism for shifting the valves, whereby the operation may be performed in one sixteenth of the time of the stroke.

PNEUMATIC CENTRIFUGAL POWER REGULATOR.—Charles A. Sullivan, Starkville, Miss.—This invention relates to means for regulating the evolution of a spring driver, and to preventing a useless and too rapid expenditure of its power. The invention consists in certain combinations and arrangements of auxiliary mechanism to restrain the actuating power, which, together, constitute the pneumatic centrifugal power regulator.

CARRIAGE SPRING.—Daniel Shockey, Waynesborough, Pa.—This invention relates to a spring apparatus in which the cross bars on which the carriage immediately rests, move on vertical guide bars projecting from the axles, and springs are interposed to check the downward movements of such cross bars. The invention consists in interposing springs to check the upward movements of such guide bars.

KNITTING MACHINE.—John Kent, New York city.—This invention relates to a new and useful improvement in machines for knitting cotton, linen, and woolen goods or garments; and consists in attaching to the ordinary knitting machine certain mechanisms whereby the goods or garments manufactured on such machines are made to present the appearance of being seamed or sewed together, while, in fact, the goods are formed entire, and with unbroken thread.

COMBINED SEEDER AND CULTIVATOR.—Clark Alvord, Westford, Wis.—This invention relates to a seeder, and consists of a seeder wheel placed in front or rear, and, for the most part, outside the seed box, but entering partially within the same, and receiving in its circumferential V-shaped groove a portion of the seed, which portion it carries under and out, and discharges; the circumferential groove being provided with transverse partitions, so constructed as to carry the seed before them until the proper moment, and then discharge it over the stop.

MODE OF CURING CHEESE AND PRESERVING THE SAME WHEN CUTTING.—Artemas Holbredge, West Burlington, N. Y.—This invention relates to an improved mode of putting up, curing, packing, and preserving cheese, whereby it is designed to improve the quality of the cheese, render it capable of preservation a greater length of time, economize in space in packing, storing, and shipping, and to economize and preserve it in cutting for use. The invention also comprises an improved mode of ascertaining and cutting off the exact amount required.

SASH AND BLIND MARKER.—George W. Burton, Bordentown, N. J.—This invention relates to a new machine for marking the bars of sashes and blinds, to indicate the proper places for mortising the same. The invention consists in the general combination of an adjustable fixed marker with a movable marker, and with a spring lever for moving the same; and also in the method of holding the markers in place so that it can readily be displaced for the several jobs.

WHEEL FOR VEHICLES.—Horatio Keys, Terre Haute, Ind.—This invention relates to a new manner of securing the spokes in the hub of a wheel, with an object of obtaining a firm hold and of facilitating repair in case one or more of the spokes should be broken.

RAILROAD CHAIR.—Loyst J. Smith, Whitehall, N. Y.—This invention relates to a new suspension railroad chair, which is so constructed that it will constitute a durable and reliable connection of railroads and a noiseless support of the same.

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THE *Phrenological Journal*, for January, is received, with the usual number of graphic sketches of character, portraits of distinguished men, and other entertaining features, which render it one of the most readable of American publications. The present number is peculiarly rich, and by the courtesy of its publishers, it furnished us last week with a fine portrait of M. Lesseps, and a sketch of his life, which is, at this time, of especial interest in connection with the recent construction of the great Suez Canal.

THE INSURANCE MONITOR, C. C. Hine editor and proprietor, 176 Broadway, New York, is one of the ablest monthlies devoted to a specialty published. To all interested in insurance matters, directly or indirectly, it is a *sine qua non*, and its miscellany cannot but prove acceptable to the intelligent general reader.

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97,970.—BASE-BURNING FIREPLACE HEATER.—Samuel B. Sexton, Baltimore, Md. Dated December 14, 1869; antedated November 23, 1869.
98,216.—STEAM ENGINE GOVERNOR.—C. D. Allen, New York city. Antedated Dec. 24, 1869.
98,217.—PROPELLING APPARATUS.—E. Averill, Sacramento, Cal.
98,218.—WATER ELEVATOR.—Jabez K. Babcock, Shortsville, N. Y.
98,219.—BOOTJACK.—S. P. Babcock, Adrian, Mich.
98,220.—HARVESTER.—L. M. Batty, Canton, Ohio.
98,221.—CHURN DASHER.—F. Bosom (assignor to himself and J. W. Tackabury), St. Louis, Mich.
98,222.—PROPELLING APPARATUS.—John Bourne, No. 1 Northumberland Terrace, Regent's Park Road, England.
98,223.—WATER WHEEL.—McK. A. Brooks, La Porte, Ind.
98,224.—FINISHING CASE FOR RAILWAY BARS.—John Burt, Detroit, Mich.
98,225.—MACHINE FOR LAYING OUT SASH AND BLIND.—G. W. Burton, Bordentown, N. J.
98,226.—APPARATUS FOR MIXING AND AGEING LIQUORS.—S. C. Brace, New York city. Antedated Dec. 21, 1869.
98,227.—RAILWAY CAR.—Joseph Busser, Troy, Ohio.
98,228.—VAPOR BURNER.—L. Chandor, St. Petersburg, Russia, assignor to C. M. Clay.
98,229.—SELF-ADJUSTING CART-SADDLE.—Matthew Clinton, New York city.
98,230.—SPRING-BED BOTTOM.—Andrew Cole, Mishawaka, Ind.
98,231.—PLANING MACHINE.—G. W. Cole, Canton, Ill.
98,232.—PISTON AND PISTON PACKING.—O. Collier, Sacramento, Cal.
98,233.—SIGNAL FOR RAILWAYS.—James P. Coulter, Bloomington, Ill.
98,234.—BALL-AND-SOCKET JOINT.—R. R. Craig and J. Craig, Nevada, Cal.
98,235.—SPUR.—Seth Craig, Philadelphia, Pa.
98,236.—HAY FORK.—Jas. Dampman (assignor to W. A. Moyer), Lebanon, Pa.
98,237.—SKATE.—C. T. Day, Newark, N. J.
98,238.—STEAM-BOILER FURNACE.—R. S. Dillon (assignor to himself and G. H. Russell), Detroit, Mich.
98,239.—CHARCOAL FURNACE.—W. T. Downs, St. Louis, Mo. Antedated Dec. 11, 1869.
98,240.—HOOP-CUTTING AND DRESSING MACHINE.—F. Ellis (assignor to himself and J. S. Ellis), Sylvania, Ohio.
98,241.—STEERING APPARATUS.—Edward Fox (assignor to himself and J. J. Walton), New York city.
98,242.—TRUSS FOR VESSELS.—Charles Furbish, Bucksport, Me.
98,243.—STOVE LEG.—John Gibson, Jr., Albany, N. Y. Antedated Dec. 11, 1869.
98,244.—COFFEEPOT, PITCHER, ETC.—John Gibson, Jr., Albany, N. Y. Antedated Dec. 11, 1869.
98,245.—DEVICE FOR TILTING PITCHERS, COFFEEPOTS, ETC.—John Gibson, Jr., Albany, N. Y. Antedated Dec. 1, 1869.
98,246.—REIN HOLDER.—John Gibson, Jr., Albany, N. Y. Antedated Dec. 17, 1869.
98,247.—HITCHING POST.—John Gibson, Jr., Albany, N. Y. Antedated Dec. 18, 1869.
98,248.—RAILROAD-CAR HEATER.—John Gibson, Jr., Albany, N. Y.
98,249.—SECURING LEGS TO STOVES.—John Gibson, Jr., Albany, N. Y.
98,250.—HEAD REST.—D. R. V. Goetchins, Little Falls, N. Y.
98,251.—SHOVEL PLOW.—Frank Goss, Wexford, Pa.
98,252.—COMBINED SEED SOWER AND HARROW.—A. D. Gray, Chariton, Iowa.
98,253.—PAPER FEEDER.—J. H. Gray and W. B. Turner, St. Anthony, Minn.
98,254.—REGISTER FOR SPINNING JACK.—Henry Greenwood, Gilbertsville, Mass.
98,255.—APPARATUS FOR RAISING AND LOWERING CHANDELIERS AND LAMPS.—H. S. Hall, Boston, Mass.
98,256.—HAIR CUTTER.—G. A. Harley, New York city.
98,257.—HYDRAULIC NOZZLE.—Aaron Harris, Laporte, Cal.
98,258.—HORSE HAY FORK.—Elam Harter, Dowagiac, Mich.
98,259.—GRAPPLING HOOK.—Elam Harter, Dowagiac, Mich.
98,260.—ANTI-FRICTION JOURNAL BEARING FOR HOISTING MACHINES, ETC.—R. G. Hatfield, New York city.
98,261.—CURTAIN FIXTURE.—Rufus E. Hitchcock, Waterbury, Conn.
98,262.—CURING CHEESE.—Artemas Holbredge, West Burlington, N. Y.
98,263.—DRIED-BEEF CUTTER.—C. J. Holmes and D. C. Holmes, Stafford Springs, Conn.
98,264.—LAMP.—John Horton (assignor to B. B. Schneider), New York city.
98,265.—BORING AND MORTISING MACHINE.—John Humphrey, Ravenna, Ohio.
98,266.—GRAIN SMUTTER, SCOURER, AND SEPARATOR.—J. C. Hunt, Terre Haute, Ind., and W. W. Ingraham, Chicago, Ill.
98,267.—REVERSIBLE CHAIR.—William H. Joeckel, New York city.
98,268.—PROPELLER WHEEL.—J. A. Joyner, New York city. Antedated Dec. 18, 1869.
98,269.—ROTARY TABLE WAITER.—A. N. Kellogg, Chicago, Ill.
98,270.—MACHINE FOR GRINDING GLASS JARS.—A. W. Kelly and J. B. Samuel, Philadelphia, Pa.
98,271.—BUTTON.—John Kenmuir, Leavenworth, Kansas.
98,272.—KNITTING MACHINE.—John Kent, New York city.
98,273.—CARRIAGE WHEEL.—Horatio Keys, Terre Haute, Ind.
98,274.—BOB SLED.—John Killefer, West Richfield, Ohio.
98,275.—PULLEY BLOCK.—C. H. Knapp, Lawrenceville, Pa.
98,276.—TABLE.—H. F. Learnard, Mazo Manie, Wis.
98,277.—BRAKE FOR CARRIAGES.—Benjamin F. Leet, Dayton, Nevada.
98,278.—METALLIC CARTRIDGE.—Chas. D. Leet, Vienna, Austria, and B. B. Hotchkiss, New York city. Antedated December 15, 1869.
98,279.—STEAM PUMP.—J. A. Lidback (assignor to himself and Henry Baker), Portland, Me.
98,280.—AXLE GAGE.—Gottlieb Luedke, Princeton, Wis.
98,281.—HARROW.—C. R. Macy, Bedminster, N. J.
98,282.—CHARCOAL COOKING FURNACE.—Angelina Madison, Cincinnati, Ohio. Antedated Dec. 15, 1869.
98,283.—TRACE FASTENING.—W. W. Mallery and C. H. Sage, Copenhagen, N. Y.
98,284.—HARVESTER RAKE.—F. H. Manny, Rockford, Ill.
98,285.—APPARATUS FOR BLEACHING AND DEFECATING CANE JUICE.—J. C. Marsh (assignor to G. R. Marsh), Alexandria, La.
98,286.—WELT KNIFE.—Elezer May, Natick, Mass.
98,287.—STREET BOX FOR GAS PIPES.—Emerson McMillin, Ironton, Ohio.
98,288.—CHURN.—A. H. McWaine, Shickshinny, Pa.
98,289.—WATCHMAN'S TIME DETECTOR.—A. Meyer, Stuttgart, Germany, assignor to Theodor Hahn.
98,290.—BAR OF HORSESHOE BLANKS.—James Montgomery, Sing Sing, N. Y.
98,291.—SPIDER.—Elias Nashold, Rockford, Ill.
98,292.—HAY SPREADER.—Eben W. Nichols, Worcester, Mass.
98,293.—DRAFT AND SPARK EXTINGUISHING DEVICE FOR STEAM GENERATORS.—J. S. Patric and Lewis Patric, Rochester, N. Y. Antedated Dec. 24, 1869.
98,294.—TUBE CUTTER.—John Peace, Camden, N. J.
98,295.—SHIPWRIGHTS' CLAMP.—Wm. H. Phillips, Bridgetown, N. J.
98,296.—ELECTRICAL ANNUNCIATOR FOR HOTELS.—Henry B. Porter, Chicago, Ill.
98,297.—PULVERIZING CHASER.—Theophilus Pugh, Chicago, Ill. Antedated Aug. 7, 1869.
98,298.—SOFA AND TABLE.—Wm. Reichenbach and Frietrich Roschdiantzky, Chicago, Ill.
98,299.—LOCK FOR SATCHELS AND CARPET BAGS.—William Roemer, Newark, N. J.
98,300.—BUTTON AND PIN FOR CARPET BAGS, ETC.—Wm. Roemer, Newark, N. J.
98,301.—BASE-BURNING STOVE.—J. J. Roeper, Philadelphia, Pa.
98,302.—PROPELLING BOATS.—D. J. Ross, Havre de Grace, Md.
98,303.—HARVESTER CUTTER.—Jacob Schneider, Canton, Ohio.
98,304.—CHEWING GUM.—Wm. F. Semple, Mount Vernon, Ohio.
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98,306.—PERPETUAL BRICK BURNER.—Zachariah Shaw, Ypsilanti, Mich.
98,307.—CURTAIN FIXTURE.—John Shorey and F. H. Butler (assignors to said Shorey and John Griffith), Lowell, Mass. Antedated Dec. 13, 1869.
98,308.—MACHINE FOR FOLDING CLOTH.—Augustus Simpson (assignor to Woonsocket Iron Foundery), Woonsocket, R. I.
98,309.—SPINDLE FOR SPINNING SILK.—George Singleton, (assignor to himself, J. F. Preston and J. N. Leonard), Rockville, Conn., Robert Singleton and E. K. Rose, Paterson, N. J., and Leonard & Lockhart, Chicago, Ill.
98,310.—APPARATUS FOR PACKING STUFFING BOX.—D. L. Smith, Montana, Iowa.
98,311.—HAMES AND COLLARS.—J. G. Smith, Oregon, Wis., assignor to himself and F. A. Vickery, Mason City, Ill.
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98,313.—SEED PLANTER.—J. L. Strait, Cooksville, Miss.
98,314.—PNEUMATIC CENTRIFUGAL POWER REGULATOR.—C. A. Sullivan, Starkville, Miss.
98,315.—HAMES FASTENER.—W. H. Tillou, Le Roy, N. Y.
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98,329.—STONE SEPARATOR.—Henry Aiken, Philadelphia, Pa.
98,330.—TURBINE WATER WHEEL.—O. N. Angell and A. J. Angell, Providence, R. I.
98,331.—MACHINE FOR THE MANUFACTURE OF SPOKED WHEELS.—E. A. Archibald, Methuen, Mass.
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98,333.—PEAT MACHINE.—Amie N. N. Aubin, Montreal, Canada.
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98,362.—WAITER.—Obed Fahnestock, Lebanon, Ind.
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98,367.—PUMP.—Isaac N. Forrester, Bridgeport, Conn.

98,368.—PUMP.—Isaac N. Forrester, Bridgeport, Conn.
98,369.—HANDLE FOR CUTLERY.—J. D. Frary, New Britain, Conn.
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98,383.—LANTERN.—John Hughes, Buchanan, Pa.
98,384.—CURTAIN FIXTURE.—M. G. Imback, Bethlehem, Pa. Antedated Dec. 18, 1869.
98,385.—MECHANICAL MOVEMENT FOR ACTUATING PRESSES.—P. C. Ingersoll (assignor to himself and H. F. Dougherty), Green Point, N. Y.
98,386.—QUILTING FRAME AND CLOTHES DRYER.—John G. Ishler, Martinsville, Ill.
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98,388.—HOISTING MACHINE.—George Johnson, Cincinnati, Ohio. Antedated Dec. 17, 1869.
98,389.—RUFFLING ATTACHMENT FOR SEWING MACHINES.—A. C. Kasson, Milwaukee, Wis.
98,390.—SEWING MACHINE.—Thomas Lamb, Philadelphia, Pa.
98,391.—LADIES' BOOT.—William Love, McConnellsville, Ohio.
98,392.—WATER-WHEEL.—Thomas Lowden (assignor to himself, George Stout, and R. J. Lowden), Boston, Mass.
98,393.—ADJUSTABLE WRENCH.—James Magee, (assignor to himself and S. A. Alpin), Usquepaugh, R. I.
98,394.—HARVESTER.—L. J. McCormick, Lambert Erpelding, and W. R. Baker (assignors to C. H. McCormick & Brother), Chicago, Ill.
98,395.—WASHING MACHINE.—W. T. McKean, East Palestine, Ohio.
98,396.—CUTTER HEAD.—R. N. Meriam, Worcester, Mass.
98,397.—HORSE HAY FORK.—J. A. Miller, Shippensburg, Pa. Antedated Dec. 18, 1869.
98,398.—CLOTHES DRYER.—R. M. Miller, Port Andrew, Wis.
98,399.—VENTILATOR.—C. J. Neger, Philadelphia, Pa.
98,400.—SALVE.—W. W. Oglesbey, Benton county, Oregon.
98,401.—BED BOTTOM.—O. S. Osgood, Burlington, Iowa.
98,402.—DEVICE FOR LUBRICATING JOURNALS.—Addison Overbagh, Scranton, Pa.
98,403.—WINDOW BLIND.—Lindon Park, Brady, Pa.
98,404.—SOLAR CAMERA.—Isaiah Paxson and Charles Paxson, New York city.
98,405.—EXTINGUISHER.—S. W. Perkins, Genesco, Ill.
98,406.—LOCK.—N. Petre, New York city.
98,407.—SEED AND GRAIN SEPARATOR.—J. F. Pool, Monroe, Wis.
98,408.—NOZZLE FOR OIL CANS.—Chas. Pratt, New York city.
98,409.—THREAD CONTROLLER FOR SEWING MACHINE.—G. M. Pratt and L. E. Maynard (assignors to the Finkle and Lyon Manufacturing Company), Middletown, Conn.
98,410.—KNITTING MACHINE. — A. B. Prouty, Worcester Mass., assignor to Samuel V. Essick, Mansfield, Conn.
98,411.—HYDRANT.—D. J. Pruner, Bellefonte, Pa.
98,412.—HOPPER BOY RAKE.—Aaron C. Pry, Keedysville, Md.
98,413.—SEED SOWER.—Amos Raffensparger and D. G. S. Goehnauer, Mulberry, Pa.
98,414.—FEED CUTTER.—J. P. Randolph, Marietta, Ohio.
98,415.—FOLDING CHAIR.—E. C. Ranks, Boston, Mass.
98,416.—BASE-BURNING STOVE.—S. H. Ransom, Albany, N. Y.
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98,418.—SPRING COUPLING.—L. Rodenhausen, Philadelphia, Pa.
98,419.—SHIP PUMP.—Benj. K. Rogers, Jonesport, Me.
98,420.—HEAD-REST FOR CAR SEATS.—H. W. Safford, New York city.
98,421.—CURING AND PRESERVING BUTTER.—Jacob F. Saiger, Shelby, Ohio.
98,422.—PUMP.—Jacob Scott, Earlville, Iowa.
98,423.—LATHE.—William Sellers, Philadelphia, Pa.
98,424.—BASKET MACHINE.—Merville Shaffer (assignor to Ford Tanner), Lafayette, Ind.
98,425.—MANUFACTURE OF NITRO GLYCERIN.—Taliaferro P. Shaffner, Louisville, Ky.
98,426.—PROCESS OF PRESERVING NITROLEUM AND OTHER EXPLOSIVE LIQUIDS.—Taliaferro P. Shaffner, Louisville, Ky.
98,427.—EXPLOSIVE COMPOUND. — Taliaferro P. Shaffner, Louisville, Ky.
98,428.—BLASTING FUSE.—Taliaferro P. Shaffner, Louisville, Ky.
98,429.—WELL TUBE.—James T. Shattuck, Natick, Mass. Antedated November 27, 1869.
98,430.—MACHINE FOR PRESSING CLAY PIPES.—Thomas Shaw, Philadelphia, Pa.
98,431.—KNIFE REST.—Daniel Sherwood, Lowell, Mass., assignor to Woods, Sherwood & Co.
98,432.—TABLE CASTER.—Daniel Sherwood, Lowell, Mass., assignor to Woods, Sherwood & Co.
98,433.—CARRIAGE SPRINGS. — Daniel Shockey, Waynesborough, Pa.
98,434.—TOBACCO, HAY, AND COTTON PRESS.—Valentine J. Shryock, Folsomville, Ind.
98,435.—WATER WHEEL.—William Slade, Sen., Gum Creek, Ga.
98,436.—CARRIAGE AXLE.—Alfred E. Smith, Bronxville, N. Y.
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98,438.—PICTURE NAIL.—Friend W. Smith, Jr., Bridgeport, Conn.
98,439.—METALLIC CARTRIDGE.—Wm. H. Smith, Charlestown, Mass.
98,440.—CHAIR FRAME.—Wm. M. Smith, Columbus, Ohio.
98,441.—TAG FOR MAIL BAGS.—C. A. Snyder, Richmond, Va.
98,442.—APPARATUS FOR PRODUCING AND CARBURETING HYDROGEN GAS.—John H. Steiner (assignor to himself and Christian Sharpa), Philadelphia, Pa.
98,443.—CARRIAGE.—Lewis Theobald, Bremen, Ind.
98,444.—MACHINE FOR MAKING RAILROAD SPIKES.—Leopold Thomas, Pittsburgh, Pa.
98,445.—SODA WATER APPARATUS.—James W. Tufts, Medford, Mass.
98,446.—WALL FOR BUILDINGS.—M. P. Turner, Des Moines, Iowa.
98,447.—GAGE FOR FILING SAWS.—Oliver Tyson, Otho, Iowa.
98,448.—TICKET HOLDER.—George M. Van Buren, New York city.
98,449.—STEAM ENGINE.—Charles C. Waggoner, St. Johns, Ohio.
98,450.—MANUFACTURE OF PARTLY GILT FRAMES.—Washington Wallick (assignor, by mesne assignments, to Wallick & Asay), Philadelphia, Pa. Antedated December 22, 1869.
98,451.—APPARATUS FOR FILLING VIALS.—John P. Whipple, Woonsocket, R. I.
98,452.—FEEDING MECHANISM FOR SEWING MACHINES.—James H. Whitney, Brooklyn, N. Y.
98,453.—STATIONERY FURNITURE.—Charles H. Wight, Baltimore, Md.
98,454.—MACHINERY FOR OPERATING CHURNS.—C. S. Williamson, Covert, N. Y.
98,455.—MACHINE FOR BORING BLIND STILES.—Albert M. Winn, Jefferson Kindleberger, and William Augustus Arnold (assignors to "The Inventor's Association"), San Francisco, Cal.
98,456.—HARVESTER CUTTER.—Frederick Wittram, San Francisco, Cal.
98,457.—APPLE CORING AND SLICING MACHINE.—Moses B. Wright, West Meriden, Conn.
98,458.—MOUNTING WRITING SLATE.—George F. Bowman, Cleveland, Ohio.
98,459.—CLAMPS FOR ELEVATING WELL TUBES AND RODS.—Adam Good, Jr., Titusville, Pa.

REISSUES.

96,866.—SEWING MACHINE.—Dated November 16, 1869; reissue 3,776.—P. J. Clever, Gollard, Texas.
77,304.—PREPARING COMPOUNDS CONTAINING COLLODION.—Dated April 28, 1868; reissue 3,777.—Division A.—John A. McClelland, Louisville, Ky.
77,304.—MATERIAL FOR FORMING DENTAL PLATES.—Dated April 28, 1868; reissue 3,778.—Division B.—John A. McClelland, Louisville, Ky.
73,900.—CARBURETING AIR FOR THE PRODUCTION OF LIGHT AND HEAT.—Dated January 28, 1868; reissue 3,779.—Blakey Pilkington, Oakland, Cal., assignee, by mesne assignments, of James D. Jenkins.
94,248.—FRUIT JAR.—Dated August 31, 1869; reissue 3,780.—Henry E. Shaffer, Rochester, N. Y.
55,581.—FRUIT JAR.—Dated June 12, 1866; reissue 3,781.—Thomas B. Whitney and S. A. Whitney, Glassborough, N. J., assignees of John Focer.
12,627.—PLOW.—Dated April 3, 1855; extended seven years; reissue 3,782.—Thomas J. Hall, Bryan, Texas, for himself and Henry P. Stockton and Robert P. Lane, Rockford, Ill., assignees of Thomas J. Hall.
80,865.—PRINTING PRESS.—Dated August 11, 1868; reissue 3,783.—J. M. Jones, Henry Johnson, and George M. Bowman, Palmyra, N. Y., assignees of J. M. Jones.

DESIGNS.

3,807.—BADGE.—Abraham Demarest, New York city.
3,808.—KEY.—Emery Parker, New Britain, Conn.
3,809.—STRIKER-PLATE FOR A LOCK.—Emery Parker (assignor to Russell and Erwin Manufacturing Company), New Britain, Conn.

EXTENSIONS.

TREATING OILS.—Philo Marsh, South Adams, Mass.—Letters Patent No. 14,042, dated January 1, 1856.
METHOD OF OPERATING AND LUBRICATING SLIDE VALVES.—James Cochrane, New York city.—Letters Patent No. 14,010, dated January 1, 1856.

APPLICATIONS FOR EXTENSION OF PATENTS.

ORE WASHER.—William L. Carter, Marietta, Pa., has petitioned for the extension of the above patent. Day of hearing, Feb. 22, 1870.
MACHINE FOR CUTTING LOAF SUGAR.—Adolph Brown and Felix Brown, New York city, has applied for an extension of the above patent. Day of hearing March 9, 1870.
FIREPLACE.—Alice Dodge, of Pittsburgh, Pa., administratrix of Calvin Dodge, deceased, has applied for an extension of the above patent. Day of hearing March 2, 1870.
SURFACE CONDENSERS FOR STEAM ENGINES.—D. D. Foley, Washington D. C., assignee, by mesne assignments, of James M. Miller, has petitioned for an extensionof the above patent. Day of hearing May 4, 1870.
METHOD OF COOLING AND VENTILATING ROOMS, ETC.—Azel S. Lyman, New York city, has applied for an extension of the above patent. Day of hearing March 9, 1870.
GRAIN SEPARATOR.—Cyrus Roberts, Three Rivers, Mich., and John Cox, Newhope, Pa., have petitioned for an extension of the above patent. Day of hearing March 9, 1870.
HERMETICALLY SEALING PRESERVE CANS.—Charles Brunwhite, New York city, has petitioned for the above patent. Day of hearing March 9, 1870.
MACHINE FOR MAKING CARPET LINING.—John R. Harrington, Brooklyn N. Y., has applied for an extension of the above patent. Day of hearing March 16, 1870.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

3,411.—ROCK-BORING MACHINERY.—Charles Burleigh, Fitchburg, Mass. November 25, 1869.
3,461.—BEDSTEADS AND GUARDS.—C. H. Hudson, New York city. Nov. 30, 1869.
3,462.—ELLIPTIC SPRINGS AND APPARATUS THEREFOR.—B. T. Henry, New Haven, Conn. November 30, 1869.
3,477.—CURING SPONGE.—W. H. Spencer, New York city. December 1, 1869.
3,515.—FLUID LENSES.—D. A. Woodward, Baltimore, Md. December 4, 1869.
3,527.—GRAIN HULLER.—J. T. Prince, Boston, Mass. December 6, 1869.
3,579.—SAW, SAW TEETH, AND MACHINERY THEREFOR.—S. G. Arnold Providence, R. I. November 23, 1869.
3,386.—APPARATUS FOR GRINDING SAWS.—H. Disston, Philadelphia, Pa. November 23, 1869.
3,396.—APPARATUS FOR LIGHTING AND EXTINGUISHING GAS BY ELECTRICITY.—New England Electric Gas Lighting Company, Boston, Mass. November, 24, 1869.
3,441.—SEWING MACHINE.—L. Melone, Mount Gilead, Ohio. November 27, 1869.
3,456.—JOURNAL BEARING.—I. P. Wendell and S. P. M. Tasker, Philadelphia, Pa. November 29, 1869.

Advertisements.

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Stroke of piston, inches	42	42
Duration of experiment, hours	8	8
Average pressure of steam, per gage	81·803	80.445
Total revolutions of Engines	28,958·88	28,952·96
Average revolutions of Engines per minute	60·331	60·277
Total weight of coal used during experiments, lbs.	2,509	1,957·5
*Indicated horse-power	78·792	76·579
Average pounds coal per indicated horse power per hour	5·965	5·195
**Dynamometer horse-power	65·981	69·952
Difference between Indicated horse-power and Dynamometer horse-power, showing horse-power required to drive each Engine, by itself, and piece of heavy shafting between Dynamometers—say 75 feet—which, if deducted in both cases, would increase the ratio of the difference of power required to drive the engines alone	12·811	6·627
Proportion of coal consumed for dynamometer horse-power	3993·44	1787·944
Proportion of coal to drive engine and first piece of shafting	406·56	169·556
Percentage of difference of coal necessary to drive engines, in favor of Harris		58 p.ct.
Average pounds of coal per dynamometer horse-power per hour	4·736	3·498
Percentage of difference of coal per dynamometer horse-power per hour, in favor of Harris		26 p.ct.
***Total cubic feet water during experiments	256·09	255·29
***Total water used, as per meter, during the experiments in lbs.	16061·94	15956·13
†Average dynamometer horse-power per last three indications	69·453	71·791
Temperature of feed water, deg	47	47
Temperature of engine room, deg	72·6	66·5
Temperature of fire room, deg	42·7	49·7
Barometer, inches	30·05	30·29

*The power exerted on Piston of Engine, is termed INDICATED HORSE-POWER, and *includes* the power required to drive the Engine itself, as well as the load.

**The power exerted beyond Engine, is termed DYNAMOMETER HORSE-POWER, or actual load, and *excludes* the power required to drive the Engine.

This shows which Engine runs with the least friction, and which has the best valves, and the best mechanism for working them, termed Valve Gearing.

***See Water Meter test.

†See Regulating test.

WATER METER TEST.

BY MR. EMERY (Sup't).

*Test proving the inaccuracy of Water Meter after trial of Engines.

State of Meter	Cubic feet	Weighed.	Should weigh.
4181·1			
4185·1	4	229·	250·
4189·1	4	249·25	250·
4194·1	5	279·25	312·5
4199·1	5	308·	312·5
4204·1	5	299·75	312·5
4208·1	4	250·	250·
4213·1	5	315·	312·5
4218·1	5	315·	312·5
4223·1	5	304·	312·5
4228·1	5	301·75	312·5
4231·1	4	251·	250·
4237·1	5	306·	312·5

*This table shows that the water passed through the meter did not weigh as the dial indicated it should.

Test of Regulator and Valve Gear Combination,

as shown with full load on Engine, 2¼ dynamometer horse-power more load carried during the regulating test by Corliss Engine. Furnace doors open and fires banked. Indications of steam gage and counter taken each minute. This shows which Engine runs with the least friction, and which has the best valves, and the best mechanism for working them, termed Valve Gearing; also, the best Regulator and Valve Gear Combination.

Babcock & Wilcox Engine.			Corliss Engine.		
Steam gage.	Counter.	Revo. per minute.	Steam gage.	Counter.	Revo. per minute.
65·	126.468		65·	10.071	
62·	529	61	62·5	131	60
58·	588	59	59·	190	59
54·	646	58	56·	249	59
50·	704	58	52·5	308	59
45·	762	58	48·5	366	58
40·	818	56	45·	424	58
37·5	871	53	42·	482	58
34·5	920	49	38·	540	58
Loss of 30·5 pounds steam. Loss of 12 revolutions. Average loss of one revolution to each 2·54 pounds steam.			Loss 27 pounds steam. Loss 2 revolutions. Average loss one revolution to each 13·5 pounds steam.		

From these Tables, those interested, and the public generally, can obtain facts long withheld from them, and from which they can draw their own conclusions.

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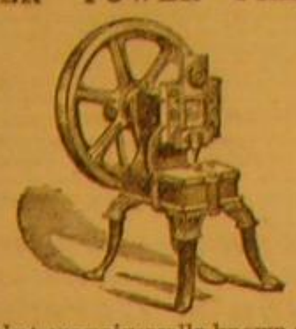
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SCIENTIFIC AMERICAN

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

Vol. XXII.---No. 3. [NEW SERIES.] NEW YORK, JANUARY 15, 1870. $3 per Annum [IN ADVANCE.]

Machine for Branching Artificial Flowers.

Few people outside of the trade are aware of the extent of the manufacture of artificial flowers. It has been estimated that ten thousand people, mostly girls, are employed in this business in New York. These girls are chiefly employed in what is called "branching," that is, the arrangement of stems, leaves, flowers, and fruits, previously made in large establishments, upon stems, the length of which is limited on account of the inconvenience in turning them when wound by hand.

The basis of the stems is wire, and two threads of suitable material are laid along this wire to prevent subsequent slipping of the colored thread, which forms the outer covering of the stems. The ends of the short stems of leaves, flowers, buds, and fruits, being laid against the wire are wound under the outer covering, and are thus fastened to it.

The process is a slow one, and, as we have said, is limited to such length of the main stem as can be conveniently manipulated.

Our engravings illustrate a very ingenious machine for performing the latter kind of work. The general features of the invention being admirably shown in Fig. 1, and portions of the device in Figs. 2 and 3.

The wire being fed from a spool, A, Figs 1, 2, and 3, then passes through a hollow spindle, B, Figs. 1 and 2, and lies upon an endless feed belt, C, to which it is clamped by small pincers, D, Figs. 1 and 2. The small pulleys upon which the feed-belt, C, is carried, are actuated by a train of gearing receiving its motion from gearing and pulleys underneath the table, not fully shown in Fig. 1.

The motion of this belt carries with it the wire stem which is slowly unwound from the spool, A. Two threads passing through an eye, E, Fig. 3, are also drawn through the hollow spindle, B, in conjunction with the wire, by the motion of the endless belt. These threads are unwound from the spools, F, Fig. 1. At the same time a rapid rotary motion is given to the hollow spindle by a small belt from the driving pulley, G, Fig. 1. Motion is imparted to G, from gearing not fully shown in the engraving, but which the imag ination can easily supply, the form of this gearing being wholly immaterial to the claims of the inventor.

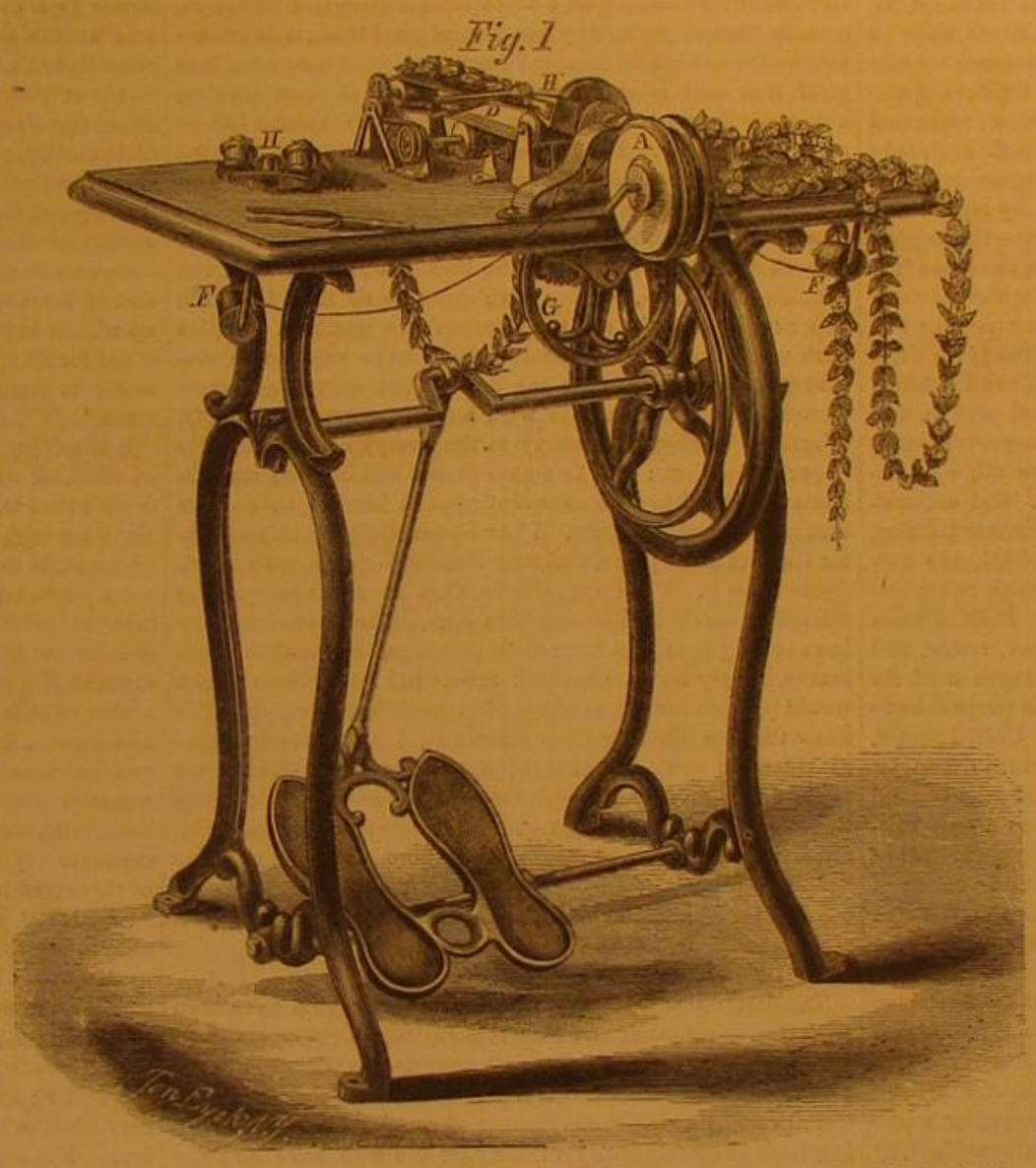
On the revolving hollow spindle, B, is fixed a spool frame, H, which carries a single spool when formed as in Fig. 2, and two spools when formed as in Fig. 3. The covering threads are led from these spools through the loop of a small flyer on the end of the hollow spindle, B, and being held in contact with the wire as the latter is slowly fed through the spindle, are wound rapidly and uniformly over its surface, the spool frames revolving with the spindles.

The ends of the stems of leaves, fruits, or flowers being thrust into the end of the hollow spindle, are at once caught, and firmly wound under in a manner far superior to hand work, and so much more rapidly that a girl may perform in two hours as much work as she could do in ten hours by hand.

It is also obvious that by readjusting the pincers on the endless belt a wire of any length may be wound and branched which cannot be done by hand labor. Friction springs are provided to prevent the spools from turning too easily, and thus the requisite tightness in winding is secured. This is a beautiful and unique machine, and to be fully appreciated it needs to be seen in operation.

Patented through the Scientific American Patent Agency, November 9, 1869, by Ambrose Giraudat, whose place of business is at 16 Wooster street, New York, where the machine may be seen in practical operation.

Fig. 1



GIRAUDAT'S MACHINE FOR BRANCHING ARTIFICIAL FLOWERS.

Fig. 2

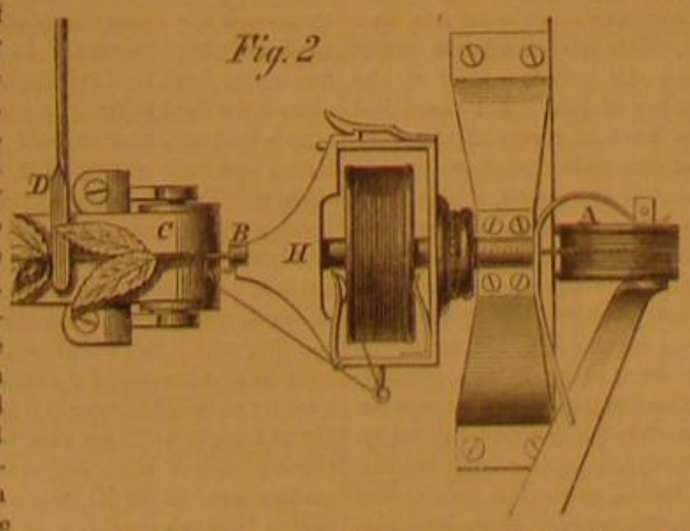
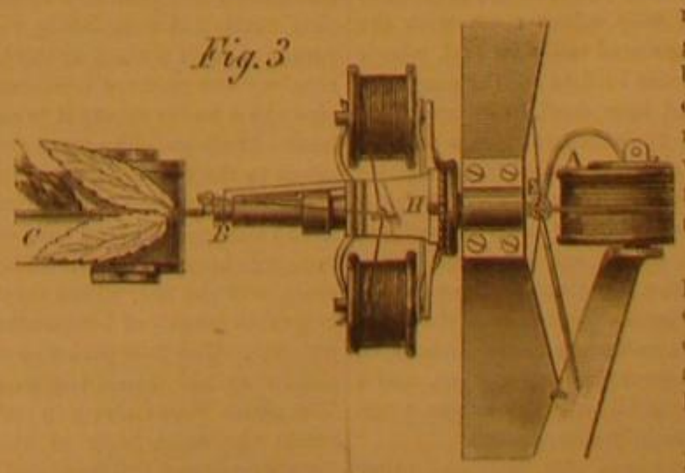


Fig. 3



WASTE NOT--HOW SMALL THINGS ARE UTILIZED.

(From Chambers' Journal.)

One of the blessings of modern science presents itself in the form of economy, frugality, utilization. Things which were formerly thrown away as waste are now applied to man's purposes, to an extent far beyond our general supposition. Dr. Lyon Playfair and Mr. P. L. Simmonds have frequently drawn attention to this subject, chiefly in illustration of the wonders of chemistry. Mr. Simmonds has recently collected a new budget of instances, which he has brought under the notice of the Society of Arts.

Before touching on these, let us refresh the reader's memory by a summary of results already recorded. Beautiful perfumes are produced from substances not merely trivial, but in some cases fetid and repulsive. Fusel oil, putrid cheese, gas tar, and the drainage of cow-houses, are thus transformed; the result is a triumph of chemistry; but it is commercially shabby and unfair to call perfumes thus obtained by such delightful names as "oil of pears," "oil of apples," "oil of pine-apples," "oil of grapes," "oil of cognac," "oil of bitter almonds," "eau de millefleurs." Blue dyes are made from scraps of tin, old woolen rags, and the parings of horses' hoofs. Old iron hoops are employed in ink making; bones as a source of phosphorus for tipping Congreve matches; the dregs of port wine for making Seidlitz powders; the washings of coal tar for producing a flavoring condiment for *blanc-mange*. Old woolen rags are the foundation of the prosperity of Dewsbury and Batley, in Yorkshire; these musty, fusty, dusty, frouzy fragments being ground up into shoddy and mungo. Other relics of old woolen garments are made to yield flock for wall paper, padding for mattresses, and Prussian blue for the color makers. Chemicals are employed to destroy the cotton fibers in old worn-out balzarines, orleans, coburgs, and other mixed fabrics for ladies' dresses, and to liberate the woolen or worsted fibers for a new career of usefulness. Woolen rags, when even the shoddy maker will have nothing to do with them, are choice materials for the farmer as manure. That bones are used for knife handles we know very well; but it appears they are also used for bone-black by color and varnish makers, for size by dyers and cloth finishers, and for manure by farmers. Horns and hoofs are a very magazine of useful products in the hands of the scientific chemist. Whalebone cuttings yield Prussian blue; dogs' fat is (shamefully) made into sham cod-liver oil; wool scourers' waste and washings reappear as beautiful stearine candles; bullocks' blood is used in refining sugar, in making animal charcoal, and in Turkey-red dyeing; ox gall or bile is used by wool scourers and by color makers; fishes' eyes are used for buds in artificial flowers; bladders and intestines are made into air-tight coverings and into musical strings; all the odds and ends of leather and parchment dressing are grist to the gluemaker; calves' and sheep's feet yield an oil which is doctored up most fragrantly by the perfumer; stinking fish is always welcome as manure to the farmer; and a brown dye is extracted from those small bedroom acquaintances whom few of us like to talk about, and none like to see or to feel. At least fifty thousand tuns of cotton waste, the residue and sweepings of the mills, are annually utilized by being worked up into coarse sheeting, bed covers, *papier-mache*, and the commonest kinds of printing paper. Seaweed is used as a material for paper, as a lining material for ceiling and walls, and as a source whence the chemist can obtain iodine. Various kinds of seed, when the oil has been squeezed out of them, are useful cattle fatteners as oil cake. Grape husks yield a beautiful black for choice kinds of ink; raisin stalks constitute a capital clarifying agent for vinegar; bran or corn refuse is valuable in tanning, calico printing, and tinplate making; brewers and distillers' grains are fattening food for cattle. Bread raspings are in France sometimes used as a substitute for coffee, and as a tooth powder. Tan-pit refuse is valuable for the gardener's hot-house. Damaged potatoes, and rice and grain are made to yield starch. Ground horse-chestnuts are not unknown to the makers of cheap maccaroni and vermicelli. Cork cuttings and scraps are eagerly sought for stuffing and for buoyant purposes. Pea shells are used as a food for milch cows, and spirit may be distilled from them. Sawdust is now applied in a prodigious number of ways, for making paper, distilling oxalic acid, smoking fish, clearing jewelry, filling scent bags, stuffing dolls, etc. Tobacco ashes are made into tooth powder. The coal tar from gas works is made to yield sulphate of ammonia, sal ammoniac, printers' ink, lampblack, disinfectants, naphtha, benzole, paraffine, and the magnificent series of aniline colors for dyeing and calico printing. The sediment in wine casks is made into cream of tartar. Old kicked-off horseshoe nails yield the best of all iron for musket barrels. As for the shops in which gold workers, jewelers, and gold-beaters work, not only is the very dust on the floor precious, but a refiner will gladly give a new waistcoat or apron for an old one, for the sake of the auriferous particles thereby obtained.

Mr. Simmonds' new batch comprises many instances of substances recently transferred from the domain of waste to that of utility, and many suggestions for a similar transference in other quarters.

First, for the animal kingdom. Horse flesh is certainly not waste so long as dogs and cats eagerly feed upon it; but the French say that we ought not to leave it to the dogs and cats, by reason of the excellent qualities it possesses for human food; however, we must leave this matter to the hippophagic admirers of "chevaline." Fish are applied to many more useful purposes than was customary a few years ago; shark fins are prized as food by the Chinese: shark liver is boiled down by them for oil; shark skin is dried and used for polishing wood and ivory; dried shark heads are given by the Norwegians to cattle as food; smoked and dried dogfish is eaten as food, as are also the eggs, while the skin and the liver are applied to the same purposes as those of the shark. The French procure useful medicinal oil from the liver of the skate fish, which used to be thrown away, but which is now

found to be nearly as efficacious as cod-liver oil. A French firm, Messrs. Souffrie, make large quantities of useful tallow or fat out of the pickings and waste of slaughter houses, the dead cats and dogs found floating in the Seine, and the used-up grease of railway wheels; when doctored by means of steam and hydraulic pressure, this fat becomes available for stearine manufacturers. Leather scraps are made into "shoddy leather," by grinding and macerating them into a pulp available for the inner soles of shoes and such-like purposes. There is another leathery composition much used in America under the name of "pancake." Thin bits of leather, the odds and ends cut off by the tanner and currier from whole hides, are interlaid with paste until they accumulate to an inch in thickness, and then heavily squeezed between two iron rollers; the mass comes out as an oblong pancake twelve inches by four, and half an inch thick, looking very much "like a cross between a sheet of gingerbread and a cake of tobacco;" it is used for inner soles, heels, and stiffeners. The albumenized paper used by photographers is subject to much waste in its manufacture; this waste, instead of being consigned to the pulp vat, is now converted into beautiful marbled paper, by a peculiar application of aniline colors to the albumen.

Next, as to the vegetable kingdom. We are told that the using up of what was formerly considered waste, in the textile manufactures, now reaches the enormous quantity of a hundred thousand tuns annually in the three forms of cotton, flax, and hemp waste. If we include animal fibers, such as shoddy wool and silk waste, the aggregates becomes largely increased. The French make firewood or fire lighters of the cones of pine trees and the waste cobs of maize, saturated with any cheap resinous substance. Messrs. Souffrie (already named) buy all the waste and pickings of vegetables from the twenty-five hospitals of Paris, cook them by steam, and feed a piggery of seven hundred head of swine—the vegetables being enriched with the greasy slops from the same hospitals. The same firm also produce beautiful white fat from the black residue left after purifying colza or rape oil; and another residue from the treatment of *this* residue gives them a useful varnish for cheap out-door purposes. The oil retained in olive oil-cake is now extracted by chemical means, and converted into capital stearine; and by this improvement it is expected that seven million pounds of olive oil, now annually wasted at Marseilles, will be utilized. Old account-books, letters, invoices, envelopes, checks, insurance policies, and other kinds of *writing* paper (not *printing*), are now bought at about £12 per tun, and worked up with other materials into pulp for the penny newspapers. Besides linen and cotton rags, cotton waste, old writing paper, straw, and esparto or Spanish grass, wood is also now much used for making into paper. Large factories for this purpose have been established in Italy, Wurtemberg, the United States, and other countries; the wood is rubbed down into dust by friction against rapidly revolving roughened wheels, and then treated by chemical processes until it forms a pulp suitable for paper-making. There is one wood-pulp paper-mill in Pennsylvania that can work up thirty thousand pounds of of wood or of sawdust per day. Nearly all the German newspapers now have a percentage of wood in the paper on which they are printed. The *New York Daily Tribune* is said to be printed on paper made of bamboo; and other American journals are printed on paper made chiefly of a kind of wild cane that is found in vast abundance on the shores of the Mississippi. A German chemist has found a mode of distilling spirit out of a residue left after chemically treating wood-pulp for paper. A French manufacturer converts sawdust, by intense pressure, into beautiful little boxes and other ornamental articles. The seed in the cotton pods or tufts, which used to be an annoyance to the cultivators, is now most usefully employed as a gas fuel, as a source of oil for lamps, as a chief substitute for olive oil, as oil cake for cattle food, and as a source of good hard grease or stearine for soap and candles. The refuse molasses from beet root sugar, formerly used only as pig food, are now distilled to obtain alcohol, and the residue crystallized to obtain potassium salts. Spent dye woods, after the coloring matter has been extracted from them, are sold in France to a large manufacturer, who mixes them with tar refuse, and forms them into compressed cakes for fuel, which has a very large sale. The acicular leaflets of the pine tree are converted into what is called tree wool, in France, Sweden, Holland, and other parts of the continent; this wool is used for wadding, stuffing for mattresses, and other articles of furniture; a cloth made from its fibers is used for inner vests, drawers, hose, shirts, coverlets, and chest-preservers; the membranous fragments and refuse are compressed into blocks for fuel; the resinous matter contained in them is distilled for gas; while by various modes of treatment there are produced an essential oil for rheumatism and skin diseases, an etherial oil useful as a curative agent and as a solvent, and a liquid for a medicated bath—all useful substances from a material which not long ago was utterly disregarded.

And now for the mineral kingdom. Mr. Mill, and other thoughtful men, are cautioning us that, as our stock of coal cannot last for ever, we should do well to utilize the thirty million tuns of small coal and dust which is allowed to go nearly to waste annually at the pit's mouth; and attention is drawn to what Belgium is doing in this matter. Near Charleroi, eight hundred thousand tuns of coal dust had accumulated, a burden to the colliery owners, and an injury to the health of the work people. Whereupon a company was formed expressly to utilize this refuse. The coal dust is sifted, mixed with eight per cent of coal tar, heated to a paste by steam at a temperature of three hundred degrees, and pressed into blocks and cylinders about twenty pounds weight. These blocks form excellent fuel for locomotives and steamboats, productive of great heat and very little ash. In various foreign countries where paving stone is scarce, the slag from iron furnaces is brought into use, by being run into pits eight or nine feet in diameter, and cooled into slabs for paving. The cuttings of tin plate, and worn out tin kettles and saucepans, are subjected to processes which yield pure tin, good weldable iron, ammonia, Prussian blue, and stannate of sodium; and as the make of tin plate in England and Wales amounts to more than half a million tuns annually, there must be a very large store of material available in the old tin plate which is replaced by the new. The waste flux, such as borax, used in galvanizing metals, finds a ready market among refiners and for making paint.

But there are mounds of things still waiting to be utilized, waiting for the day when some clear practical minds will find out what to do with them. The Cleveland iron sells for a comparatively low price in the market, because it is contaminated with phosphorus. Now, the iron would be worth seven shillings per tun additional if the phosphorus were out of it, while phosphorus itself is worth sixty or seventy pounds per tun; what would not be the national gain if the two could be easily and cheaply separated! Nearly a hundred thousand tuns of sulphur a year are wasted in our alkali manufactures; means have been discovered for recovering this sulphur, but the system has not yet been sufficiently adopted to prevent the sad waste of a vast quantity of spent liquor in which the sulphur exists. Cinders from refineries and puddling furnaces, and scale from rollers and hammers, contain from thirty to fifty per cent of good iron; it is known that the metal can be obtained from them, and converted into good iron and steel; and iron masters are now waiting anxiously for chemists to show how such extraction can be managed cheaply. Mr. Frank Buckland has pointed out that we destroy millions of wholesome fish every year, by poisoning the waters of the Tees, the Wear, and the Dovy with lead refuse, the Dee with petroleum refuse, the Usk with sulphuric acid refuse, the Camel and the Fowey with mud from the Cornish clay works, the Exe with chloride of lime from the paper mills, and many of the rivers of the northern counties with waste from the chemical works. As to substances useful for food, there can be no doubt that enormous waste occurs. We will conclude with a few observations by Mr. Warriner (teacher of cookery to the army) concerning this important subject: "The refuse grease and kitchen stuff in Paris is utilized to a great extent; but in London, there is an immense amount of waste. I have been studying this subject for the last three years, and can therefore speak with confidence upon it. I am quite sure that as much material is wasted as would feed one million pigs. There are sanitary laws telling people to burn their potato peelings and cabbage leaves, simply because we lack municipal regulations which would provide for the removal of these things every day. To show the loss which is thus sustained, I may mention that at Aldershot each regiment of about five hundred men get about four pounds per month for their refuse of this description. I calculate that from every family of twelve individuals, living at the rate of £300 a year, there is enough refuse to keep two pigs."

REPAIRED BOILERS.

The dangerous character of steam boilers which have been subjected to repeated mending is notorious to every engineer who has given even the slightest attention to the working of this class of machinery. His list of boiler calamities will contain many conspicuous records of serious disasters resulting from the incapability of many people who have had the practical oversight of boilers at ironworks, and collieries in particular, to detect when a boiler has been sufficiently patched. Those records will likewise strengthen him in his conviction that very many workmen to whom repairs are intrusted are altogether unfit for their duties.

There is hardly any operation connected with the repair of a boiler more productive of danger than that by which rivets are brought into a line. The day is gone by, we hope, when in new boilers the longitudinal seams are made to run in a continuous line from end to end, with the transverse seams also continued completely round the boiler, giving at the corner of each plate four thicknesses of iron. Yet unskillful repairs often produce continuous lines of rivets at the very place in a boiler where it is most desirable that there should be the brick-wall-like arrangement of the seams, which adds much to the strength, and also often prevents a rent from continuing forward to a dangerous point. A large externally fired tube boiler at an ironworks in Wolverhampton some time ago burst its shell. The first rupture took place in a seam over the fire, where frequent repairs had led to a considerable length of longitudinal seam being in one continuous line. The four plates over the fire parted and opened out until they had ripped two seams completely round the boiler. The plates were thrown in one flat piece upon a bank behind, while the main body of the boiler, with the tubes, was turned over and the front end blown away. More recently, at Newcastle-upon-Tyne, a plain cylindrical boiler was much torn up, and all the fragments thrown to the front of their original position. The boiler was very old and much deteriorated, so that it was unable to bear the ordinary pressure, a longitudinal arrangement of the plates contributing to the weakness. Shortly afterwards, in the same town, a similar boiler was much torn and scattered. Here, too, the plates had been arranged longitudinally, and the accident began at a patch lately put on. The boiler had become so deteriorated by nearly thirty years' wear that it was not able to do the moderate duty required of it. Very quickly afterwards, at Durham, another plain cylinder with plates longitudinally arranged, and which had been working twenty-seven years, gave way at an old fracture over the grate, and was torn into four pieces, which fell a great distance off; and on the 18th of October last a plain cylinder with round ends, 40 feet long and 6 feet diameter, made of half-inch plates, and set with a fire-grate at one end, and flash flue, exploded at the works of the Great Bridge Iron and Steel Company, in South Stafford shire. The front end, with three rings of plates, was thrown up to a sufficient hight to clear the buildings, and fell into a pool some distance to the right and slightly to the rear, the remaining part of the boiler being left near to its original position. The boilers on each side were thrown off their seats, that on the left knocking down a new upright boiler which was nearly ready to work. The first rent appears to have taken place at a seam over the left side of the fire-grate, where four new grates and a long patch had been inserted. This rent must have instantly extended across the front of the man-lid above and around the fourth transverse seam, near some patches, thus allowing the shell to open out, the reaction of the issuing contents sending the fragments upwards. There were so many patches in the boiler, especially around the part which gave way, that many seams were made in continuous lines without any break of joint, and a great number of rivets must have been removed from some of the seams more than once, thereby very much reducing their strength. "I believe," said Mr. E. B. Marten, from whose evidence at the inquest we have been quoting, "the cause of the explosion was simply that this frequent repair had so reduced the strength of the boiler that it was unable to bear even the usual working pressure. It is often difficult," he adds, "to convince those who have the repair of boilers, that the putting of patch upon patch reduces the strength of the boiler, until it is completely untrustworthy, although it may not leak; but several explosions this year, and very many in past years, have proved the fact beyond dispute. The great havoc caused by such an explosion as that now under investigation leads many casual observers to suppose they are caused by some sudden accession of force within the boiler; but the enormous force pent up within any high-pressure boiler is quite sufficient to account for all the mischief, when the balance of strain in the fabric is destroyed by the sudden giving way of a weak seam."

It is as true now as it was eighteen hundred years ago that an effectual way of destroying that which is old, is to patch it with that which is new. The danger is more in the patching than in the repairing. True, a boiler, any more than a garment, is as strong after repair as when new, even though not a patch but a new breadth be inserted; still the new breadth, properly put in, is much less likely to bring about destruction than the patch. Very little capital and hardly more ability is needed in the coal and iron districts to enable a man to pass muster as a "boiler maker." He should rather be termed a boiler mender. A portable forge, a few hammers and drifts, and he is set up. Small colliery proprietors, and sometimes ironworks-people, instead of sending for help to a boiler-making firm of standing, too often call in these small masters. When an accident happens the evidence of empirics of this class is too often gravely taken as the evidence of "practical" men. Invariably the proprietor of the boiler is able to say that he has given orders for everything to be done to the boiler the maker considered necessary. The boiler mender, knowing that because of its lesser first cost a patch would be far more in consonance with the proprietor's views than a whole plate, had patched, and not effectually repaired, the boiler; and he is always ready to declare to a coroner and jury that, in his opinion, all had been done that was necessary. Yet how frequently it turns out that the accident has happened almost immediately after the repairs have been done. In the case of a cylinder boiler at Dudley, not long since, this frequent patching over the fire had brought the longitudinal seams for several plates without break of joint. A patch had been put on a few days before the explosion, and as the rivet holes had badly fitted there had been much strain caused by drifting, and the rivets were much distorted. The frequent and badly executed repairs over the fireplace had so weakened the structure as to make it unable to bear the very high ordinary pressure. In the case at Great Bridge, which has called forth this article, the boiler maker had only at four o'clock finished putting in some sixteen rivets over the fire to stop a leakage, and at half past seven, half an hour after steam had been got up in it, the explosion occurred, killing three people. In this case the boiler maker acted up to the light which he promised, and the proprietors of the boiler had no reason to believe that it was not as much light as was needed. His evidence is that when called in he found the boiler in good repair with the exception of a few rivets over the fire, which were leaking. How should it be otherwise than in good repair, for during the past two years he had frequently mended it over the part where the fire was placed. He had never any idea that the boiler was rendered unsafe in consequence of these frequent repairs; and their instructions always were to do all repairs required. This man had no notion that the patching, in the manner in which it had been performed in this case, was the chief immediate cause of mischief. Mr. Marten, however, testifies—as every other competent engineer would have testified under similar circumstances—that "the rivets, which were put into the boiler in the very line of the seam where they gave way, had proved the great point of weakness. Immediately that the fire was put under, and the steam got up, the openings extended from rivet-hole to rivet-hole, and the boiler exploded."

A very practical view suggested itself to one of the jurors. If the putting of patch upon patch had reduced the strength of the boiler till it had become completely untrustworthy, although it might not leak, "some one ought to know whether it was worn out." Mr. Marten responded that "the experience of engineers, who saw so many cases of this kind

was that, though boilers in such a condition as the one in question might last for many years, sometimes they burst at once after being repaired. The question was, whether those who saw the boiler thought it was safe or not." One of the managers of the works, it transpired, who had been there eight years, had never had any reason to believe it was unsafe; the boiler maker believed it safe; and the engine-tender, who had the charge of the six boilers at the works, believed the same—indeed, did not see that it leaked until his son pointed out that defect. At the testimony of these work-people no reader of the *Engineer* will be surprised. But the evidence of the secretary of the company was that all the boilers used by the company were insured with the Manchester Boiler Insurance and Steam Power Company, whose agents were accustomed to visit the works once in six months. On the 6th of October an external examination was made on behalf of the Manchester Company. "From that inspection he was led to believe that the boilers were in good condition." In May last the agent of the boiler company made an internal inspection, and suggested certain repairs, which it was not disputed were carried out. The secretary added, in reply to the coroner, that in May nothing was said as to the boiler being unfit for use, "or they should have condemned it." Yet, to replace this very exploded boiler, and also "any other which most required to be replaced," orders had been given for two new boilers. One of these Mr. Marten speaks of above. Even a Black Country juryman, when this last fact came out, wanted to know why, if the boiler was safe, it was to be replaced? The reply he obtained was, that "boilers, when they got to a certain point, might be considered safe, and yet want replacing."

The moral of all this must be tolerably patent to the reader. (1) When boilers need repair those repairs should be put into the hands of boiler-making firms who have a reputation to sustain. (2) The surest way to ascertain the true condition of a boiler is to examine it at frequent intervals in every part, both inside and outside. (3) When, as in this case such intimation has been conveyed to proprietors—whether by boiler insurance agents or others—that the time has come when a boiler should be replaced, it is the truest economy to lay it off at once. (4) It cannot be too strongly urged upon users of steam power that it is far safer and cheaper to renew a boiler than to resort to continual, expensive, and unsatisfactory patching.—*Engineer.*

For the Scientific American.

TO WASH LEATHER GLOVES.

BY DR. REIMANN.

Washing leather gloves, when rationally performed, is no laborious operation, being of so simple a nature, that it can be effected by any one. The principle is to remove the grease which has become deposited on the gloves by usage, and at the same time the dust which is incorporated with the grease. It must be observed, however, that the gloves are not to be treated with any liquid likely to destroy their color, or prove injurious to the leather when too long immersed in it.

Soap and solutions of carbonate of soda, or of caustic soda, are self-evidently unsuitable in this operation, because these substances must be dissolved in water, which evaporates so slowly that the shape of the gloves would be destroyed, while the caustic solution would exercise an injurious influence on the color of the leather.

It is necessary therefore to employ a liquid which, though able to dissolve the grease, does not yet contain water.

Substances possessing this property we have in benzine, petroleum-essence, ether, and other allied bodies.

Formerly, glovesused to be rubbed with a rag which had been wetted with one or other of the above liquids, particularly benzine. They were finally cleaned, but the surface of the leather was often injuriously affected in those places where there was more dirt than elsewhere. Then the washing could never be carried out quite regularly, so that gloves cleaned in this way were often unfit to wear again, or if worn again they soon began to smell of benzine, when brought in contact with the warm hand, and often indeed, so strongly, that it was quite impossible to go into society with such gloves, because every one was immediately aware that some one had entered the room, whose gloves had been cleaned.

The cause of this inconvenient circumstance was as follows: The glove makers, after cleaning the gloves, allowed them to hang some time in the air, whereupon all the benzine volatile at ordinary temperatures was certainly removed, but another portion less volatile than the former, could not be volatilized at ordinary temperatures, and was therefore retained in the gloves. When this retained benzine is afterwards warmed by the hand, it begins to volatilize in minute quantities, which are, however, sufficient to give annoyance to a large party.

But not only were the public sufferers by this simple but irrational method of washing gloves, but the glove maker himself was also a sufferer. He consumes large quantities of the volatile substances, which were entirely lost in the process of volatilization. Besides which, the vapor of the hydrocarbons caused headache, and proved highly injurious to his health.

All this inconvenience can be obviated by washing the gloves in a larger quantity of liquid, and in a closed vessel.

To effect this, the following process is resorted to:

A bottle, 2 feet high, and 1 to 1½ feet wide, the stopper of which is also made of glass, is filled with two pounds of benzine, petroleum-essence, etc. Then the gloves which are to be washed are put also into the bottle. On this account the neck of the bottle must be very wide, perhaps from ½ to ¾ foot in diameter. Such bottles are easily obtained, being much used in pharmacy. As many gloves may be introduced into the bottle as the liquid will cover. The bottle is then closed, well shaken, and allowed to stand some minutes. The shaking is then repeated, the bottle opened, and the gloves taken out with a pair of iron forceps.

To prevent the possibility of there being any smell, it is a good plan to open the bottle under a good chimney, which thus carries off all the vapor that escapes.

The gloves, when brought by the forceps to the mouth of the bottle, are taken out, one after the other by the hand, and wrung out, care being taken that the superfluous liquid runs back again into the bottle. It is highly advisable to perform this operation under a chimney, or the workman will soon suffer from the injurious influence of the volatile hydrocarbon.

Under the chimney is placed a cord stretched between two pins, and the gloves are hung upon this by means of small S-shaped hooks. After hanging a short time they will be dry.

The benzine contained in the bottle dissolves all the grease which adheres to the gloves, and the dirt which had been combined with the grease is consequently removed at the same time. The benzine remaining in the bottle assumes a dirty gray color during the process of washing.

When the benzine has become too dirty, it is put into a distilling apparatus, and distilled over. In this way the benzine is restored to its original purity and whiteness, so that it can be used again in further operations.

If the operation of distilling the benzine is disagreeable to the glove maker, he can have it purified at the apothecary's or chemist's. It is, however, an operation which he can readily perform himself.

The apparatus is neither complicated nor expensive. A small wooden pail, such as is used in every establishment, is furnished with two holes. The first of these is drilled near the upper margin of the pail, so that, when the pail is filled with water, the water runs out through the hole, until the surface of the water within the pail is on a level with the lowest portion of the hole, that is to say, just below the upper margin of the vessel.

On the opposite side of the pail another hole is made, but this time near its bottom, so that water would run through this hole, until the surplus of the contained water was within a short distance of the bottom.

A leaden tube, the thickness of which equals the diameter of the hole, is bent so as to form a distilling worm, the upper end of which is inserted into the upper opening, and the lower end into the lower hole.

The tube is tightly inserted into both holes, so that no water can run through the space between the tube and the hole.

The pail is then filled with cold water.

The upper and lower ends of the leaden tube must project a little beyond the outer surface of the pail, perhaps two inches.

The lower end is bent downward a little. The upper end is a little enlarged, so that the tube forms a sort of funnel above.

In this is inserted a glass retort, conveniently fixed in a holder

The space between the neck of the retort and the enlarged end of the leaden tube, is conveniently filled with moistened cotton, so that no vapors can escape through it.

It is a good plan to employ a glass retort with a tube, so that any fluid can be poured into it when the apparatus is already fixed.

Having placed the retort on a vapor bath, where it can be heated at 100° C., the pail is connected with the neck of the retort, as above mentioned, and in this way filled with cold water. The retort is then filled with the impure benzine or petroleum-essence which has been used in washing gloves.

After pouring in the benzine, the tube of the retort is closed by a stopper, and then the apparatus is completed by a bottle placed under the lower end of the leaden tube, which projects beyond the outer surface of the pail, so that the liquid running down this flows directly into the bottle.

The vapor bath is now heated, the retort soon becomes warm, and the volatile liquid begins to distil over, either quickly, or slowly, according to the way in which the heating process is conducted.

The vapor of the hydrocarbon condenses in the worm, and a stream of liquid flows out of its mouth. In a short time there remains behind in the retort only the grease which the benzine has extracted from the gloves.

The gloves when taken out of the bottle are often not quite clean, in which case it is necessary to rub them with a rag, moistened with benzine, in all places where they are still dirty.

Thus the last traces of dirt are removed, and the gloves become perfectly clean. In this state they may be hung on a cord under the chimney.

The gloves soon become dry, but a part of the benzine still remains behind, which is less volatile, and which, when the glove is in contact with the warm hand, causes a strong odor of benzine to be evolved.

To remove this also, the gloves are placed on a common plate, which is put upon an iron pot containing boiling water. The first plate is covered with a second, and the gloves between the two plates are heated at the boiling temperature of water, until the last traces of the unvolatilized benzine have escaped.

The gloves are now removed from the plate, and put upon a wooden glove-stretcher, or shape. In this way they are made to resume their original form, and are now ready for use.

The whole operation must be so conducted that no smell of benzine is perceptible. The smell of benzine is always a sign of carelessness on the part of the workman, who can readily conduct all the benzine vapors up the chimney.

Railroads in the United States.

It is difficult, with all our accumulated facilities to reach every part of our vast country, and ascertain the exact condition of the railroad interest in each State or section. And during the last year the development of this great interest of the nation has been so immense and so rapid, as to make it impossible to keep pace with its growth. The construction of the Pacific Railroads, indeed, has forced all parts of the country to railroad extension, and hence we find that the extent of mileage constructed, and improvement on old lines has been greater in 1869 than in any former year of our railroad history. When we state that there have been brought into use during the year no less than 6,588·37 miles of new road, this fact is fully proven. This is more than one eighth part of the total mileage in the country, the other seven eighths having taken forty years of varied fortune to establish. Yet still we are progressing, and the year now commencing promises to eclipse even the year just closed. We have now in use an estimated mileage of 48,860·55 miles, and also projected and in progress a mileage of 27,505·83 miles. Take all the world without the United States, and this is not equaled. Truly we are progressive, and see in all this development a destiny as grand as insured. With our railroads we scale mountains and span the uninhabited plains, which are still in possession of the Indian, and open up vast territories for human habitation, which, without the railroad, must forever have been closed against civilization. If we are going fast, we are going in the right direction, and the day is not far off which will give us the great benefits we seek in our headlong course. The railroad will unite us, and make us the great nation of the world, free and indissoluble.

The following tabulation shows the distribution of mileage and cost to the several States and Territories:

States, etc.	Miles of road—Total.	Miles of road—Open.	Cost of road and equipment.
Maine	949·79	672·97	$21,182,110
New Hampshire	725·32	685·32	22,642,000
Vermont	658·09	658·09	28,797,186
Massachusetts	1,769·55	1,488·70	74,619,463
Rhode Island	121·47	121·47	5,132,607
Connecticut	806·94	698·57	27,350,017
New York	4,735·91	3,636·23	269,001,671
New Jersey	1,028·65	889·65	74,691,785
Pennsylvania	6,878·36	5,014·45	300,556,508
Delaware and E. Maryland	455·50	292·50	8,772,631
Maryland other than above	770·02	493·32	31,814,659
West Virginia	723·75	264·75	27,549,915
Virginia	2,069·11	1,482·94	49,326,461
North Carolina	1,552·97	1,129·67	29,505,685
South Carolina	1,439·17	1,089·97	27,448,817
Georgia	2,695·41	1,694·70	36,875,552
Florida	613·20	440·20	9,882,581
Alabama	2,529·60	1,536·00	36,471,103
Mississippi	900·20	900·20	34,919,504
Louisiana	928·30	414·50	17,285,223
Texas	2,589·35	572·25	17,000,000
Arkansas	897·00	86·00	4,010,000
Tennessee	1,876·53	1,483·03	46,918,448
Kentucky	1,402·85	549·35	22,511,748
Ohio	4,613·46	3,725·89	150,624,247
Michigan	2,282·26	1,, 98·76	48,702,418
Indiana	3,331·10	2,977·10	121,152,301
Illinois	7,186·45	4,707·85	211,450,252
Wisconsin	2,779·00	1,460·00	60,128,723
Minnesota	1,200·00	853·00	27,800,000
Iowa	3,719·28	2,140·83	85,762,142
Nebraska	449·00	449·00	26,450,109
Wyoming Territory	560·00	560·00	45,000,000
Missouri	3,261·79	1,827·00	88,273,131
Kansas	1,601·20	920·20	29,622,200
Colorado	250·00	120·00	6,000,000
Utah Territory	365·00	365·00	18,000,000
Nevada	390·00	390·00	19,500,000
California	2,397·60	810·60	46,650,000
Oregon	2,019·50	119·50	5,700,000

The annual progress of railroad building since in 1827 the commencement was made in the construction of the Granite Railroad at Quincy, Mass., to the present time is shown in the following table:

Year.	Miles.	Year.	Miles.	Year.	Miles.	Year.	Miles.
1828	3	1839	1,129	1850	7,465	1861	10,253
1829	28	1840	2,197	1851	8,589	1862	11,779
1830	41	1841	3,319	1852	11,027	1863	32,471
1831	51	1842	3, 77	1853	12,997	1864	33,860
1832	131	1843	4,174	1854	13,673	1865	34,443
1833	576	1844	4,311	1855	17,918	1866	36,751
1834	762	1845	4,522	1856	19,731	1867	36,294
1835	918	1846	4,979	1857	22,015	1868	39,555
1836	1,102	1847	5,396	1858	25,000	1869	42,229
1837	1,431	1848	5,692	1859	30,635	1870	48,860
1838	1,843	1849	6,250	1860	31,771		

City passenger railroads are not included in the above summary. These are now in general use in all considerable cities, and in numerous instances in places where population is less dense. Their economical bearings are fully recognized, and their popularity is increasing. Boston New York, Brooklyn, and Philadelphia count their street railroad tracks by hundreds of miles. Probably the total is not less than 3,500 to 4,000 miles.

Nor have we included in our statement any account of the second tracks with which most of the leading lines are supplied, nor the sidings and turnouts on all the lines. These may be estimated at 25 per cent of the length of road, and are being added to yearly. Adding these supplementary tracks to the tabulated mileage, we find that the total length of equivalent single track in use is about 60,000 miles, and if we add to this the equivalent for the city passenger tracks to nearly 65,000 miles.

It is now about forty years since we began to build railroads, and in that time, as before intimated, we have built a greater length than is to be found in the whole of Europe. Progress leads but to new demands and new enterprises.—*American Railroad Journal.*

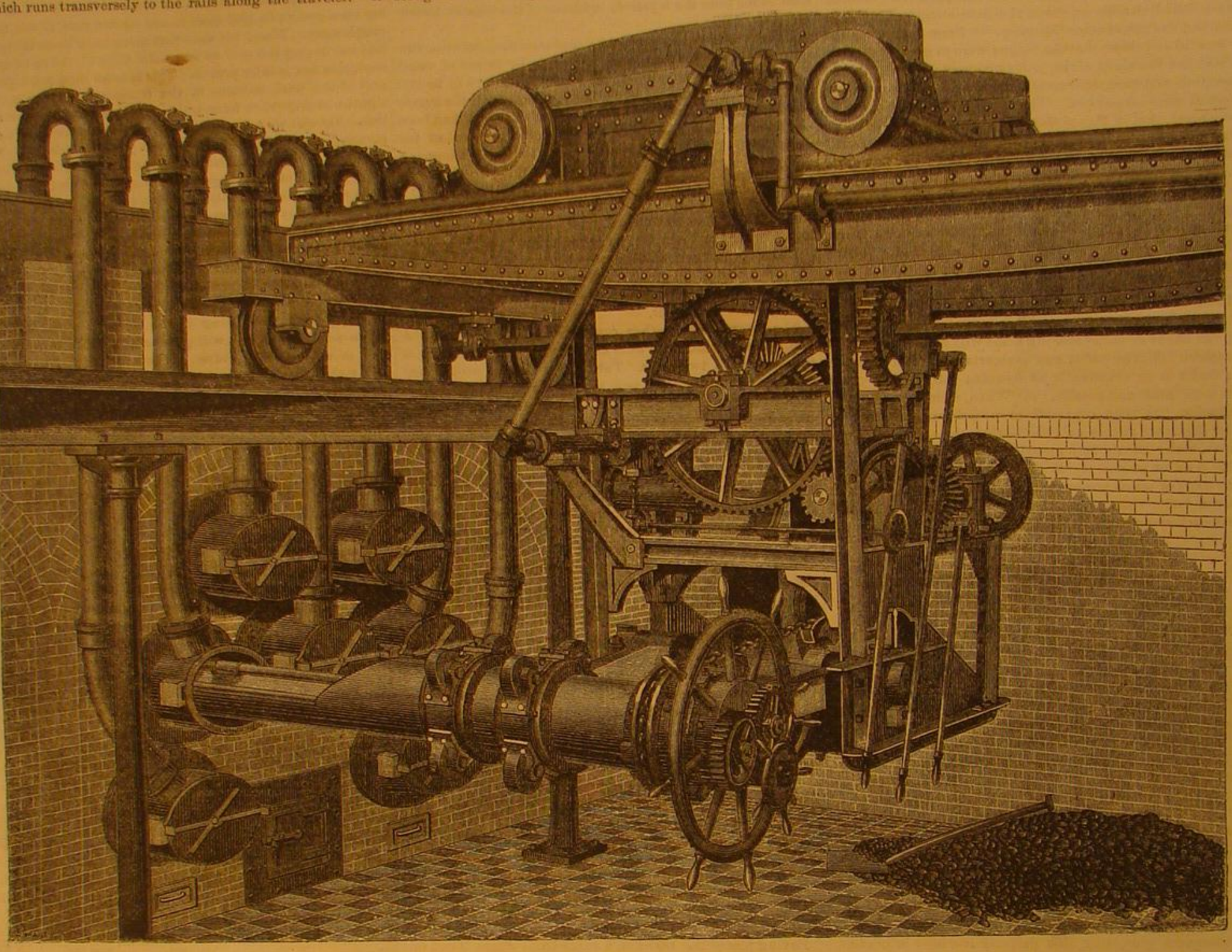
If Dr. Livingstone has really discovered that one of the sources of the Nile rises ten degrees south of the equator, that river becomes the longest in the world. The distance from such a southern latitude to Cairo is about equal, in air line, to the distance from the mouth of the Mississippi to Sitka, in Alaska, or to Upernavik, in Greenland, or from the Isthmus of Panama to the mouth of the St. Lawrence river.

The plans of the new Steam Flying Ship *Aviter* have been submitted to a thoroughly competent engineer who, it is said, has pronounced favorably upon them.

Gas-Retort Charging and Drawing Machinery.

The machine, an engraving of which we herewith reproduce from *Engineering*, is a new English invention worthy of attention, as it demonstrates the practicability of adapting machinery to the performance of labor hitherto supposed to be almost beyond the scope of mechanical appliances except such simple tools as are employed in manual operations.

On reference to the engraving (it almost speaks for itself), it will be seen that the retort house is fitted with two parallel over-head rails, which extend longitudinally and parallel to the range of retort mouths. These rails support a traveler, which is provided with wheels, running along the longitudinal rails; other wheels are mounted on a carriage or cradle, which runs transversely to the rails along the traveler. It will thus be seen that the cradle may be moved horizontally towards or from the mouths of the retorts, and may be brought opposite to any retort in the series.



GAS-RETORT CHARGING AND DRAWING MACHINERY.

The movement of the cradle along the rails of the traveler is effected by means of the steam engine giving motion from a pinion on the crank shaft, which is geared to the spur wheel on the counter shaft. On this counter shaft are two miter wheels with a double frictional cone clutch working between them on a feather. Into these two wheels is geared a third, which is placed and keyed on the lower end of the inclined shaft, the upper end being fitted with a bevel pinion gearing into a wheel on the forward axle of the running wheels of the cradle. The engine being always in motion, the clutch has only to be thrown in gear on either side to obtain either the in or out motion without reversing the engine. The motion to the main traveler for traveling longitudinally is taken from the crank shaft of the engine, which is fitted with miter gearing and frictional clutch (for reversing motion); these wheels give motion to a vertical shaft fitted at the upper end with a continuous screw or worm, which is geared into a worm wheel that is held in a bracket secured to the T framing of the cradle. A square shaft passes through the center of the worm wheel, the latter sliding on it; this square shaft is carried by bearings at each end from the traveler framing. On one end of this shaft is fitted a spur pinion, which gears with a spur wheel fast on the axis of one of the running wheels of the traveler, thereby imparting motion to it.

From the cradle or carriage are suspended wrought-iron T frames, which support the combined scoop and rakes. The outer end of the scoop, or that which is furthest from the retorts, is made cylindrical, and this portion forms the journal on which the scoop turns.

Radial lever arms are provided for supporting the scoop, these arms being fitted with frictional rollers, which are fitted so as to form the bearing, and allow the scoop to turn over freely. These arms are balanced and keyed on to a rocking shaft carried in bearings in the lower end of the suspended frames. The said rocking shaft carries a segment of a worm wheel into which gears a worm on a shaft, which is actuated by miter wheels on the counter shaft and frictional clutch, as before described.

The attendant in charge of the machine stands on a small platform in front of it, and by maneuvering the handles as may be required he produces all the movements requisite for introducing and withdrawing the scoop into and from the retort, and transporting it, either in a horizontal or a vertical direction, from one retort to another.

On rotating the endless screw the rocking shaft rotates partially, by which means the radial lever arms will be brought to different positions, thus raising the scoop to the hight of any one of the retorts in the bench or setting. In order to maintain the upper surface of the scoop perfectly horizontal during this movement there is a parallel motion given to it by the aid of an endless chain passing over two equal sized chain pulleys, the one being held stationary on the rocking shaft, and the other fitted loosely upon the cylindrical part of the scoop, but coupled therewith by the intervention of the well-known arrangement of detent and ratchet wheel. The object of the detent and ratchet arrangement is to enable the scoop to be reversed or turned over in its bearings for the purpose of discharging the coal into the retort (without interference from the chain wheels) after it has been introduced into such retort; while the detent serves to couple the chain wheel with the scoop when imparting the necessary parallel motion to the scoop for keeping its open side upwards or horizontal. This endless chain is also used for turning the scoop over in its bearing. The chain wheel or rocking shaft has a worm wheel attached to it, which is driven by a screw worked by frictional gearing from the engine shaft.

With the feeding scoop is combined one or more movable blades or series of movable blades or rakes, these blades answering the purpose for withdrawing; by this combined apparatus the two operations are performed, namely, feeding of the retorts with coal and withdrawing the coke.

In withdrawing the coke or residual products of the destructive distillation the combined scoop is introduced in an inverted position into the retort, the rakes being well within the hollow of the scoop, so as to pass freely over the surface of the coke until the scoop has entered a sufficient distance therein. In this position the rocking shafts with rakes are partially rotated in their bearing by the action of a hand-wheel with spur pinion and spur gearing fast on the outer ends of the rocking shafts when two are used. The hand-wheel and pinion work on a stud pin on the cap that forms the end of the scoop as well as the bearings for rocking shafts thereby causing each rake to describe an arc of a circle in a downward direction, so as to cut transversely across the mass of caked fuel or coke in the retort, from side to side, at each point where a rake or pair of rakes occur. In this position the scoop is withdrawn from the retort by running back the cradle, and the entire contents of the retort will be drawn out with it at one single stroke or traverse, leaving the retort ready for a fresh charge. The hand-wheel is now turned in the reverse direction, which has the effect of turning the blades or rakes inside the scoop again, the scoop being turned over by the endless chain that also acts as the parallel motion.

The steam is supplied from a stationary boiler to steam pipes running along the wall of the retort house. To this pipe is attached a flexible steam pipe (fitted with universal joints) in connection with the steam pipe or traveler which runs along the side of the girders that carry the cradle with the engine. On the girder there is a bracket placed, and through the upper end of this bracket the steam passes into the radial and telescopic pipes that connect to the steam casing of the cylinder. On reference to the illustration this will be readily understood.

The scoops may be filled with coal either by manual labor from the retort house floor or from a traveling tender, which consists of a coal-box or bunker suspended from a frame mounted on running wheels, with traverse longitudinal rails in company with the traveler, so as to be always in readiness for filling the scoops.

The same machinery, as illustrated and described, may be made to travel upon rails laid down upon the retort house floor, where such floor is not used as a coal store.

Death of an Eminent Chemist.

Otto Linne Erdmann, Professor of Chemistry at the University of Leipsic, born in Dresden, April 11, 1804, died after a protracted illness, on the 9th of October, 1869. He was particularly famous as the founder of *Erdmann's Journal of Applied Chemistry*, which he started in 1828, but he has also been an original contributor, to our knowledge, of many chemical substances, and there were few teachers in Europe more successful and popular than he. Fears were entertained that at his death the journal would cease to appear, but the publishers announce on the cover of the last number that they have made arrangement for its continuation.

A DOG'S BED.—The best bed which can be made for a dog, consists of dry newly-made deal shavings; a sackful of these may be had for a shilling at almost any carpenter's shop. The dog is delighted in tumbling about in them until he has made a bed to suit himself. Clean wood shavings will clean a dog as well as water, and fleas will never infest dogs that sleep upon fresh deal shavings. The turpentine and resin in new pine soon drive them away.—*Septimus Piesse.*

New Method of Piling Fagots for Rolling Rails.

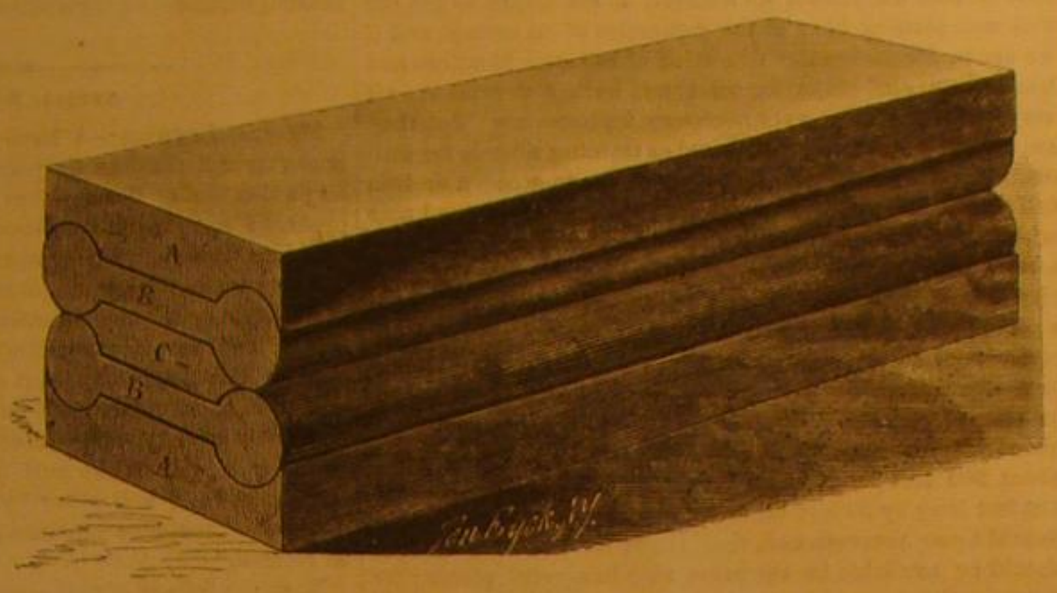
Our engraving illustrates a new method of forming the fagot or pile in the manufacture of railroad iron, by which it is claimed a rail is produced much superior to those made by the ordinary method, and the process of rolling is also greatly facilitated.

By this plan it is claimed a superior weld and more homogeneous rail is obtained, while the tendency of the head of the rail to split under wear is almost entirely eliminated. The rails are also claimed to be more elastic than those formed by the ordinary method, while they can, also, be made longer than at present, reducing the number of joints and the labor of constructing the permanent way.

Our engraving is a perspective view of the fagot. Three different sorts of bars, A, B, and C, are rolled and laid together as shown. Thus the pile may be laid up as high as desired, while each piece will be held to its place by the pieces with which it is combined. The pieces, A, may be omitted if desired, and only those marked B and C retained.

Different qualities of iron, or iron and steel, may be combined in this manner, so that when the pile or fagot is rolled a superior quality of iron or steel may form the face of the rail, while the less important parts are of inferior metal.

A trifling cost suffices for the slight alterations necessary in the rolls, and both the process of manufacture and the laying of the rails after they are made, are greatly facilitated.



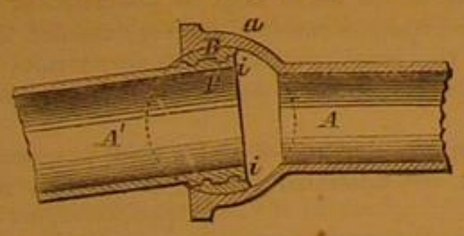
HAYWARD & LEES' IMPROVED RAIL FAGOT.

The object of the heads on the bars, B, is, besides the purposes already described, to envelope or surround the bars, C, for the purpose of securing the greater elasticity claimed for rails formed in this manner. The parts marked A form the head and bottom flange of the rail when the rolling is completed, and the upper of these pieces assumes such a form in the head of the rail, when rolled, as to resist the splitting tendency of the subsequent action of the wheels.

This method of making a fagot was patented through the Scientific American Patent Agency, July 14, 1868, by William Hayward and John Lees. For further information and terms address the above patentees at Brazil, Ind.

LAYING CAST IRON PIPES UNDER WATER.

John F. Ward of this city, has recently completed his contract with the Croton Aqueduct Department, of New York, for the laying of an eight inch iron pipe under the Harlem river from Manhattan Island to Wards Island. The pipe extends from the foot of 121st street on this city side, directly across the river to the landing house opposite, a distance of about 850 feet. The pipes are cast in 8-foot lengths, and united by means of a ball and socket joint, formed by providing one end of the pipes with a concave flange, which receives the conjoining pipe end, having annular ribs upon it. The space between the pipe end and the flange is packed with lead. The joint is thus rendered perfectly secure; while it is



also flexible and economical, as no screw bolts are required, This joint was patented by Mr. Ward, Aug. 25th, 1863, and will be readily understood by a glance at the diagram.

The method adopted by Mr. Ward for laying the pipe was both novel and simple. A large open boat was provided, in which was carried a supply of pipes and melted lead. At the stern a small supporting frame was placed. The pipes were jointed together in the boat, and, as fast as completed, pushed out over the stern into the water, thus forming a flexible string of pipes, which sank and rested upon the river bottom as the boat progressed. The work was easily and quickly accomplished. The depth of water in the Harlem river where the pipe lies is 40 feet.

Mr. W. has recently laid a water pipe of three feet diameter, on the same plan, under the Hackensack river, N. J., for the Jersey City Water Works. The simple and effective manner in which the work was done reflects the highest credit upon Mr. Ward's skill as a civil engineer. He projected some time ago a plan for a pneumatic tube to pass under the East river between New York and Brooklyn; and of its feasibility, in view of his successful experiences elsewhere, we entertain no doubt. By means of such a tube, letters and parcels might be transported between the cities in two minutes.

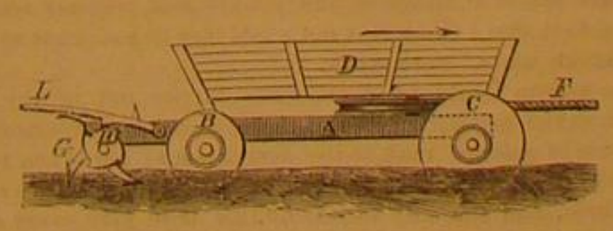
Improved Locomotive Alarm Bell.

There has been a recent trial on the Detroit and Milwaukie Railway, of an invention or device for ringing the locomotive bell continuously. The device consists of placing an ordinary bell, weighing about 100 lbs., on the front of the locomotive just over the cow-catcher. A rod attached to the eccentric shaft causes a clapper to strike the bell each turn of the driving wheel. The bell is suspended loosely, and revolves from the force of the stroke it receives, so that all parts of its surface are equally exposed to wear.

The advantages of this arrangement are a continuous sound, slow or rapid in proportion to the speed of the engine, each revolution of the wheel producing a stroke of the bell. In case of accident the railway company can always prove that their bell was ringing according to law, that being the point most difficult to convince a jury, and the one which railways have the greatest difficulty in proving. Owing to the position in which this bell is placed—in front of the engine and about three feet from the ground—the sound can be distinctly heard about three miles in the day time, and by night four miles or more, the ground and the continuous rail, both excellent conductors of sound, assisting in carrying the vibrations. The bell may also be rung, if necessary, by a cord from the foot-board when the engine is at rest. Quite a number of these bells have been placed on the engines of the Detroit and Milwaukie Railway, and several other companies are giving them a trial.

SELF-MOVING ANCHOR FOR STEAM CULTIVATION.

One of the few new things exhibited at the recent Smithfield show in England, was a self-moving anchor for use in the "roundabout" system of steam cultivation. It is now some thirteen years or so since the late Mr. John Fowler brought out his well-known disk anchor, and so applied it to the "roundabout" system, that the strain on the rope passing along the headland from the anchor carriage tended to shift the latter forward. According to Mr. Fowler's plan, this tendency to forward motion was resisted by a chain secured by a fixed anchor, and the necessary shifting from time to time was obtained by removing pins passed through the links of this chain, and thus allowing the anchor carriage to move forward a certain distance. The anchor carriage, an engraving of which we reproduce from *Engineering*, is also moved forward by the strain on the rope extending along the headland, but instead of its movement being regulated by a chain, it is governed by means of a set of revolving anchors, the arrangement of which we can perhaps best explain by referring to the annexed sketch. In this, A is the frame of the anchor carriage, which is provided with the axles carrying the disk anchors, B C, one of these axles—that marked C—being capable of being "locked" round by means of a hand lever, not shown in the sketch, so as to enable the carriage to be readily turned when being brought into place or steered along a curved headland. The carriage is provided with a shallow body, D, which, as in Fowler's anchorage, is loaded with earth, etc., for the purpose of forcing the anchors into the ground. The strain on this latter ply of rope, extending along the headland, tends to draw the carriage forward in the direction in which the rope is led, but this motion is resisted by the revolving claw anchors or tines of which two sets are fixed to a strong axle at the rear of the machine. At one end of this axle is a kind of coarse ratchet wheel, H, the teeth of which are engaged by a projection from a hand lever, I. So long as this lever or detent is in gear with the teeth of the ratchet, the revolution of the shaft carrying the claw anchors is prevented, and these anchors are thus enabled to prevent the forward motion of the carriage. As soon as the lever is raised, however, the claw anchors being free to revolve, the strain on the headland rope



draws the carriage forward until its further motion is arrested by the lever coming into gear with the next tooth of the ratchet wheel. The lever just mentioned can be raised by a boy, and it is intended that one of the boys in charge of the rope porter shall lift this lever at each traverse of the implement, the men usually employed to shift the claw anchors being thus dispensed with—an important advantage. In the model exhibited, the ratchet wheel or stop, H, is provided with four teeth only. It, however, appears to us that the position of the anchor carriage could be more readily adjusted to suit the varying width of land cultivated at each traverse by different implements, if a greater number of teeth were provided, the number of tines of the revolving claw anchors being of course also increased. Indeed it might, in some cases be found more convenient to abandon the ratchet wheel and substitute a powerful brake in its place.

Correspondence.

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

The Wandering Jew, or Cow Killer.

MESSRS. EDITORS:—For the past forty years I have never spent a summer without my attention having been attracted to, and my curiosity excited by, an insect known in some localities of the Southern States as the "Wandering Jew;" in others as the "Cow Killer."

I herewith send you an outline of all I have ever learned of its appearance and habits, which is but little at best, still it partakes of so much that is singular as to create the wish to know more, and I doubt not but it may induce some of your correspondents versed in entomology to give its history in full.

The "Wandering Jew," or "Cow Killer" is in form a perfect ant, of large proportions, varying from five eighths of an inch to one and one fourth inches in length; the smallest I have ever seen being fully one half inch long. Its color is generally a solid, deep vermilion, of a shining velvety appearance, though sometimes there are found those which have one or two glossy black bands, about one sixteenth of an inch wide, across the back or upper part of the abdomen. These latter, however, are rare. They are by no means a numerous race, for though seen every summer, one will rarely meet over a dozen or fifteen in any single season. Of their food I know nothing, having in vain repeatedly attempted to ascertain upon what they subsist. They confine themselves to no particular localities, being found upon ridge and bottom lands, upon the sea-board and in the interior. They are not congregative; they never even "hunt in couples," but are invariably found roaming about singly—hence the name of "Wandering Jew." They are remarkably deliberate in all their movements; never exhibit any signs of fear, nor do they ever appear to hurry under any circumstances, nor have I been able to detect them with any apparent definite purpose in their travels. They show no reluctance when compelled to change their course, and when unmolested no disposition to return again to their former route; "whence they come or whither they go," is beyond my knowledge.

Of life they are exceedingly tenacious; roll them upon hard soil, under the foot till you think them dead, twenty times over, and twenty times over they will rise, "shake off the dust," and continue their route as unconcernedly as though no untoward event had occurred. More than this, cut off the abdomen of one in his journey, and the parts to which the legs are attached make no stop; how long they continue to travel, in the event of such an accident, I am not prepared to say, the statement nevertheless is strictly true.

Lastly, they are provided with the most formidable sting of any insect within my ken. I have frequently, in hunting expeditions, been compelled to "change my base" by bees, wasps, yellow-jackets, hornets, etc., but the exciting effect of the sting of all these combined is as naught, when compared to the exhilarating influence upon "mind and matter," produced by that of the veritable "Cow Killer." I speak from experience.

The name "Cow Killer," originates from a very general impression among the lower classes that cattle are frequently killed by the poison of the sting; this I think is questionable however. S. W. T.

Handsboro, Miss.

Circulation of Water in Steam Boilers.

MESSRS. EDITORS:—I have made a number of experiments to find out exactly what was going on in a rapidly fired steam boiler. First, as to the water level. Second, as to the circulation. Third, as to the state of steam over the water level, and to find out how high the water spray followed the new made steam in its upward escape, from the surface. I send you the results of my first experiments and will, if this proves acceptable, send you an account of the others.

I placed a row of water gage glasses along the side of my boiler, which was 16 feet in length, with inside pressure 45 pounds, and 14 pounds vacuum in condenser, it was indicating 180-horse power through a good low pressure engine.

I found the water, though quiet, was not level at all, but stood four inches higher over the grate bars than at the back end. I tested the heat of escaping gases at the back end and found 475° Fah. Here then I had water running down an inclined plane of 4 inches in 16 feet. This flow must be very rapid; and it must descend to the bottom and rush along the lower surface at the same rate to take its place in the upward current at the front end. I have always since then favored boilers that made free way for this downward current, and which had no obstruction that would hinder the water from reaching the hottest part in time to take its place in the upward current to the surface T. L. L.

Olney Ill.

[We shall be glad to hear further from this correspondent.—EDS.

Ideas on Matters Nautical.

MESSRS. EDITORS:—As usual, I religiously read all but the advertisements and list of patents in your valuable journal, and I trust you will pardon me for suggesting that there is considerable poetry in the description of the Torpedo Boat, page 1, current volume, copied from the *Army and Navy Journal*, and an old salt like myself is disposed to doubt some of the statements contained in the article alluded to, when he

reads that "the concussion felt on board the torpedo boat was not more than that caused by a wave striking a vessel at sea." Why, bless your hearts! a wave very often strikes a vessel so gently that it would not break a soap bubble or spill a glass of wine, and another will sweep the deck of spars, water casks, deck house, wheel, and binnacle, and, sometimes, ships are dismasted by the force of a wave.

If a jet of water, thrown from the deck pump, will knock over a cat, what will be the effect on a ship of a mass of water, containing a hundred tuns, rushing against her at high velocity?

This is a question in hydraulics which, if put right before your 100,000 readers, will create as much discussion as the great wheel question, to solve which I used up one pair of scissors, two reams of card paper, many pencils, and nearly one pair of old eyes.

While I have my pen in hand, I may as well allude to what is said, page 12, current volume, on the important subject of the preservation of iron, by Professor Colton, who, I am sure, has never paid a bill for docking and painting the bottom of an iron ship.

When the ship is building there is, generally, time enough and weather good enough to put on several coats of paint, and allow plenty of time between each for hardening; but when an iron ship or steamer comes from sea, and is advertised to sail on a certain day, there is very rarely time to clean and dry the ship inside and out, and not often suitable weather, so that the paint will dry and adhere. Under these circumstances, I know of no paint that will fulfill the necessary conditions, and I doubt if one has been found.

Let me go a little into details. The expense per day for hauling up or docking a ship of 2,000 tuns, will amount to nearly the cost of the professor's plan. We will give one day for cleaning and drying, inside as well as out, so as to guard against the usual effect of condensation, or what we salts call sweating. One day for each of the three coats of red lead, and two days for drying between coats. One day for the coat of beeswax, tallow, and rosin mixture. This makes six days of fair weather. It will readily be seen, and I think, generally admitted that this will cost too much money.

The question is not, wholly, what will "ward off the attacks of atmospheric oxygen, and be unaffected by acids and salt water;" but, what will do this best, at a reasonable cost? The mere cost in money is usually small, compared to time, interest on capital, and the contingencies connected with delay.

I have had a good deal of costly experience on the subject of pigments for iron ships, and have found pure white zinc paint, put on over good red lead, the best of all—it dries quick and does not rub off easily—but nothing will stand when put on in frosty weather, or when the surface is damp from cold without and heat within, and the reverse—artificial or natural heat without, and cold within. Therefore, the composite ship, planked with teak, elm, or yellow pine, in two layers, and suitably fastened so as not to be injured by galvanic action, is the best and most durable ship, for she can be sheathed with metal, and will be likely to keep clean if you keep her going.

I should not have dared to write in a jocose vein, as in the opening of this double-shotted gun, had I not lost my gravity by reading Mark Twain on the stove question, page 13.

Boston, Mass. OLD SALT.

American Inventive Talent.

MESSRS. EDITORS:—In looking over your volumes for 1868—which I do with great pleasure and instruction—nothing strikes me more than the immense amount of inventive power in our people. Do they acquire this power in consequence of the greater facilities for education enjoyed by our working people, or is it imported in an undeveloped form from other countries? It would be an interesting fact to know, whether we get this power out of pure Yankees, or whether it comes of foreign blood, stimulated by better institutions and fostered by a better market. In France, among mechanics in wood, especially, away from the great centers of trade, one finds men working with the rudest tools upon the roughest wood, and consequently turning out such crude work as would never be put into a house in this country, certainly not north of Mason and Dixon's line. In a town of France containing a population of 15,000, I often visited joiners' shops where all mortising was done with the hand chisel, and a mallet of ancient model; all sharpening of tools was done on a large flat stone by hand rubbing; all sawing by frame saws, similar to those we use for sawing firewood; wages were about three francs, or about sixty cents a day in gold; the amount of work done—the time for labor (ten hours)—being seriously cut up by several meals and much drinking and smoking, seemed to be very small and very poor in quality. When I told one of the most intelligent workmen that our house joiners earned about fifteen francs a day, he wanted to pack up at once, and asked if I could not pay his way to America, taking a lien on his chest of tools and on his labor for one year. He did not seem to be flattered when I told him that with his bad tools and worse habits, the security would be valueless, and that, if landed in America, without any lien on tools or labor, he would come to want in a few weeks. Yet it is literally true that this first class French joiner with his tools could not get a meager living here, until he should get into better training and could use our tools. But this is a digression; my intention when I took up my pen was to allude to what is said on page 216, in 1868, volume XIX., of your journal, about a uniform standard for bolts and nuts, as adopted by the navy department on the recommendation of a board of naval engineers. It was a subject well worth the thought of Mr. Wells and the naval engineers, and calls to mind a favorite idea many times discussed by naval constructors and naval commanders, but never carried out, that I am aware of, in any country; namely, to inaugurate a perfect system of interconvertibility, so that all the various fittings of ships, as spars, sails, anchors, cables, tanks, parts of machinery, boats, etc., etc., should be known by their numbers, and come into play in any vessel, large or small. It is for engineers to say whether this system could be carried out so as to include cylinders, boilers, shafting, and all the heavier parts of the motive power; but I see no reason why it could not be in many particulars, if we were to begin to re-organize our navy under a well digested system of economy.

Leaving this point of the subject to experts in that line, I now come to speak on the part most familiar to me, the sparring and rigging of *cruising ships*. These are a class of vessels that we cannot do without, if we desire to get the first well planted blow at the commerce of an enemy, and if we are to encourage the education of sailors. Monitors and heavy iron clad ships for coast and harbor defense are all very well, and will be very necessary for home use; but they are unsuited to act as cruisers and as training schools for sailors. I shall therefore confine my remarks to wooden or iron full rigged ships with steam enough to go ten or twelve knots with a moderate consumption of fuel, and to sail with their screws disconnected or turned up, as fast as any good modeled ship of their size. A well organized navy belonging to a commercial nation, likely to come in contact with another commercial nation, apart from monitors and iron clads, should have a considerable fleet consisting of at least three grades or sizes of cruisers. Suppose No. 1 to be 2,000 tuns—say about 240 feet long by 42 feet beam; No. 2, 1,150 tuns, say about 200 feet long by 35 feet beam; No. 3, 720 tuns, say 170 feet long by 30 feet beam. Now the rig of these vessels should be so proportioned, that the spars and sails in each should be available in the same ship in several places; for instance, the fore yard should be of the same length as the main top-sail yard, the lower fore top-sail yard the same as the upper main top-sail yard and the same as the cross-jack yard, the upper fore-top sail the same as the main top gallant and the lower mizzen-top sail, the fore top-gallant yard the same as the main royal and upper mizzen-top sail, and the fore-royal the same as main sky-sail (if one be needed, which I doubt), and the same as the mizzen-top gallant yard; and the fore sky-sail (if one be required) the same as the mizzen royal.

The sky-sails are only named by way of illustrating the different grades of sails and yards. The fore sail, too, might be of the same size as the main top-sail, the fore top-sail the same as the cross-jack sail; this implies very short lower masts, and consequently shoal courses, which would not suit naval men, but these are found to be most efficient in the merchant service, and require no reefing.

Now all these sails and spars should be known in naval arsenals by their numbers, namely, main yard and sail, 1; main top-sail and fore sail, 2; top-gallant, or upper top-sail and fore top-sail, 3; main top-gallant sail and upper fore top-sail, 4; and so on; whereby it will be seen the main sail, No. 1, is the only square sail not available on some place in the same ship.

The 2d class ships would have main yard No. 2, and the 3d class would have No. 3 for main yards, and so on to the end.

The same principle should prevail as to the jibs, flying jibs, and stay sails. In the same ship the head sails should fit as stay sails setting between the masts, and they should also be known by their numbers.

The navy storehouses would always have sails and spars ready for emergencies, known by their numbers, so that a ship arriving at any yard would call for and find her sail or spar ready again. As to anchors and chains and boats, the stream anchor and chain of No. 1 grade ship would be the bower anchor and chain of No. 2. The 1st cutter of No. 1 would be the launch of No. 2, and so on. This system may be carried out almost indefinitely, except as to arms. As to the guns, all vessels should carry as nearly as practicable the same caliber, diminishing the number in the smaller classes. Supposing, for instance, the larger class should mount two pivot and twenty broadside 10 or 11-inch guns, No. 2 could mount two pivot guns and twelve broadside, and No. 3 could carry 24-lb. boat guns on poop and forecastle, and work 6 or 8 broadside guns and if the recoil of a 10-inch gun should interfere on a 30, feet beam with the opposite gun, then cut the ports so as not to come directly opposite. This arrangement would look odd at first, like fidding a top mast or top gallant masts abaft the lower masts, but this is the only proper way to place masts in steamers, and the eye soon becomes accustomed to it, and I think it is not a bad idea to put guns so as to "break joints," so to speak.

The system would be in one sense carried out in the officers, as the smaller classes of ships would be commanded by men of inferior rank to the larger ones; but when you come to the steamers, we want first class men in all if we can get them, and the only way to do this is to give every encouragement to good seamen to enlist and to remain in some degree men-of-war, even when on temporary service in merchant vessels. A man once well trained to gunnery and naval discipline should be subject to call, and for this obligation he should receive a certain sum, and be permitted to enjoy certain hospital rights, and when finally disabled by age and long service he should have a home, even if he should not have been constantly on board of vessels of war. As the law now stands, a seaman must have been constantly, for the very long period of twenty years, in actual service, before he can be taken care of by Government. Last, but not least, every encouragement should be given to the young to sail in vessels of war, or to be trained in naval floating schools, without being compelled to enlist for a long period, or even to enlist at all. In a country like ours, when in time of war we shall be compelled to call on the seamen of the mercantile marine to man our war ships, there will be great economy in trusting to those who have had some previous training.

If I had not already made my communication longer than I intended, perhaps too long to permit of publication in your journal, I should want to add much more on this subject of nautical schooling, both for the navy and for the merchant service. The full development of nautical schools for both is a desideratum which, when fully realized, will restore something of our waning prestige on the ocean, and do much to prevent and mitigate crime on the land, by absorbing a large mass of elements to make excellent seamen, which otherwise would be preparing to graduate in public institutions, namely, by reason of the neglect of parents, and the shortsightedness of legislation and city governments.

R. B. F.

Aerial Navigation.

MESSRS. EDITORS:—I have been a constant reader of the SCIENTIFIC AMERICAN for years, and I must say that there is no publication of the day that I read with equal pleasure and profit. I have been very much interested in the articles on aerial navigation. My sympathies and best wishes are with the men who are now exploring this field, and, notwithstanding the many failures in attempts to navigate the air, I believe it will yet be accomplished. I wish here to call attention to the false argument of the *Philadelphia Bulletin*, as quoted in the second article on aerial navigation. We quote: "A ship is steered in the water because the action of the wind on the sails, and of the hull in the water, can be brought to counteract with each other by means of the rudder. Now, a flying machine is in but one element, and, hence, can never be steered."

Now, the fallacy of this argument must be apparent to every one who gives it the least attention. We have yet to learn that the two elements are necessary in order to the steering of a ship. It will not be denied that this is true of sail vessels, which depend upon the wind for motive power; but but when this motive power is stored in the vessel in the form of powerful engines, the one medium alone is used, both for propulsion and steering, and the vast difference claimed in the above quoted remarks, between the propulsion and steering of a vessel in water, and that of an aerial ship, is not nearly so apparent as when illustrated by a sailing vessel. On On the contrary, by taking a steam ship as the embodiment of the principles sought to be applied to aerial ships, it will be seen that the cases are completely analogous. If, then, the navigation of the air, by a steam vessel, is governed by the same principles as the navigation of water by steam vessels, what are the means necessary to apply those principles to the proposed object?

It is well known that the speed of a vessel steering against a curret, depends upon the excess of space passed over by the paddles or propeller, in their revolutions, to that of the current in the same time. In other words, the velocity of the circumference of the paddle wheels must be greater than the velocity of current. If the two be equal, it is apparent that no progress can be made—the vessel will drift upon the current. Neither can the vessel be guided. But, by increasing the velocity of the paddles sufficiently above that of the current, progress and direction are at once attained.

Now, the mechanical principles here employed to propel a vessel against a current of water would, if applied to the analogous case of the aerial ship, be productive of like results. But these principles must be largely extended in their application to the latter case if satisfactory results be reached. We regard the general conditions, necessary to success, to be:

1st. Engines constructed with a view to economy of space and fuel, the minimum of weight and the maximum of power.

2d. Propellers of large area compared to size of ship, and working at high velocities—rudder of like proportions.

3d. Gas holder of sufficient capacity to give ample buoyancy, and of a form presenting the least possible resistance to the air.

We think there is little danger of going too far in either of the directions indicated. These conditions complied with, success will result. T. A. HUFFER.

La Fayette, Ind.

The Recent Aurora.

MESSRS. EDITORS:—At 5 A. M. this morning I was awakened by a brilliant rosy light flooding the entire room. I arose and thought there must be a large fire at no great distance. Further observation proved the existence of a magnificent aurora, of a rosy hue, extending from northwest to southeast to 2° west of the zenith. One mass was very striking, a column 2° south of Ursa Major extending to 3° east of zenith, of a deep lake, so intense as to cast a shadow. At times an undulating curtain of light would form over the sky, then fade into increasing spears of dark and light. The aurora lasted till 16:45 A. M. Barometer, 29·009; thermometer, 28°; needle, 8° to 11° 30'; wind w.; force, 7. Latitude 40° 1' 00"; longitude 75° 10' 00".

ERNEST TURNER, C.E.

Germantown, Philadelphia, Pa., Jan. 3, 1870.

THE PRIZE ENGRAVING.—Letters acknowledging the receipt of the engraving are pouring in from all quarters, and every writer, without an exception, expresses great delight with his picture. It is gratifying to receive such unqualified testimonials of satisfaction from our friends.

[For the Scientific American.]

ON CHROMIUM.

BY PROFESSOR CHARLES A. JOY.

One hundred years ago a Saxon mineralogist named Lehman, was a good deal puzzled by a red mineral that was thought to contain gypsum, iron, and lead, and which was called red-lead spar. He wrote about it to Buffon in the orthodox Latin of the day—*de nova minera plumbi specie crystallina rubra*—but no one could tell him what it was.

Each successive chemist who examined it detected something new, and the ore was in a fair way of contributing a complete mineralogical cabinet in itself, until the famous German Klaproth, the father of analytical chemistry, announced that it contained a new metal; and the equally famous Frenchman, Vauquelin, discovered in it a new acid, which, on account of the beautiful colors it forms, was called in the Greek tongue *chroma*; and from the Greek we have the English word chromium. As soon as these two discoveries were announced, many of the chemists of the day attacked the mineral; and it was not long before they found that it was a very innocent thing and was composed of chromate of lead.

And here the history of this element would have come to an end, if, some years later, an iron ore had not been discovered in France, which also contained it, and thus afforded it in sufficient quantity for the various uses to which it was destined to be applied. Chromium ore has since been found in a good many localities, among others in the United States, near Baltimore, where it is a source of profit to the owners of the mines.

All attempts to prepare metallic chromium in any quantity have failed, and it is probable that no one has ever seen the pure metal. We can give an account of what has been done in the matter, and leave our readers to infer how near the various chemists have approached to obtaining it.

Fremy passed the vapor of sodium over chloride of chromium, and obtained in this way chloride of sodium or common salt, and a powder which he took to be the metal in a fine state of division. Under the microscope, perfectly regular octahedra were revealed, and what is singular about it is, that no acids, not even aqua regia, had any effect upon the powder. Fremy's metal was exceedingly hard, and so were its alloys. With iron it yielded needles which looked like cast iron, and were harder than steel.

Deville also tried to prepare chromium by reducing the oxide with charcoal at a very high temperature, but he was unable to obtain a perfectly homogeneous mass, although the heat was sufficient to convert platinum into a vapor.

The button obtained by Deville was as hard as corundum, was easily attacked by hydrochloric acid, slightly by sulphuric acid, not at all by nitric acid. Its specific gravity was 5·9. This was not the pure metal but a mixture of carbon and chromium.

Woehler also made an effort to obtain the metal by reducing the chloride of chromium with zinc. The regulus thus procured was an alloy of zinc and chromium from which the zinc was removed by nitric acid, leaving the chromium as a crystalline powder. This form of chromium is a clear gray, crystalline, shining powder, dendritic under the microscope, not the least magnetic, with a specific gravity 6·81. It is remarkable that an attempt to reduce the chloride of chromium by means of cadmium resulted in an explosion; but magnesium was found to serve as well as zinc. It is said that chromium can be prepared by passing hydrogen gas over its amalgam, and also that the chloride of chromium can be decomposed by electrolysis, as was done by Bunsen, in the form of laminæ resembling iron.

According to Loughlin, the sesquioxide of chromium can be reduced by a mixture of cyanide of potassium and animal charcoal. Prepared in this way it has the specific gravity of 6·2.

Bunsen's method of throwing down chromium by means of the battery has been proposed to be employed for electroplating, and a patent was taken out in England for this purpose. None of the alloys of chromium have any technical value, although several of them, as, for example, chromium with iron, zinc, copper, and tin, have been patented. It is not impossible that, in consequence of their hardness, some of them may ultimately prove of value.

Debray decomposed the chromate of lead and obtained an alloy with lead similar to Woehler's alloy with zinc, which he afterwards decomposed by nitric acid, and thus obtained the metal as a powder.

Peligot got a dark gray powder by reducing the violet chloride by means of potassium.

The specific gravity of the metal is given by different authorities at 5·9, 6·2, 6·8, 7·3—and researches differ quite as widely in reference to its behavior to acids, and in many other respects. From all of these observations it will be apparent that we know very little, as yet, of the properties or possible uses of metallic chromium—but the same remark cannot be applied to its compounds, as they are among the most useful and best understood salts we have in the whole round of chemistry.

MILK---FROM THE DEPOT TO THE CONSUMER.

WRITTEN FOR THE SCIENTIFIC AMERICAN BY A MILKMAN.

In your issue of Jan. 1st, I was much interested in reading an article on "Milk and what comes of it."

It gives the many consumers of milk in this vast metropolis, a very clear and comprehensive idea of the treatment of milk, from the time of milking, until it reaches the city; and closes with a few indefinite remarks, in regard to price, water, freight, and profits, which are liable to misconstruction, and are apt to mislead the consumer; in view of these facts, with your kind permission, I feel impelled to give you a supplement to the article referred to.

I think that almost every one is aware that from time immemorial, milkmen have been the jibe and jest of young and old, while the jokes and squibs relating to their treatment of milk, or "fixing it for sale," rival the adventures of Munchausen, or the travels of Gulliver. Indeed, to such a degree has this been carried, that it is really wonderful to see the enormous exaggerations that sensible, intelligent persons will swallow at a single gulp, and, should any one speak a favorable word for that proscribed class, the same expression that one of old was met with by the Jews, would be thought if not spoken, "How can any good thing come out of Nazareth?"

Strange though it may seem, there are honorable, honest, and respectable retail dealers of milk, in this city, to whom it is a source of regret to be obliged to furnish you on Sunday morning, with what you consider an indispensable auxiliary to your cup of coffee.

Neither the business, nor the inclination of but few of your readers, will induce them to rise early enough to inhale the fresh, invigorating morning air, and accompany me over a milk round and see for themselves: so if you will become the vehicle of communication, and your readers will accompany me in imagination, I will try and give them an idea of the way milk is served to them.

The time is 3 o'clock A. M. The horse tackled to the wagon, and cans in readiness, we proceed to the milk depot of—say the Harlem Railroad, which occupies half of the square bounded by 4th and Lexington avenues, and 47th and 48th streets. On arriving here, you will see a train of ten or a dozen cars, arrived some two hours since, and a hundred and fifty teams already here before you, and there will be no diminution in the number, some going, some coming, till the morning has well advanced; and the din of voices, gesticulations of drivers, clattering of hoofs and wagons, and rattling of cans, the apparent confusion prevailing, to obtain the most favorable position at the platform (which extends through the block on two sides of the depot), will present a scene of novelty that will not soon be forgotten. Our first business is to pay the freight, and ascertain how many cans our farmers have sent us this morning; we take all their dairies produce (this is invariably the case), and as each one milks from fifty to eighty cows, the slight variation of a pint to a cow will make a difference of a can or more in his amount.

The railroad company never trusts, so we have our money ready to pay the freight and receive our slip, or account of cans. The freight is one and a half cents per quart, and if a kettle leaks out, or is spilled by the carelessness of the employés of the railroad, as is not unfrequently the case, still we must pay the same as though the cans were all full, or they will not deliver us our milk. With our slip in hand, which is our voucher, we proceed to the car containing our supply, show our slip to the car tender, and he allows us to get our cans, which are marked with the farmer's initials, the number of the station, and labeled to the dealer. Having easily procured them, we roll them on edge to our wagon, and there taste the milk, the quality of which is told by an experienced person, as readily and more so, than an easy living, robust bacchanalian can detect the different qualities and flavors of wine. Should we be suspicious that a can will not keep, we must sell it or take it home and churn it.

If the supply is too great, we sell a can or more to a brother milkman who is short. If we have not enough, we buy. If the supply is scarce, we often pay more than our customers pay us, so that we may lose none, and if the supply is very great, we sell at even less than cost price; this part of the business is generally carried on, these later years, by speculators, or middlemen; the agent at this depot being one of the chief. In the summer time a great deal of sour milk comes over the road, especially during hot, murky weather, or after a severe thunder storm. Our German friends absorb a great portion of this milk in making pot cheese, smear kase, and sundry other articles of diet, peculiar to themselves, and a portion is churned for fresh (unsalted) butter, which our French and Jewish population are very fond of. Our quantity being correct, we turn the milk from the farmers' cans into our own, leaving theirs to go back, and off we start for our first customer.

But how is this, I fancy I hear one of you say, how about the Croton? Well, Sir, that is one of the things that you are so willing to be deluded about, as you have seen me this morning, so you see me every morning; and where water is used it is the exception. In that respect we milkmen have few secrets from one another, and though one should know another to use water, a principle of honor would prevent him from promulgating the fact. Yet, I am sorry to say that truth compels me to say, I have seen it done. I had the supervision, and was formerly agent for one of the largest milk companies in this city, and have now a business of my own, and I have *never* seen water used to "stretch" the milk, or any other adulteration whatever, where I have been concerned, nor have I seen anything of the sort, except in a very few cases. I have been at pains to inform myself in the matter; the farmers sometimes add a little water, as they say "to keep the milk," but they are soon found out, and their dairies go a begging. But we must hurry up to get our customers served; we go across this street, down that avenue round the corner, down to the next block, and so backward and forward, up and down, serving one customer here, another there, till you are completely puzzled, and wonder how a milkman ever learns to serve a round. Well, that is not one half; in one place we have a key to the area gate, in another the key to the front door, in another we open a window, and pour the milk through a long spout in a small kettle into the receptacle—the grating in front of the window preventing us from reaching the dish; and so on, more than forty or fifty different ways of serving.

Then, too, some have a regular quantity every day; some vary, and some have tickets; some pay by the week, some by the month; all this has to be remembered (for few have books with them) so that the accounts can be correctly set down when we get home. Then we must remember who paid money, so as to give them due credit, and who wants tickets, so that we can take them a supply to-morrow; but we must hurry on, or we shall be late and customers will find fault. You see a half minute late at each customer, supposing our round to number 120 customers, makes us one hour late at the last customer; and of course, they would all like to be served before breakfast; one half the customers in milk in this city are served before they are awake, and in many instances a milkman never sees his customer, or they their milkman, especially if they are "good pay."

With regard to profits, I suppose the average of retail rounds is not far from 160 quarts, more less than that than there are over; by the article previously referred to, 160 quarts cost $11·20—but wait a moment, customers generally insist on a little more than is their due, "good measure," they say. It is close dipping to come within five quarts to the hundred, making eight quarts more to pay for. First cost of one day's supply, $11·76; freight, 1½ cents per quart, is $2·52; rent of stable and horse feed is cheap at $1·50 per day; and $1·75 to driver, makes a total of $17·53; now 160 quarts at 12 cents per quart, is $19·20; at 10 cents, is $16 00; so you see, when a milkman serves a customer at 10 cents in winter, he is losing money. I say to customers when a milkman offers to serve you at 10 cents at this season of the year, look out, something is wrong; it is better for you to buy a pint of a respectable dealer for 6 cents and put in the Croton yourselves. At 12 cents, the profit on a round is $1·67 per day. It must be taken into account, however, that wagon, harness, and kettles, are wearing out, and must at some time be renewed, then too, horses are liable to mishaps, and sooner or later must be replaced. You may take off the 67 cents, then—and it is a small allowance—for these expenses, that will leave $1·00 per day profit; one fourth of this remainder, will not more than balance your losses from "bad pay;" 75 cents a day then is the net profit on an investment of from one thousand to fifteen hundred dollars—that is about the average price of milk rounds, though you may buy a round cheaper, with an old, or lame horse, and a wagon that needs constant repairs.

Is the profit too great? Then tell your milkman you must have your milk cheaper; if he is an honest man you will drive him out of the business, if he is dishonest, then "look out for showers about this time," and your milk will serve as a barometer; these are the views of a milkman who is a constant reader of your valuable journal.

IT has been found that in all parts of the world arable land contains traces of phosphorus and magnesia, and various speculations have been hazarded as to the probable origin of these substances. M. Reichenbach, who has given much attention to the subject of shooting stars, has concluded that they constitute the source; and, seeing that the metallic dust accruing from the combustion of meteorites and shooting stars must have been rained upon the earth for myriads of years, it can hardly be doubted that the components of these bodies must be found widely diffused in the soil. To test the validity of this hypothesis, M. Reichenbach analyzed earth obtained from the tops of different mountains never before trodden by the foot of man, to ascertain if it contained nickel or cobalt, which are common constituents of meteors, and he found those metals to be generally present.

COTTON SEED AND COTTON SEED OIL—We have in course of preparation some valuable illustrated articles upon the manufacture and purification of cotton-seed oil, which promises soon to become an important branch of industry, and one of especial value to the cotton producing States. The series of articles will be prepared by a French chemist thoroughly versed in all the details of the manufacture and trade, both theoretically and practically. We should be glad to have our Southern exchanges take notice of this announcement.

COMMISSIONER WELLS' ACCURACY DISPUTED.—A memorial to Congress prepared by proprietors of thirty-seven iron furnaces in the Lehigh, Schuylkill, and Susquehannah regions, recently published, maintains that instead of from $24 to $26 per tun, which the Commissioner instructed Congress was the cost of manufacture of pig iron, it ranges from $29 to nearly $30 per tun, these latter figures it is claimed being rather below than above the average.

SPOTS ON THE SUN.—We are in receipt of several able communications on the "Origin of the Solar Spots." With the present pressure on our columns we find ourselves unable to devote more space to this discussion than has been already allotted to it. Correspondents who have favored us with essays upon this subject can have their manuscripts returned to them by writing us to that effect, and inclosing postage stamps.

ACCORDING to the Frankfort *Zeitung*, an important (*sic*) discovery has been made by Herr Kircher, of Wurtemburg, of a new printing ink. The essential part of the discovery is that, by a peculiar process, the ink can be completely removed from the surface of the paper, at a cost of half a dollar (one gulden) for every hundred pounds of printed paper, and the material is then ready for use again.

Improved Motive Power for Domestic Purposes.

Our engraving is a representation of a new domestic motive power, or mechanical movement designed to transmit the force of a weight or spring to the propulsion of a churn, pump, or other light machine employed for domestic purposes. The minute details of its construction will be at once understood by any mechanic on inspection and need not, therefore, be dwelt upon.

Our artist has placed it in strong contrast with that other domestic motive power, which good housewives have found so difficult to manage and from which so many pray to be emancipated.

Mechanical powers of this character have not hitherto been very acceptable as aids to domestic work. Some have required too heavy weights, others using too much rope, and all requiring too much labor in winding to be labor-saving machines.

The inventor of this machine claims to have produced a power free from the objections named, as well as others not specified but which have proved insurmountable obstacles to the general introduction of other devices of the kind. It has a light weight and a short rope, and is easily wound by a woman or a child. It is also simple, compact, and cheap.

It is further claimed to make a splendid and powerful down dash, and it has a reversible or gathering dash to gather the butter. It occupies a space on the floor of only 18 by 20 inches, and is about 40 inches in hight. It is provided with a regulating lever to make the dashes slower or faster without changing the weight.

We are assured that all the advantages claimed have been established by actual test in practical churning. The movement consists of a double or twin gear escapement, spanned by a crossbar, having adjustable pawls to carry force to the balance wheel, thereby securing the benefit of a long lever to receive great force in close proximity to the driving wheel. It is applicable to any size of churn, and makes from forty to sixty dashes per minute; the speed being governed by the governing lever. It is also asserted to make better butter than hand churning, because the stroke is more uniform. It can be wound up in one minute to run half an hour, or in two minutes to run one hour.

Our engraving represents the old tedious and laborious mode of working the dash by hand, in contrast with the movement we have described, where the power is self-working, giving the attendant time to sew or read while the machine is churning. It is also, as we have said, applicable for turning cylinders for coffee roasting, also for pumping water, for running sewing machines, or any kind of work where light mechanical power is required.

This device was patented through the Scientific American Patent Agency, Nov. 2, 1869. Parties who wish to confer relative to buying territory will address the patentee, D. A. T. Gale, Poughkeepsie, N. Y.



GALE'S CHURN POWER.

Improvement In Breech-Loading Fire-Arms.

A great number of improvements in breech-loading fire-arms have been made, and the great amount of inventive genius which has found scope in this field, shows that the method of breech-loading is ultimately destined to almost entirely supersede the method of muzzle-loading, in arms used for sporting as well as military purposes. A serious drawback to many of the arms of this class is the danger of their being accidentally discharged while the loading is going on; and it is regarded as the chief advantage of the gun, engravings of which we give herewith, that this accident can never occur in its use.

Fig. 1 represents a longitudinal section of this arm. Fig. 2 is a central longitudinal section, and Fig. 3 a cross section through the catch, I, Figs. 1 and 2.

A is the breech-block, having a forward extension, B, and a tail-piece, C. The double barrel is attached to the forward extension of the breech-block by lugs, D. These lugs are pivoted to B by a pin which plays in a slot, E, made in the front part of C. This arrangement allows not only a swinging motion of the barrel, but a sliding motion forward and backward. A cross-head, F, limits the motion of the barrel, and sustains it in the position shown in Fig. 1, while the loading is going on. Breech pieces, K, project from the breech-block, A, which, when the barrels are thrown down and slid back, as shown in Fig. 2, fit into and close the rear ends of the barrels, and also serve to help to hold them in position.

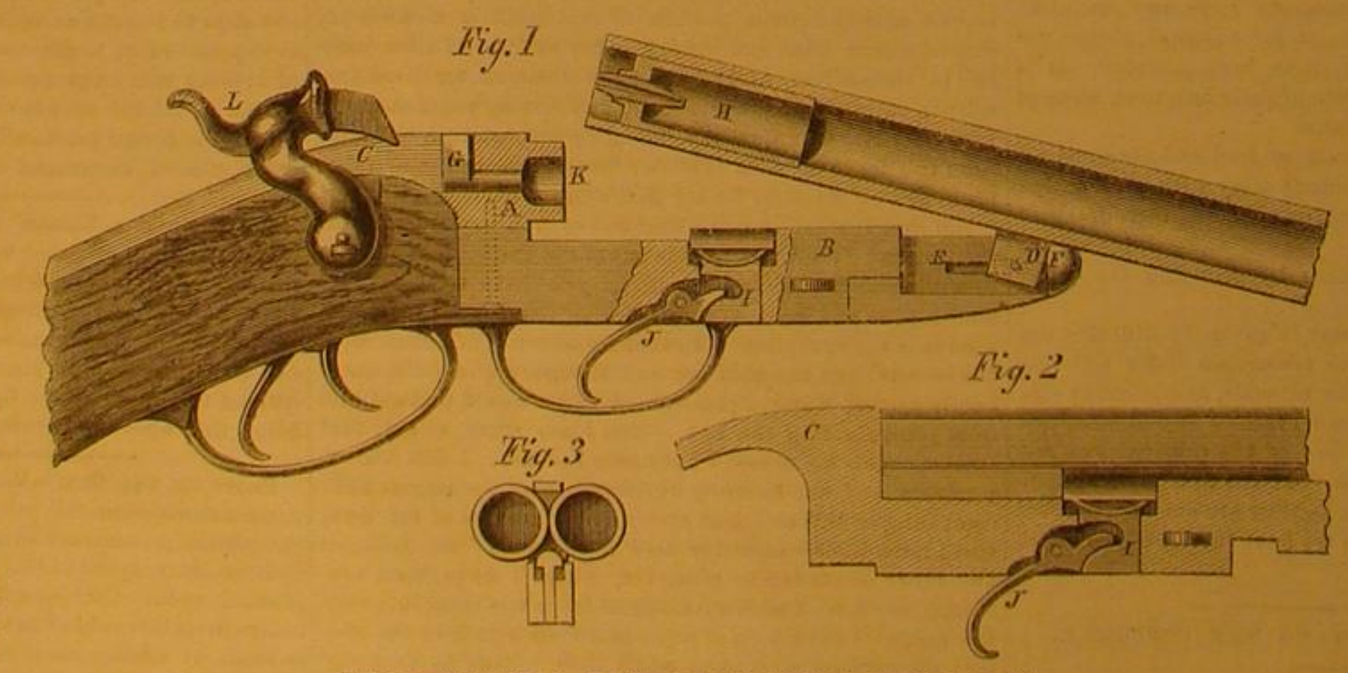
The position shown in Fig. 1 is that occupied by the barrels while the shells, H, are being inserted. These shells are made of steel large enough to receive the entire charge of powder and ball, or shot, as the case may be. Its front end fits closely against a shoulder on the interior of the barrel, and from this rear end projects a nipple upon which the percussion caps used are placed. When the piece is closed, as shown in Fig. 2, a spring catch, I, Figs. 1 and 2, holds the barrels from moving again until released by the action of the trigger, J.

The cap is exploded when the piece is closed by the action of the hammer, L, on the sliding bar, G; the front end of the latter fitting closely against the cap, when the piece is loaded.

The aperture in the nipple is widest at its rear end, and tapers to the front, where it is perforated by a cross bore, which, with the terminus of the longitudinal bore, makes three passages by which fire is communicated from the fulminate in the cap to the powder in the shell. The nipple is pointed on the inner end, so that it will pierce a cartridge and penetrate the powder. One or two of the passages described may be closed without interrupting the firing, and thus the piece is less liable to miss fire than if a single aperture were used.

The case or shell, H, forms a reliable measure for the charge, and also serves to keep the barrel clean, and in constant working order. The cases may be recharged as wanted, or extra ones previously charged may be employed.

As a sporting piece we regard this arm as very convenient, and likely to become popular. Patented through the Scientific American Patent Agency, June 22, 1869, by J. A. Heckenbach, whom address at Mayville, Wis.



HECKENBACH'S BREECH-LOADING FIRE-ARM.

Occupation for Women.

A medical exchange thinks "there is no occupation for which women are better fitted by nature than that of the chemist or druggist. The science of chemistry can be as readily learned in the school and laboratory by woman as by man, and, as an art, it requires the delicate manipulation, fine perceptions, and mathematical accuracy, in which woman excels. In the drug stores for dispensing medicines, but little physical strength is needed, and the business is very remunerative. The late frequency of fatal accidents, resulting from the carelessness of drug clerks, in putting up prescriptions, points with emphasis to the expediency of substituting female prescription clerks, as, other things being equal, the superior conscientiousness of women, especially where human life is involved, would go far to insure safety."

The Oyster Trade of Baltimore.

There are now licensed by the State 569 vessels, all engaged in bringing oysters to Baltimore from the Chesapeake and its tributaries within the limits of Maryland, and all those vessels are employed eight months of the year, and their average capacity is about 600 to 700 bushels, which makes an aggregate of about 4,000,000 bushels of oysters per year. Each vessel employed in the trade has an average of five men, which, in that branch of the business, makes an aggregate of 3,475 men. The greater part of the oysters brought to this market are packed and shipped, though many find their way to the west in the shell. There are in the city nearly one hundred packing houses, which give employment to five thousand persons the greater part of whom are females. In those houses where the oysters are packed raw, men are employed as shuckers, but in those where they are steamed females almost entirely are employed. Connected with this trade is the manufacture of tin cans, and while many of the larger packing establishments have a part of their cans manufactured on the premises, there are very few who make as many as they use. There are besides, some ten or twelve factories which do no other work, while immense numbers are made by the convicts in the Maryland Penitentiary, and by the inmates of the House of Refuge. The machinery for the manufacture of cans has been made so perfect that two or three men at the machines in cutting out and forming the cans will keep from twenty to thirty solderers to work. It is estimated that about five hundred persons are employed in the manufacture of cans.—*Baltimore Gazette.*

Paper Blue.

An invention which promises well for laundry establishments has been patented in England. According to the *Mechanics' Magazine*, it consists in substituting blue coated paper for the ordinary blue bag, and is more economical as well as more convenient. In manufacturing this article the inventor takes indigo of the best quality, and after it is finely ground and sifted he dissolves it in acid in the proportion of 3 lb. of acid to 1 lb. of indigo, and allows the mixture to stand for three days. After this there is added to every pound of indigo 20 lb. of water and 5 lb. of cow hair, the whole being boiled for three hours or until it becomes of a greenish hue. This is then allowed to remain twenty-four hours standing. The hair is then taken out and washed in clear cold water until a beautiful blue color appears. The hair is then put in ten gallons of water and boiled, and, whilst boiling, potash is added in the proportion of 10 lb. of potash to 1 lb. of indigo, thus rendering the indigo solution free from acid. The whole is then strained and evaporated to half its bulk, and allowed to remain thirty-six hours standing. Two fluids are now formed; the upper thin portion, when mixed with size, can be used as a blue writing ink; the lower portion, containing the real indigo-carmine, is then put in a wide but shallow vessel, and some glycerin added in the proportion of ¼ oz. of glycerin to 1 lb. of indigo. Unsized paper is then dipped in the solution, and in a few minutes the paper takes up the coloring matter. The paper is now dried and pressed, and is then ready for use as a coloring and bleaching agent for use in the laundry, and for manufacturing purposes. Professor Attfield, F. C. S., has had this paper blue submitted to him, and he writes that he has fully examined and tested it, and is of opinion that it contains nothing likely to injure the fiber of linen goods in any way whatever, and that it possesses many advantages over the older forms of blueing.

M. ABEL accounts for the difference remarked in the nature of the explosion produced by various substances when they act upon matter of a different kind by supposing that the explosion produces a certain kind of vibration that may or may not be synchronic with that produced in the body operated upon by the explosion.

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VOL. XXII., No. 3 . . . [NEW SERIES.] . . *Twenty-fifth Year.*

NEW YORK, SATURDAY, JANUARY, 15, 1870.

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THE PROGRESS OF THE PHYSICAL SCIENCES IN THE YEAR 1869.

There have been no conspicuous and startling discoveries in the year 1869, but the progress of our knowledge in every department of the physical sciences has been as great as at any former period. Purely theoretical investigations have given place to the practical applications of previous discoveries, and we have, as a result, a great improvement in every thing that relates to the amelioration of the condition of mankind.

We propose to pass in review some of the most important investigations that have been carried on during the past year.

NEW METALS.

The discovery of a new metal associated with zirconium, was announced some months since, but scarcity of material has prevented a more careful study and description of it. It is proposed to call it "Jargonium," after the name of the mineral in which it was found. At present our knowledge of this element is limited to a description of a few of its salts. Its oxide is used as a pencil in the oxy-hydrogen light and appears to withstand the heat as well as magnesia or lime.

The important researches of Graham on hydrogenium belong chiefly to this year, and are among the most important of any that have been announced. We are not prepared to exhibit a specimen of metallic hydrogen, but are nevertheless entirely convinced of its metallic character, and are fully acquainted with its properties.

The metals dianium, wasium, ilmenium, terbium, and norium have sunk into suspicious obscurity, and we shall probably never hear of them again. There are now fifty-two metals known to chemists, all of which have been made the subject of study during the past year, and some of them are growing in favor. Better ways of making zinc have been devised, and that metal is coming more and more into use in buildings and for ornamental purposes.

IRON AND STEEL

are manufactured on a vast scale, and the chief progress has been in improvements on the Bessemer process and in the construction of blast furnaces. The very valuable invention of Ellershausen for the conversion of crude cast iron, as it runs from the blast furnace, into wrought iron of fine quality, by the admixture of iron ore, is of American orgin, and has been chiefly worked out during the past year.

RARE METALS.

Our scientific knowledge of the properties of cæsium, rubidium, cerium, indium, uranium, molybdenum, tungsten, vanadium, thallium, and osmium, has been materially increased, but nothing practical has grown out of the subject.

POTASH.

A total revolution has occurred in the production of this salt since the discovery of the Stassfurt mines. Instead of coming from America and Russia, it is now found in vast deposits under the earth, and the whole business of the manufacture of saltpeter and of carbonate of potash has changed its base of operations, and has been transferred to Germany. By the side of potash has grown up an industry in bromine that is destined to materially affect our use of that element.

ANILINE COLORS.

The great contribution of chemistry has been in the production of new and magnificent colors from coal tar. Nothing can exceed the beauty of some of the shades of red, blue, and green invented during the year. The whole aniline industry is founded upon profound scientific research, and on this account it is destined to still greater triumphs.

CHEMISTRY AND ASTRONOMY.

During the year 1869 the extraordinary spectacle has presented itself of astronomers turning chemists. The telescope has been exchanged for the spectroscope, and mathematics has been laid on the shelf. Our observatories have become chemical laboratories, and the physical conditions of the sun's atmosphere, its protuberances, and the source of light and heat, have been chiefly studied, and all of the heavenly bodies have been brought down to earth for accurate analysis. No sooner was the computation of the time of the last total eclipse completed than the slate was thrown aside and preparations were made to photograph every stage of the obscuration, and to study the light of the sun by means of the spectroscope. The chief preparations were chemical ones, and the most novel discoveries were in this department of science. We are now acquiring information of the moon's temperature and atmosphere. We find hydrogen in the sun, and curious bands in the fixed stars and planets, and a system of telegraphing to the nearest star is no more impossible now than the submarine cable would have appeared to the man of science fifty years ago.

DISSOCIATION.

The material for the study of the theory of Laplace and for the solution of the gaseous condition of the sun has been gradually accumulating under the unfamiliar name of dissociation. This important doctrine is destined to play a most conspicuous part in the investigations of 1870—the foundation for which has been laid during the last twelve months. It is not a new doctrine, but has been revived by Henry St. Claire Deville, of France, and given its present name. It is just the opposite of association, and means that the chemical elements can be so separated or dissociated that they are out of the reach of the action of affinity, and thus are suspended independently in space. The study of astronomy and of geology will be greatly affected by a nearer knowledge of the laws of the tension of dissociation, and we can only allude to it as one of the dawning glories of the coming year.

ELECTRICITY.

The year 1869 has witnessed the publication of valuable works on the application of electricity to therapeutics, and what was for a long period in the hands of charlatans and quacks is now recognized by men of pure science as worthy of the most careful study. The result has been the invention of better apparatus, more portable and constant batteries, and a more accurate knowledge of the physiological effects of electricity.

The electric light has been brought to great perfection during the year, and for purposes of signals and for researches in anatomy through the intermediation of philosophy and the magic lantern, its uses have been very great. This form of artificial light appears destined to play an important part in the lecture room as an aid in the illustration of the study of the lower forms of life, and of its minutest cells as revealed by the microscope. All of these objects can be thrown upon screens and magnified to an extent that admits of a study that was never before possible.

The thermo-electric battery and the magneto-electric machines have made little progress during the year.

NEW MEDICINES.

The most important contribution of chemistry to medicine has been the hydrate of chloral. This substance is not to be considered as a substitute for chloroform, or an anæsthetic agent, but as a sedative and hypnotic it appears to have no rival. It will put a patient to sleep in cases of the most acute suffering—in delirium tremens, in insanity, and under circumstances that were not possible to be reached by any other remedy. It is a solid substance, easily soluble in water, of an agreeable, aromatic odor, and of sweetish taste, and can be taken along with the food without suspicion. The recovery from its effects is not attended with nausea or any of the consequences that usually follow the opium alkaloids. There are other remedies for which the pharmacopœia is indebted to chemistry, but the details would involve us in too many technical phrases, so we omit them.

DISINFECTANTS.

One of the most important contributions to sanitary science has been the introduction of the earth closet, founded on the disinfecting property of dry earth. It is difficult to overestimate the importance of this application as a preventive of fevers and cholera, and as effecting a saving of a most valuable compost. Another matter of sanitary and economical importance is the introduction of the Norwegian felted boxes into domestic use. The theory of heat is here practically applied in an important way, effecting a saving of fuel and securing better cooked food.

PHOTOGRAPHY.

Carbon prints have been brought to great perfection, and processes have been invented for transferring photographs upon metallic plates so as to print under a press. The most successful invention of this latter kind is the direct printing process of Albert, of Munich. By this invention several thousand pictures can be produced in a day upon paper that will not require mounting, and with ink that will not fade. Attempts to dispense with silver have thus far failed, although Dr. Bolton, in this country, obtained very fair results with salts of uranium.

SOUND.

Investigations into the properties of sound have been continued with great zeal during the past year, and the leading practical result has been in a more intimate knowledge of the organs of hearing, and a consequent improvement in the treatment of deafness. Practical use is made of the researches of Helmholtz and Tyndall in improved ear trumpets, and in sensitive flames for the detection of burglary. Photographing sound by means of sensitive flames has not been brought to perfection.

PETROLEUM FOR FUEL.

Henry St. Claire Deville, was instructed by the French Academy to conduct a series of experiments upon this important subject, and he has succeeded in inventing a furnace that satisfactorily accomplishes the object. This may safely be regarded as one of the most important inventions of the year.

ILLUMINATING GAS.

The manufacture of illuminating gas been rendered less of a nuisance by the introduction of the iron purification process in the place of the lime purifiers that so long disgraced this branch of industry. The quality of the gas has not been improved in this country, and we are a people who sit in darkness as compared with other nations.

The application of the oxy-hydrogen gas for illuminating purposes does not find favor with scientific men; but its advantages for signal lamps, for the magic lantern, and especially for metallurgical works, are admitted by all.

ARTIFICIAL ICE.

Considerable progress has been made in the artificial production of cold, and ice machines have been set up in New Orleans, Philadelphia, and elsewhere. The method preferred is that of the liquefaction of ammonia, although compressed air and ether engines, and carbonic acid, have been successfully tried in this country and Europe.

METEOROLOGY.

The invention of self-recording meteorological instruments has greatly advanced our knowledge of the laws of storms, and the time appears to be at hand when we shall be able to predict the state of the weather with absolute certainty What is wanted at the present time is a careful study of the rich material on hand, and its reduction to tables. We are on the eve of important discoveries in this department of science.

MICROSCOPY.

The application of the microscope to the study of the lowest forms of life, has been greater than ever before. The system of immersion has been thoroughly tested, and finds great favor with physicists. Microscopical anatomy has been the great feature of progress during the year, as it has received the important assistance of photography and the electric light. The microscope has revealed to us well organized beings in the lowest depths of the ocean, and has shown us traces of life in rocks that were formerly considered by our most learned geologists as of igneous origin.

CONCLUSION.

We have lightly touched upon some of the more popular investigations of the year and have omitted to speak of many of the abstruse points in the progress of our knowledge of heat and light, of geology and mineralogy, and of natural history. Enough has been said, however, to show that the past year has contributed its full share to the general increase of our knowledge, and that it has paved the way to grand discoveries in the future.

We shall endeavor to give soon a brief review of the progress of mechanical and engineering science during the past year.

SPECIALISTIC JOURNALISM.

No one who watches the growth and progress of journalism can fail to mark the tendency of the age toward the establishment and support of publications devoted to specialties. Newspaper and periodical literature is the most powerful educating agent of the nineteenth century. Compared with it, institutions of learning, from the university down to the free school, inclusive of all intermediate grades, dwindle into insignificance. The pulpit has, to day, far less influence over the public mind than the religious press. For instruction, the masses turn to the daily, weekly, and monthly publications.

Now, it is manifest that, in any journal or magazine, endeavoring to cover all fields of information, and to teach on all topics, there must, of necessity, be much in which nearly every one of its readers will feel little or no interest. Some will read the sporting news and discussions on breeding trotting horses. Others will turn in disgust from such things to topics of moral and political reform. Some will feel a deep interest in an account of a new variety of potato, while many, not relishing potatoes, will prefer politics. It is seldom or never that a man can be found so omnivorous for information as to follow, with interest, all topics.

Such a publication will necessarily find it impossible to give as full information on any topic as those who make that topic a special study, require; and so a journal, devoting its columns to the full and complete record and discussion of events and discoveries in one particular field finds favor among those who delight in that field more than any other.

The demand for publications of a special character arose in this country many years ago. At first it was confined, more particularly, to scientific, religious, and sectarian publications, but we are now in the full stage of specialistic journalism.

One of the earliest established as well as one of the most successful of American papers of this class is the SCIENTIFIC AMERICAN. Its success is mainly attributable to the fact, that at the outset, it recognized the demand for a paper devoted to the topics which constitute its specialty, and, that while it has ever been a medium of instruction to the masses, it has never allowed itself to lose sight of the fact that, to instruct the masses, it is necessary not to assume a greater standard of general information among them than they really possess. It has, therefore, been an eminently popular journal, and its gradual improvement, since its foundation, is only the reflex of the general intellectual improvement among the masses, to which its efforts have doubtless contributed as much as any other paper ever published on this continent.

The tendency to specialistic journalism will, undoubtedly,

increase, and, with the increase, diversity of industry and knowledge. To what length it will ultimately by carried, no one can, at present, predict. That its effect upon the profession of journalism is altogether salutary appears almost self-evident to us. It gives us men who concentrate their abilities upon the study and discussion of few subjects, instead of dispersing them over wide and unlimited regions of thought, and consequently gives strength and comprehensiveness to their productions.

AMERICAN AERONAUTICS---A FLYING SHIP TO BE BUILT.

Our transatlantic friends have done a good deal of talking and writing, and not a little inventing, upon and in the art of navigating the air. From giant projects down to engines of the minutest size and minimum weight, with maximum power in proportion to weight, they have filled the air with the fame of their devices, if not with the devices themselves.

Our trans-continental inventors on the contrary, have made little noise in the world; but if we are to credit statements coming from sources apparently entitled to credence, they are outstripping the rest of the world in this field.

Our readers will recollect the engraving of the aero-steamship *Aritor*, published in a recent number, with an account of a trial, the results of which as stated were not very encouraging. It now appears that the want of complete success in the experiments was, if we may credit our informant, attributable more to causes entirely disconnected from the machine, than the apparatus itself.

A meeting of the shareholders of the Aerial Steam Navigation Company was held on the 17th ultimo at San Francisco, and the Secretary's report read on that occasion details the following particulars.

An experiment made with the *Aritor* had resulted in a triumphant demonstration of the capability of the machine to move against the wind, to ascend or descend, and to be guided to any desired course. To use his own words, "enough has been demonstrated to convince the most skeptical, as well as to confirm the theory of the most scientific, that a machine has been constructed capable of moving through the air by its own power; capable of moving in any direction according to the will of the engineer; capable also of moving against the wind; nay, more, by its system of planes utilizing the adverse winds for the purpose of elevation and progress. This was not all. The committee judged it for the best to remove the model *Aritor* to the then unoccupied Mechanics' Pavilion, which was accordingly done, at considerable expense and risk. Thousands visited it there, and all expressed themselves satisfied that aerial navigation was an established fact. Nevertheless, there were great difficulties to contend with. The numberless gas fixtures in the hall were obstructions to continuous flight, and absolute impediments to the machine soaring to the roof. Still, the easy, graceful, calm power of motion through space was eminently exemplified in this, the first *Aritor*, that fulfilled all the requisitions for aerial flight, viz., sustaining power—propelling power—guiding power. The first was obtained by a spindle cylindroid filled with hydrogen gas, and by a system of planes, which, by their impingement on the air, materially aided the elevation of the machine when in motion; for whereas, when the model was at rest it barely maintained its equilibrium in the atmosphere, the moment it was in motion, and consequently atmospheric resistance obtained, the machine rose, more especially if the breeze were adverse, as was shown on that morning when it traversed the Shell-mound race track."

Naturally the public is skeptical of the truth of such statements as are here put forth, a skepticism which we not only think excusable, but in which we cannot help sharing. Not that we are wholly skeptical as to ultimate success in this field, but the thing has been so often to be done, and yet not done, that we are naturally shy of any sweeping announcements of success, fearing that they may prove premature. While, however, we may well be pardoned for entertaining some doubts, we must say that the action of the shareholders shows that their faith in the success of the invention is rather confirmed than weakened.

The construction committee having advertised for drawings and specifications, for a machine one hundred and fifty feet long with a carrying power of two thousand five hundred pounds—the steam engine and boiler being already constructed and in possession of the company—have accepted those prepared by Messrs. Miller & Haley, who offer to construct the machine for three thousand dollars in gold. This bid has been accepted, and a committee appointed to raise the necessary funds.

The general opinion prevailed at this meeting that the new *Aritor* would prove a triumphant success, and our readers will doubtless join us in cordial good wishes to the enterprise.

There is perhaps no mechanical problem of modern times more absorbingly interesting than that of self propelling air vessels, the solution of which has hitherto bid defiance to mechanical skill; and that the nineteenth century should add still another to its many glorious triumphs, is a consummation all must greatly desire. Success, say we, to "*The Aritor.*"

PUMPING DOWN BUILDINGS.

A little recognized, but without doubt a serious cause of danger to heavy and massive structures, is the disturbance of deep water-bearing strata of earth underlying them. The moment a free outlet for the water in such strata is opened, the movement of the water commences to make inroads upon the material of the stratum through which it flows, the results of which will be speedy or slow in their manifestation, according to the peculiar character of the stratum itself.

If the water-bearing stratum be quicksand or of a character approximating thereto, the shifting of the material may be so rapid as to undermine and render unsafe any superimposed heavy structure in a short space of time.

This fact has been illustrated quite recently in a striking manner. The Metropolitan Railway Company in London, having tapped a layer of water-bearing earth extending under the dining hall of King's College have pumped down that building, and have, it is said, brought out of perpendicular to the extent of three inches, the river front of the large structure known as Somerset House. It is feared that unless proper precautions are taken, the safety of several other important structures, including St. Paul's church may be endangered by the operations of this company.

So far as we are aware nothing is determined in regard to the effect of tappings remote from large buildings upon the stability of such buildings; but it seems probable that in course of time a stratum of loose material might shift sufficiently to cause settling in an edifice situated so far from the outlet as to be supposed beyond the influence of any such movements. The subject is one of such interest and importance that more light upon it is desirable.

SILVERING MIRRORS.

The process of coating glass with an amalgam of quicksilver and tin is interesting. Notwithstanding many attempts have been made to secure an easier and less expensive process for converting plates of glass into mirrors, it still remains the principal method by which this important object is attained.

To understand this process it is necessary to understand somewhat of the nature of an amalgam.

When metals are reduced to a liquid state, they will, by their solvent power, often reduce other metals to that condition, although the fusing temperatures of the latter may be many degrees higher than that of the metal which dissolves them. In such cases the dissolved metals mingle intimately with the solvent metals, and in many instances form definite chemical combinations. Such mixtures or combinations are called alloys, but the special term amalgam has been applied to the alloy of mercury with another metal.

Mercury being liquid at common temperatures forms amalgams with a number of metals without the aid of heat, but its most important amalgams are those of tin, gold, and silver. The amalgams of gold and silver are important, as by their formation these metals are readily separated from certain kinds of ores.

The amalgam of mercury and tin is readily formed by dissolving tin in mercury, and this amalgam adheres with considerable force to glass when properly applied.

The process is as follows: The size of the glass being known, a sheet of tinfoil somewhat larger than the glass is spread upon the silvering table. This table is a slab of stone, with as perfect a plane surface as can be made by mechanical means. When the tin foil has been sufficiently smoothed, it is brushed over with quicksilver until its surface is uniformly covered. Quicksilver is then added in larger quantity until the fluid metal lies upon the foil to a depth of from two to three twelfths of an inch.

The plate of glass is now gently and slowly slid, its longest side foremost, on to the foil, care being taken that its edge dips beneath the surface of the quicksilver so that no air may be retained between the latter and the plate.

The glass being thus slid upon the quicksilver floats upon it, and the excess of the latter is now squeezed out by the application of pressure to the glass. This is done by placing heavy weights upon the plate; and the table being now inclined, so that the quicksilver flows to one side, the latter is received in a trough provided for that purpose.

Notwithstanding the process is simple enough in its general principles, it requires much skill to successfully silver very large plates, and there are many things connected with it which it would be very desirable to avoid.

Hence many processes for silvering have been devised. Of these, we believe Drayton's has been the most successful, but it has not superseded the use of quicksilver. Mr. Drayton's method consists in depositing a film of pure silver upon the glass, the silver being reduced from a mixture of nitrate of silver, ammonia, and oil of cassia.

CORRELATION OF VITAL AND PHYSICAL FORCES.

ABSTRACT OF A LECTURE DELIVERED BY PROF. G. F. BARKER, BEFORE THE AMERICAN INSTITUTE, DEC. 31, 1869.

The third of the series of lectures now in progress at the above institution, was delivered by Professor Barker, of Yale College, and was one of deep interest. The lecture was illustrated by experiments, and was listened to with marked attention throughout. It is impossible to do justice to this able lecture in an abstract, but we find ourselves unable to spare space for anything more than this.

After an eloquent introduction reviewing ancient and modern opinions on the subject of life, Prof. Barker proceeded to discuss the evidences of vital and physical correlation. The word force had been employed to signify three things: In the first place, it is used to express the cause of motion, as when we speak of the force of gunpowder; it is also used to indicate motion itself, as when we refer to the force of a moving cannon ball; and lastly, it is employed to express the effect of motion, as when we speak of the blow which the moving body gives. Because of this confusion, it has been found convenient to adopt Rankine's suggestion, and to substitute the word energy therefor. And precisely as all force upon the earth's surface—using the term force in its widest sense—may be divided into attraction and motion, so all energy is divided into potential and actual energy, synonymous with those terms. It is the chemical attraction of the atoms, or their potential energy, which makes gunpowder so powerful; it is the attraction or potential energy of gravitation which gives the power to a raised weight. If now, the impediments be removed, the power just now latent becomes active, attraction is converted into motion, potential into actual energy, and the desired effect is accomplished. The energy of gunpowder or of a raised weight is potential, is capable of acting; that of exploding gunpowder or of a falling weight is actual energy or motion. By applying a match to the gunpowder, by cutting the string which sustains the weight, we convert potential into actual energy. By potential energy, therefore, is meant attraction; and by actual energy, motion. It is in the latter sense that we shall use the word force in this lecture; and we shall speak of the forces of heat, light, electricity, and mechanical motion, and of the attractions of gravitation, cohesion, chemism.

From what has now been said, it is obvious that when we speak of the forces of heat, light, electricity, or motion, we mean simply the different modes of motion called by these names. And when we say that they are correlated to each other, we mean simply that the mode of motion called heat, light, or electricity, is convertible into any of the others, at pleasure. Correlation therefore implies convertibility, and mutual interdependence and relationship.

Having now defined the use of the term force, and shown that forces are correlated, which are convertible and mutually dependent, we go on to study the evidences of such correlation among the motions of inorganic nature usually called physical forces; and to ask what proof science can furnish us that mechanical motion, heat, light, and electricity, are thus mutually convertible. As we have already hinted, the time was when these forces were believed to be various kinds of imponderable matter, and chemists and physicists talked of the union of iron with caloric as they talked of its union with sulphur, regarding the caloric as much a distinct and inconvertible entity as the iron and sulphur themselves. Gradually, however, the idea of the indestructibility of matter extended itself to force. As it was believed that no material particle could ever be lost, so, it was argued, no portion of the force existing in nature can disappear. Hence arose the idea of the indestructibility of force. But, of course, it was quite impossible to stop here. If force cannot be lost, the question at once arises, what becomes of it when it passes beyond our recognition? This question led to experiment, and out of experiment came the great fact of force-correlation; a fact which distinguished authority has pronounced the most important discovery of the present century. These experiments distinctly proved that when any one of these forces disappeared another took its place; that when motion was arrested, for example, heat, light, or electricity was developed In short, that these forces were so intimately related or correlated—to use the word then proposed by Mr. Grove—that when one of them vanished, it did so only to reappear in terms of another. But one step more was necessary to complete this magnificent theory. What can produce motion but motion itself? Into what can motion be converted but motion? May not these forces, thus mutually convertible, be simply different modes of motion of the molecules of matter, precisely as mechanical motion is a motion of its mass? Thus was born the dynamic theory of force, first brought out in any completeness by Mr. Grove, in 1842, in a lecture on the Correlation of Force, delivered at the London Institution. In that lecture he said: "Light, heat, electricity, magnetism, motion, are all convertible material affections. Assuming either as the cause, one of the others will be the effect. Thus heat may be said to produce electricity, electricity to produce heat; magnetism to produce electricity, electricity magnetism; and so of the rest."

A few simple experiments will help us to fix in our minds the great fact of the convertibility of force. Starting with actual visible motion, correlation requires that when it disappears as motion, it should reappear as heat, light, or electricity. If the moving body be elastic like this rubber ball, then its motion is not destroyed when it strikes, but is only changed in direction. But if it be non-elastic, like this ball of lead, then it does not rebound; its motion is converted into heat. The motion of this sledge hammer, for example, which if received upon this anvil would be simply changed in direction, if allowed to fall upon this bar of lead, is converted into heat; the evidence of which is that a piece of phosphorus placed upon the lead is at once inflamed. So too, if motion be arrested by the cushion of air in this cylinder, the heat evolved fires the tinder carried in the plunger. But it is not necessary that the arrest of motion should be sudden; it may be gradual as in the case of friction. If this cylinder containing water or alcohol be caused to revolve rapidly between the two sides of this wooden rubber, the heat due to the arrested motion will raise the temperature of the liquid to the boiling point, and the cork will be expelled. But motion may also be converted into electricity. Indeed electricity is always the result of friction between heterogeneous particles. When this piece of hard rubber, for example, is rubbed with the fur of a cat, it is at once electrified; and now if it be caused to communicate a portion of its charge to this glass plate, to which at the same time we add the mechanical motion of rotation, the strong sparks produced give evidence of the conversion.

So, too, taking heat as the initial force, motion, light, electricity may be produced. In every steam engine the steam which leaves the cylinder is cooler than that which entered it, and cooler by exactly the amount of work done. The motion of the piston's mass is precisely that lost by the steam molecules which batter against it. The conversion of heat into electricity, too, is also easily effected. When the junction

of two metals is heated, electricity is developed. If the two metals be bismuth and antimony, as represented in this diagram, the currents flow as indicated by the arrows; and by multiplying the number of pairs, the effect may be proportionately increased. Such an arrangement, called a thermo electric battery, we have here; and by it, the heat of a single gas burner may be made to move, when converted, this little electric bell engine. Moreover, heat and light have the very closest analogy; exalt the rapidity with which the molecules move and light appears, the difference being only one of intensity.

Again, if electricity be our starting point, we may accomplish its conversion into the other forces. Heat results whenever its passage is interrupted or resisted; a wire of the poorly conducting metal platinum becoming even red hot by the converted electricity. To produce light, of course, we need only to intensify this action; the brightest artificial light known results from a direct conversion of electricity. Enough has now been said to establish our point. What is to be particularly observed of these pieces of apparatus is that they are machines especially designed for the conversion of some one force into another. And we expect of them only that conversion. We pass on to consider for a moment the quantitative relations of this mutual convertibility. We notice in the first place that in all cases save one, the conversion is not perfect, a part of the force used not being utilized, on the one hand, and on the other forces making their appearance simultaneously. While, for example, the conversion of motion into heat is quite complete, the inverse conversion is not at all so. And, on the other hand, when motion is converted into electricity, a part of it appears as heat. This simultaneous production of many forces is well illustrated by our little bell engine, which converts the electricity of the thermo-battery into magnetism, and this into motion, a part of which expends itself as sound. For these reasons the question "How much?" is one not easily answered in most cases. The best known of these relations is that between motion and heat, which was first established by Mr. Joule, in 1849, after seven years of patient investigation. The apparatus which he used is shown in the diagram. It consists of a cylindrical box of metal, through the cover of which passes a shaft, carrying upon its lower end a set of paddles, immersed in water within the box, and upon its upper portion a drum, on which are wound two cords, which, passing in opposite directions, run over pulleys, and are attached to known weights. The temperature of the water within the box being carefully noted, the weights are then allowed to fall a certain number of times, of course in their fall turning the paddles against the friction of the liquid. At the close of the experiment the water is found to be warmer than before. And by measuring the amount of this rise in temperature, knowing the distance through which the weights have fallen, it is easy to calculate the quantity of heat which corresponds to a given amount of motion. In this way, and as a mean of a large number of experiments, Mr. Joule found that the amount of mass motion in a body weighing one pound, which had fallen from a hight of 772 feet, was exactly equal to the molecular motion which must be added to a pound of water, in order to heat it one degree Fahrenheit. If we call the actual energy of a body weighing one pound, which has fallen one foot, a foot-pound, then we may speak of the mechanical equivalents of heat as being 772 foot-pounds.

The significance and value of this numerical constant will appear more clearly if we apply it to the solution of one or two simple problems. During the recent war two immense iron guns were cast in Pittsburgh, whose weight was nearly 112,000 pounds each, and which had a caliber of 20 inches. Upon this diagram is a calculation of the effective blow which such a ball, assuming its weight to be 1,000 pounds and its velocity 1,100 feet per second, would give; it is 302,500 tuns! Now, if it were possible to convert the whole of this enormous mechanical power into heat, to how much would it correspond? This question may be answered by the aid of the mechanical equivalent of heat; here is the calculation, from which we see that when 17 gallons of ice-cold water are heated to the boiling point, as much energy is communicated as is contained in the death-dealing missile at its highest velocity. Again, if we take the impact of a larger cannon-ball, our earth, which is whirling through space with a velocity of 19 miles a second, we find it to be 32,994,400,000,000,000,000,000,000,000 tuns? Were this energy all converted into heat, it would equal that produced by the combustion of 14 earths of solid coal.

The speaker, after discussing the subject of the mechanical equivalent of light, and stating that the energy of the light of a spermaceti candle burning 126½ grains per hour, is equal in mechanical value to 13·1 foot-pounds per minute, as ascertained by Prof. Julius Thompson, of Copenhagen, and Mr. Farmer, of Boston, and after making a startling estimate of the power of the water raised each minute on our earth by the evaporative power of solar heat, proceeded to discuss the subjects of vitality or vital force.

Having now established the fact of correlation for the physical forces, we have next to inquire what are the evidences of the correlation of the vital forces with them. But in the first place it must be remarked that life is not a simple term like heat or electricity; it is a complex term, and includes all those phenomena which a living body exhibits. In this discussion, therefore, we shall use the term vital force to express only the actual energy of the body, however manifested. As to the attractions or the potential energy of the organism, nothing is more fully settled in science than the fact that these are precisely the same within the body as without it. Every particle of matter within the body obeys implicitly the laws of the chemical and physical attractions. No overpowering or supernatural agency comes in to complicate their action, which is modified only by the action of the others. Vitality, therefore, is the sum of the energies of a living body, both actual and potential.

Moreover, the important fact must be fully recognized that in living beings we have to do with no new elementary forms of matter. Precisely the same atoms which build up the inorganic fabric, compose the organic. In the early days of chemistry, indeed, it was supposed that the complicated molecules which life produced were beyond the reach of simple chemical law. But as more and more complex molecules have been, one after another, produced, chemistry has become reassured, and now doubts not her ability to produce them all. A few years hence, and she will doubtless give us quinine and protagon, as she now gives us coumarin and neurine, substances the synthesis of which was but yesterday an impossibility.

The food of the plant is matter whose energy is all expended; it is a fallen weight. But the plant organism receives it, exposes it to the sun's ray, and, in a way yet mysterious to us, converts the actual energy of the sunlight into potential energy within it. The fallen weight is thus raised, and energy is stored up in substances which now are alone competent to become the food of the animal. The food is not such because any new atoms have been added to it; it is food because it contains within it potential energy, which at any time may become actual as force. This food the animal now appropriates; he brings it in contact with oxygen, and the potential energy becomes actual; he cuts the string, the weight falls, and what was just now only attraction, has become actual force; this force he uses for his own purposes, and hands back the oxidized matter, the fallen weight, to the plant to be again de-oxidized, to be again raised. The plant then is to be regarded as a machine for converting sunlight into potential energy; the animal a machine for setting the potential energy free as actual, and economizing it. The force which the plant stores up is undeniably physical; must not the force which the animal sets free by its conversion be intimately correlated to it?

After discussing the subject of animal heat, and showing its identity with heat produced from any other source, Prof. Barker next proceeded to show that muscular action was identical in character to that of any other machine. The actual energy of the muscle is simply the converted potential energy of the carbon of the food. A muscle, therefore, like a steam engine, is a machine for converting the potential energy of carbon into motion. But unlike a steam engine, the muscle accomplishes this conversion directly, the energy not passing through the intermediate stage of heat. For this reason, the muscle is the most economical producer of mechanical force known.

The last of the so-called vital forces which we are to examine, is that produced by the nerves, and nervous centers. In the nerve which stimulates a muscle to contraction, this force is undeniably motion, since it is propagated along this nerve from one extremity to the other. In common language, too, this idea finds currency in the comparison of this force to electricity; the gray or cellular matter being the battery, the white or fibrous matter the conductors. That this force is not electricity, however, Du Bois Reymond has demonstrated by showing that its velocity is only 97 feet in a second, a speed equaled by the grayhound and the race horse. In his opinion, the propagation of a nervous impulse is a sort of successive molecular polarization, like magnetism. But that this agent is a force, as analogous to electricity as is magnetism, is shown not only by the fact that the transmission of electricity along a nerve will cause the contraction of the muscle to which it leads, but also by the more important fact that the contraction of a muscle is excited by diminishing its normal electrical current; a result which could take place only with a stimulus closely allied to electricity. Nerve force, therefore, must be a transmuted potential energy.

The speaker next discussed at length the highest manifestation of animal life—*thought-power*. Here the question arises, Can it be manifested inwardly without such a transformation of energy? Or is the evolution of thought entirely independent of the matter of the brain? Experiments, ingenious and reliable, have answered this question. The importance of the results, will, I trust, warrant me in examining the methods employed in these experiments somewhat in detail. Inasmuch as our methods for measuring minute amounts of electricity are very perfect, and the methods for the conversion of heat into electricity are equally delicate, it has been found that smaller differences of temperature may be recognized by converting heat into electricity than can be detected thermometrically. The apparatus, first used by Melloni 1832, is very simple, consisting first, of a pair of metallic bars like those described in the early part of the lecture for effecting the conversion of the heat; and second, of a delicate galvanometer, for measuring the electricity produced. In the experiments in question one of the bars used was made of bismuth, the other of an alloy of antimony and zinc. Preliminary trials having shown that any change of temperature within the skull was soonest manifested externally in that depression which exists just above the occipital protuberance, a pair of these little bars was fastened to the head at this point; and to neutralize the results of a general rise of temperature over the whole body, a second pair, reversed in direction, was attached to the leg or arm, so that if a like increase of heat came to both, the electricity developed by one would be neutralized by the other, and no effect be produced upon the needle, unless only one was affected. By long practice it was ascertained that a state of mental torpor could be produced, lasting for hours, in which the needle remained stationary. But let a person knock on the door outside the room, or speak a single word, even though the experimenter remained absolutely passive, and the reception of the intelligence caused the needle to swing through 20 degrees. In explanation of this production of heat, the analogy of the muscle at once suggests itself. No conversion of energy is complete; and as the heat of muscular action represents force which has escaped conversion into motion, so the heat evolved during the reception of an idea, is energy which has escaped conversion into thought, from precisely the same cause. Moreover, these experiments have shown that ideas which affect the emotions, produce most heat in their reception; a few minute's recitation to one's self of emotional poetry, producing more effect than several hours of deep thought." Hence it is evident that the mechanism for the production of deep thoughts, accomplishes this conversion of energy far more perfectly than that which produces simply emotion. But we may take a step further in this same direction. A muscle, precisely as the law of correlation requires, develops less heat when doing work than when it contracts without doing it.

The lecturer next reviewed the part which American Scientists had taken in the development of these great truths, and closed his address as follows:

In looking back over the whole of this discussion, I trust that it is possible to see that the objects which we had in view at its commencement have been more or less fully attained. I would fain believe that we now see more clearly the beautiful harmonies of bounteous nature; that on her many-stringed instrument force answers to force, like the notes of a great symphony, disappearing now in potential energy, and anon reappearing as actual energy, in a multitude of forms. I would hope that this wonderful unity and mutual interaction of force in the dead forms of inorganic nature, appears to you identical in the living forms of animal and vegetable life, which make of our earth an Eden. That even that mysterious, and in many aspects, awful power of thought, by which man influences the present and future age, is a part of this great ocean of energy. But here the great question rolls upon us. Is it only this? Is there not behind this material substance, a higher than molecular power in the thoughts which are immortalized in the poetry of a Shakespeare or a Milton, the art creations of a Michael Angelo or a Titian, the harmonies of a Mozart or a Beethoven? Is there really no immortal portion separable from this brain-tissue, though yet mysteriously united to it? In a word, does this curiously-fashioned body inclose a soul, God-given and to God returning? Here Science vails her face and bows in reverence before the Almighty. We have passed the boundaries by which physical science is inclosed. No crucible, no subtile magnetic needle, can answer now our questions. No word but his who formed us can break the awful silence. In presence of such a revelation Science is dumb, and faith comes in joyfully to accept that higher truth, which can never be the object of physical demonstration.

The Phosphorescence of the Sea.

Every one recognizes the beauty of the singular phenomenon that we call the phosphorescence of the sea, and has watched the track of foam and diamond points of light left behind as the steamer cuts the wave. For a long time the cause of the shining appearance was a puzzle to philosophers. But the naturalists finally came to the conclusion that it is produced by animalculæ which are excited to luminosity when the water is agitated. It was also shown that the phosphorescence is brightest and the sparks most numerous immediately preceding an atmospheric disturbance. Thus, the little animalculæ must be included in the long list of delicate organisms that feel the approach of bad weather. Professor Decharme observed this coincidence and has been diligently studying the habits of the tiny creatures and their shining propensities. He tells us, as the result of his observations, that they are visible in the daylight with a glass magnifying about forty times. They are, under this magnifying power, of a lens-shaped form, and from seven to fifteen hundredths of an inch in diameter. They are of a transparent nature, more diaphanous in the center than around the periphery of their little bodies. The specimens experimented on by the Professsor lived in a bottle for several weeks, and became very brilliant when the water was shaken or stirred, or whenever a small quantity of exciting fluid, alcohol or acid was introduced into it. These infinitesimal barometers, when fully developed, attain the size of from two to four thousandths of an inch.

Faraday on Human Credulity.

I have not been at work except in turning the tables upon the table-turners. Nor should I have done that, but that so many inquiries poured in upon me that I thought it better to stop the inpouring flood by letting all know at once what my views and feelings were. What a weak, credulous, incredulous, unbelieving, superstitious, bold, frightened—what a ridiculous world ours is as far as regards the mind of man! How full of inconsistencies, contradictions, and absurdities it is! I declare that, taking the average of many minds that have recently come before me (and apart from that spirit which God has placed in each) and accepting for a moment that average as a standard, I should far prefer the obedience, affections, and instinct of a dog before it. Do not whisper this, however, to others. There is One above who worketh in all things, and who governs even in the midst of that misrule to which the tendencies and powers of men are so easily perverted.

THE largest span of any truss bridge in the United States is that of the bridge across the Ohio river, at Louisville. It is 370 feet.

Visit to a Chinese Silk Factory

A correspondent of the Cincinnati *Commercial* thus describes a Chinese silk factory:

"I directed my guide to take me into the silk-weaving streets. We soon entered them. I at once dismounted to make a careful observation of their *modus operandi* for the production of this renowned fabric of Oriental looms. All around me was silk, silk, nothing but silk. In small dark houses, little better than hovels, were seen people, chiefly women, dyeing this delicate textile. Outside, in little filthy yards and pig-styes, over the ground where the family swine were wallowing, were placed bamboo poles, whereon were hanging skeins of colored silk just from the dye, and glowing with the most vivid hues as they hung for drying in the sunshine over the loathsome pools below. I visited several of their weaving shops. They were quite similar in their fixtures and arrangements. I spent some time in examining one of the largest. It was, perhaps, 100 feet long and about 16 feet wide. The walls were of coarse clay blocks, sun-dried, unpierced by a single aperture for air or light save at the front, which was entirely open the whole breadth of the building. The floor was simply of trodden clay, uneven and untidy. An aisle ran down the center, just wide enough for one person to pass; on either side of this were ranged the nearest looms and standing as close together as they could be placed.

Two or three persons were employed on the work of each loom. The looms are plain, common-looking affairs, almost precisely of the same kind, as to appearance and mode of manipulation, as were those upon which our grandmothers in Ohio used to weave the linsey-woolsey for the wear of Western boys, when even the preacher was almost a stranger to broadcloth. Squatting myself down by one of these friendly looking acquaintances of my boyhood, I leisurely watched the delicate and diligent manipulations of the weaver and his assistants as their shuttles flew to and fro in the mazy mystery of figures and flowers that came gradually out larger and plainer upon the growing surface of the gorgeous fabric which those skillful workmen were there creating under my eye. So complex were the movements of the men on these simple looking machines, and so marvelously beautiful were the products resulting therefrom, that I gazed with unbounded amazement upon this work of silk weaving as it progressed before me.

The weather being warm and the shop crowded the workmen were almost naked. My visit interested them manifestly, yet not a loom ceased its clicking, clacking noise, not a man left his employment to gaze; but I detected them giving furtive glances and exchanging mutual smiles among themselves at the curious stranger who had thus unceremoniously squatted himself down in their midst, by one of these humble looking looms, on a common dirt floor, within homely clad walls, where, nevertheless, are produced those beautiful fabrics which for ages and throughout the world have been the pride of wealth, the envy of beauty and the admiration and desire of royalty. Far down and nearly to the extreme limit of this long room was a plain board counter, extending quite across the room. Beyond it stood the proprietor of the factory, a smooth-faced, richly clad Chinaman. Directly over him the building was unroofed, thereby affording a spacious skylight; except this, window there was none. Through this skylight, and down upon the counter below, the sunshine fell upon the finished work of this dingy, dirty, squalid looking workshop. The proprietor was busy measuring off and packing up the products of his looms. And as the sunlight streamed full upon the gorgeous colors of those magnificent silks, satins, and brocades which the proprietor was tossing about in billowy radiance, it seemed to my eyes, as I stood far up in the feeble light of the center of the room, as though he were tossing and toying with rainbows. From places so humble and surroundings so squalid as this come those royal fabrics which are to decorate palaces and to adorn the persons of princes and monarchs of the earth.

UNITED STATES CIRCUIT COURT--SOUTHERN DISTRICT. BEFORE JUDGE BLATCHFORD.

RIVAL SEWING MACHINES—INFRINGEMENT—PRACTICE.

Sidney W. Dibble et al. vs. James M. Augur, as Agent of the Florence Sewing Machine Company.—This was a bill in equity for an injunction and account filed by the Wheeler & Wilson Manufacturing Company, the Grover & Baker Sewing Machine Company, the Singer Manufacturing Company.

Thomas J. W. Robertson and Sidney W. Dibble, as trustees of the above companies, and of Robertson, against the above defendant, on account of an alleged infringement of a patent granted to Robertson, November 22, 1859. It appeared from the evidence that Robertson on May 8, 1868, assigned all his rights under the patent, of which he was then sole owner, to Dibble. On the same day an agreement was made between the three companies and Robertson and Dibble, which provided, among other things, that Robertson was to have the right to sue for and retain all damages for past or future infringements of the patent by others than the three companies.

On June 16, 1868, Robertson assigned to Dibble as trustee for the three companies and for Robertson all claims for past infringements of the patent. The bill in this case was filed on June 13, 1868. The only evidence of infringement was an admission of the defendant that prior to February 20, 1868, he had sold Florence Sewing Machines as agent of that company, with a certain braiding attachment which the plaintiffs claim is covered by the Robertson patent. The defendants set up in answer a license granted by the three companies to the Florence Sewing Machine Company, February 20, 1868, providing among other things, that the licensers are not to claim any license fees other than those provided in the license, under any other patents which they may now or hereafter own or control, covering devices embodied in certain specimen machines.

On this state of facts it was contended on the part of the defendant, that the right to recover for infringements committed prior to Feb. 20, 1868, was in Robertson alone; that this bill would not lie in behalf of Robertson, because he had an adequate remedy at law, and was not when it was filed the owner of the patent; that it would not lie in behalf of the other plaintiffs, because when it was filed they had no interest in the claim for such forfeits, and that the enforcement by the three companies of the interest of Robertson, conveyed by him to Dibble, as trustees for the companies, is a violation of the license of Feb. 20, 1868.

Held by the Court—That the effect of the instruments of May 8, 1868, was to vest in Dibble as trustee for Robertson, all interest in claims for past infringements against others than the three companies and their licensees; but that the assignment of that date did not convey to Dibble, otherwise than as trustee, claims for past infringements. (Moore *vs.* Marsh, 7 Wallace, 515). That the bill in this case so far as past infringements are concerned, ought to have been filed in the name of Dibble as trustee for Robertson, joining Robertson as the owner of the equitable interest. It was so brought, adding as plaintiffs, Dibble as trustee for the three companies, and the three companies themselves. Such addition was surplusage, but as the objection thereto was not raised until the hearing, and as by the instrument of June 16, 1868, the claim for past infringements was transferred by Robertson to Dibble, as trustee for the three companies, and for Robertson, and as the bill is brought in the name of such trustee and *of the cestui que trust*, it will be allowed to stand. The defendant will then be responding to every person who can make a claim against him in respect to the alleged infringements. The suit being for an account, is properly bought in equity. In respect to the alleged infringement, the license of Feb. 20, 1868, has no application to infringements committed prior to that date. The first claim of the Robertson patent is not infringed, but the second claim is infringed by the defendant, and in respect to it there must be a decree for a perpetual injunction and an account with costs.

For the plaintiffs, F. H. Betts; for the defendant, A. L. Sarle.

THE ÆTNA SEWING MACHINE.

Orlando B. Potter et al. vs. Julius E. Braunsdorf and Henry Weil.—This was a suit for a perpetual injunction and an account of profits founded on the alleged infringement of letters patent reissued to John Batchelder Dec. 12, 1865, for an improvement in sewing machines. The original patent was granted to Batchelder, as inventor, in 1849, and was reissued to Isaac M. Singer and Edward Clark as assignees, in 1858. Afterward, on the application of Batchelder, the original patent was extended for seven years, from May 8, 1863, by the Commissioner of Patents, and in 1863 and 1865 the patent so extended was reissued to Batchelder.

The defense set up that as the original patent was assigned to Singer & Clark, and was by them surrendered, and was not in existence thereafter, but only a reissue of it, the extension granted to Batchelder was an extension of a patent not in existence and was in violation of the provisions of the act of July 4, 1836, section 18 (5 U. S. Stat. at Large, 125), and null and void.

Held by the Court—That the great feature of the invention of Batchelder's was the production of a sewing machine in which the cloth to be sewn is supported horizontally, and is fed through the machine perpetually. His machine was the first in which the cloth was so supported and advanced by an automatic feed of any kind. That the machine of the defendants called the Ætna Machine, though in some respects an improvement upon Batchelder's invention, nevertheless embodies and infringes upon it. That the views advanced by the defense as to the validity of the extension and reissue to Batchelder cannot be maintained the question having been already decided. (Potter *vs.* Holland, 4 Blatchf., C.C.R. 293; Woodworth *vs.* Stone, 3 Story, 749). As Batchelder did not ratify and adopt the surrender by, and the reissue to Singer and Clark, he had the same right after such transaction (as before it in respect to obtaining an extension of time under the original patent. Such extended term did not come into being until the term granted by the reissue expired, so that the apparent objection does not obtain that there were two patents in existence at the same time for the same invention. The object of the act of July 4, 1836, section 18, is to prevent an extension for seven years after the the expiration of fourteen years. In this case the fourteen years had not expired when the extension was granted.

Objections to the validity of the extension overruled. Decree for a perpetual injunction and an account with costs to the plaintiffs.

E. W. Stoughton and G. Gifford for the plaintiffs; A. C. Washburn and C. A. Durgin for the defendants.

THE EMPIRE SEWING MACHINE.

The Same vs. The Empire Sewing Machine Company.—*Held by the Court.*—That the facts in this case are the same as in the case above, the machine being the same in construction and operation as the Ætna machine. Decree for a perpetual injunction and an account with costs to the plaintiffs.

Answers to Correspondents.

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

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

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

J. H. H., of Mass.—The apearances in the Prince Rupert's drops, wh ich you mention, are not probably bubbles, but slight imperfections in the homogeneous character of the glass, caused by imperfect fusion. The theory of the breaking of these drops with apparently explosive force, is that the molecules of the mass are in a state of unequal tension, consequent upon the rapid cooling of the exterior while the interior is yet warm. Nipping off the points sets the unequal tension into active work, and throws the glass into fragments. We have already published a full description of the spectroscope, with illustrations and explanations, in a back volume, and we do not wish to return to the subject at present.

G. T. M., of Mass.—The products of the combustion of hydrocarbon oils in lamps are carbonic acid and water. The carbon of the oil unites with the oxygen of the air to form carbonic acid, and the hydrogen of the oil unites with the oxygen of the air to form water. The water thus generated is converted into steam by the heat of the flame, and condenses, of course, upon coming in contact with any cold surface like the bottoms of the glue pots of which you write. By constructing the pots with a bottom like a champagne bottle, the condensed water may be led to the outside so that it will not drip on to the lamp flame and extinguish it.

W. A., of N. Y.—We presume the apparatus for generating ozone to which you refer, is that known as Siemens' induction apparatus. It consists of a long glass tube, coated on the interior with tinfoil, over which a second and larger tube, coated on the outside with tinfoil, is placed. These tubes are charged with electricity, and pure dry oxygen is transmitted through between them. The oxygen becomes electrified by induction and assumes the peculiar state in which it is called ozone.

J. G., of N. J.—Particles of iron melted with brass make a a very refractory compound. The iron ought to be separated before melting. The separation can be effected by stirring the brass filings, turnings, etc., with a powerful magnet. The iron filings will stick to the poles of the magnet, and may be brushed away as they accumulate. The hardness complained of is a property of some alloys of iron and zinc which any amount of annealing will not remedy.

T. P. W., of Montana.—The appearance of colored rings, or portions of rings, about the sun or moon, though not frequent in this latitude, is nevertheless sufficiently so to be well known and to have been observed by most persons at some time or other. They are called coronas when they surround the moon and parhelia when they surround the sun. They are formed by the reflection of light from the surface of watery vapor in the atmosphere.

A. P. B., of Ohio.—A great variety of nostrums and recipes has been recommended for removing scale from boilers, and all have found some to testify to their efficacy. We have found oak bark or twigs excellent for the purpose, put in in the morning and the boiler blown off at night, and repeated as often as necessary. But we know of nothing that we would consider as certain for all cases and also harmless.

W. D., of West Va.—The proposed increase of the cylinders will undoubtedly entail a proportionate increase in the capacity of your boiler; but as you give no data from which the heating surface can be computed, and nothing of the horse power you wish to obtain, no more definite answer can be given to your query.

H. M. H., of Montana.—A popular treatise on gems by Dr. L. Feuchtwanger, published by D. Appleton & Co., of this city, gives valuable nformation on the subject of gems. You will hardly, however, learn the lapidary's art from books.

R. B. S., of N. Y.—There is no doubt that the undulatory theory of light explains not only the passage of light through what is called a vacuum, but all other phenomena of light, more satisfactorily than the corpuscular theory.

G. B. M.—The process of testing the quality of soda ash and potash is called alkalimetry. You will find a full description of it on page 673 of the United States Dispensatory, which you will find in any good druggist's shop.

G. H., of Pa.—A boiler in addition to the expansive pressure of the steam which is transmitted equally in all directions, has upon the bottom the additional pressure of the contained water.

R. P. M., of Mich.—Asks whether a watch will work in a perfect vacuum. Answer—Yes.

G. H. H., of Mo.—We are unacquainted with the process to which you refer.

W. H., of Ohio.—Rubber erasers may be cleaned with soap and tepid water.

E. T., of Pa.—The plan you submit for street crossings does not seem practicable to us. We therefore respectfully decline it.

THE NEW YORK TIMES has some severe but true remarks, from which we quote: "Another illustration of the indifference to improvement is shown in the practice of Gas Companies in lighting street lamps. The lamps of European cities are lighted by a Torch, the operation being, literally, quick as a flash. Here labor is far dearer than in Europe, and yet the Manhattan Co. has but recently begun to use the Torch. Other Companies still send round a man with a ladder, with which he climbs the posts, turns on the gas, then takes a match from his pocket, scratches it upon the post, and lights the gas, the process taking about three times as long as the new one, carrying all who see it back almost to the middle ages." "This improved method of lighting street lamps, referred to by the *Times*, is the same to which we have called the attention of those interested in lighting street lamps, as being not only a great improvement, but the best, of which the full particulars may be obtained from Mr. J. W. Bartlett, of 569 Broadway, New York, who is proprietor of the Patents."—[EDS. GAS LIGHT JOURNAL.

Business and Personal.

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

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

For Small Engine Lathes, Crank Planers, etc., with foot-power. Also, any patent articles parties want to have manufactured. Addre W. E. Bradner & Co., 13 Mulberry st., Newark, N. J.

$5 to $25 per day to Agents, Male and Female.—Send 15 cents to Taylor & Nye, Stamford, Conn., for circular and sample of Liquid Silver for replating spoons, forks, castors, etc., and instantaneously silver plating all articles of brass, copper, etc., etc.

Wanted—Patent Rights to the Pacific States for the best Gas Regulator. Also, Portable Gas Machine, address Wm. Henry, 356 Clementina st., San Francisco, Cal.

State Rights of best Low-water Indicator for sale—low prices Write to A. Cutter, 429 Chestnut st., Philadelphia, Pa.

For Sale—Or exchange for Western Lands, the whole or one half interest in a 1-set Woolen Mill. Address O. Barnard, Bloomington, Ill.

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

Money Making—Making cloth water-proof, 50c. H. Dayton, Box 1203, Boston, Mass.

G. W. Lord's Boiler Powder for the removal of scale in steam boilers is good and reliable. We sell on condition. Send for circulars to G. W. Lord, 107 West Girard Avenue, Philadelphia, Pa.

Every wheelwright and blacksmith should have one of Dinsmore's Tire Shrinkers. Send for circular to R. H. Allen & Co., Postoffice Box 376, New York.

Aneroid Barometers made to order, repaired, rated, for sale and exchange, by C. Grieshaber, 107 Clinton st., New York.

The Babcock & Wilcox Steam Engine received the First Premium for the Most Perfect Automatic Expansion Valve Gear, at the late Exhibition of the American Institute. Babcock, Wilcox & Co., 44 Cortlandt st., New York.

For best quality Gray Iron Small Castings, plain and fancy Apply to the Whitneyville Foundery, near New Haven, Conn.

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

Foot Lathes—E. P. Ryder's improved—220 Center st., N. Y.

Those wanting latest improved Hub and Spoke Machinery, address Kettenring, Strong & Lauster, Defiance, Ohio.

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

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

Send 3-cent stamp for a circular on the uses of Soluble Glass, or Silicates of Soda and Potash. Manufactured by L. & J. W. Feuchtwanger, Chemists and Drug Importers, 55 Cedar st., New York.

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

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

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

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

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

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

Recent American and Foreign Patents.

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

MACHINE FOR CUTTING AND PRESSING THE HEADS OF METAL CANS.—Reuben Brady, New York city.—This invention relates to a new machine for cutting from large plates the circular heads or end pieces of sheet-metal cans and for, at the same time, forming the flanges on the same, both operations being performed by one single motion of the main working lever. The machine can be used for cutting plain circular plates or forming projecting flanges or for grooving and embossing the plates cut out in forming both the plain and ornamental impressions. The invention consists chiefly in the employment of a hollow cutter and of a punch or presser sliding therein, the presser being operated by a rocking lever, which, during part of its motion, also carries along and moves the cutter. The patent is for sale. Parties desiring information can address the inventor at 631 Hudson street, New York.

BEEHIVE.—Sylvester D. Barber and James Wolf, Mattoon, Ill.—This invention relates to certain improvements in that kind of beehives which are pointed at the bottom; and the invention consists in such an arrangement of parts that the bees will be protected from moths, frost, and all other inconveniences generally found on ordinary beehives.

ELECTRIC CLOCK.—Vitalis Himmer, New York city.—This invention relates to a new clock which is operated by electricity without the use of a pendulum, but with the aid of a spring balance, and which is so constructed, that it will operate with absolute exactness, and not be affected by atmospheric influences.

SAWING MACHINE.—Jacob D. Culver, Bellmore, Ind.—This invention relates to a new and useful improvement in machines for sawing logs across the grain.

GLOBE VALVE.—George W. Reisinger, Harrisburgh, Pa.—This invention relates to a new and useful improvement in globe valves for steam, water, or other liquids, whereby the valve may be ground on its seat without removing the steam or water pressure.

EXTENSION CURTAIN ROLLER.—Thomas Van Wagoner, Newark, N. J.—The object of this invention is to furnish a window curtain roller, all prepared to put up, without sawing off an end or putting on a cord pulley one which any person (male or female) can put up without difficulty.

SADIRON HEATER.—John G. Redline, Lanark, Ill.—This invention relates to a new apparatus, which is to be applied to an ordinary stove, for the purpose of heating smoothing irons. The invention consists in the arrangement of a separate heater which has its own fire regulated by the draft of the stove, and which is provided with hinged slotted doors to receive and retain the irons to be heated.

BEEHIVE.—John Montgomery, Union City, Pa.—This invention has for its object to furnish a simple and convenient beehive, which shall be so constructed and arranged as to greatly facilitate the management of the bees, and which will, at the same time, protect the hive from the ingress of the moth.

BREAD AND MEAT SLICER.—J. Enrigner, L. Fertig, Dauphin, Tenn.—This invention has for its object to furnish a simple and convenient machine, by means of which bread, and other soft spongy substances, may be sliced evenly and uniformly, and which may be used with equal advantage for slicing dried beef and other hard substances.

ATTACHING HOES AND OTHER TOOLS TO HANDLES.—Giles T. Jobson, Macon, Ga.—This invention relates to new and useful improvements in tools for dressing plants, and consists in a peculiar combination in one tool of a hoe and rake, or other similar implement, the said hoe and rake or other implement being made separately, and each provided with a longitudinal section of a tubular shank, by which they are connected to the handle by a clamping ring.

BRICK MOLD.—Matthew Newlove, Burlington, Iowa.—This invention relates to improvements in molds for shaping and pressing brick, and consists of a mold box with movable bottoms or followers, connected to a bar extending along all the molds in the box, and connected to bell crank levers privoted to fixed bearings on the box, and so arranged as to force the movable bottoms or followers through the mold boxes and discharge them when required for discharging the mold.

WHEEL HARROW.—A. L. P. Varian, Ripley, Miss.—This invention relates to improvements in harness, and consists of an arrangement of plane or dished disks on shafts inclined to the line of draft, and so arranged that the machine being drawn along the ground, so as to be supported on these disks, rolling on the ground will cause them to cut into the same and turn and pulverize it more or less, according to the dish or inclination of the said disks, any preferred number being arranged on the shaft, which is bent at the center so that one half the disks will throw one way and the other half the other, to counteract the side draft of each set.

SAFETY RAILROAD TRUCK.—C. R. Morris and H. R. Franklin, Bridgeport, Conn.—This invention consists in the attachment to the trucks, preferably between the wheels, of runners, or guards in the form of runners, with curves at each end which will rest on the ties, reaching across two or more and slide thereon when the cars are thrown off the track, in a manner calculated to greatly protect them against the disastrous results which now occur by the wheels going down between the ties.

WASHING APPARATUS.—John T. Grose, Upper Sandusky, Ohio.—This invention has for its object to furnish a simple, convenient, and efficient machine by which the clothes will be quickly and thoroughly washed by the circulation of steam and hot water, and which shall be so constructed as to allow the dirty water to be drawn off and replaced by clean hot water when desired.

CULTIVATOR.—B. F. Ward, Indian Springs, Ga—This invention has for its object to furnish a simple, convenient, effective, and cheap machine designed more particularly for cultivating plants planted in hills and drills, but which may be used with great advantage for preparing the ground to receive the seed, and for covering seeds planted in hills and drills.

MARKER FOR CARPENTERS, JOINERS, ETC.—G. M. Nickason, Ellenville, N. Y.—This invention relates to a new device for marking the places on window blinds, sashes, etc., where mortises are to be cut, and has for its object to make the marking with such precision and accuracy that a large number of bars or planks can be prepared alike, when to be used for a number of equal sized shutters, sashes, or other articles.

WINDOW JACK.—S. P. Loomis, Philadelphia, Pa.—This invention has for its object to simplify the construction of window jacks and to allow the same to be readily folded together.

PLOWING AND HARROWING MACHINE.—Arthur Cunningham, Cincinnati, Ohio.—This invention relates to improvements in machines for plowing and harrowing, and consists in certain peculiar arrangements of connecting and operating devices, whereby a common plow and harrow are connected to a truck adapted for the operator to ride on, in a way by which he may govern the plow and harrow as required. The said plow and harrow are adjustably connected to the frame of the truck so as to vary their action.

SCAFFOLD BRACKET.—James Chattin, Marion, Iowa.—This invention relates to new and useful improvements in brackets for attachment to inclined roofs to support the scaffold braces, without the driving of nails through the shingles. It consists of a pair of clamp jaws, an eccentric or cam-shaped clamping dog or lever, and a spring, so arranged that the jaws may be readily and securely attached to the end of a shingle already nailed on, by raising the end of the said shingle, inserting it between the jaws, and turning the clamp dog to force the jaws together; the spring is used to force the jaws apart when the dog is turned down to release them, and to hold the cam dog in place.

ELECTRIC PENDULUM CLOCK.—Vitalis Himmer, New York city.—This invention relates to a new pendulum clock, which is operated by electricity in such manner that a very accurate and reliable time-keeper is produced which can readily be regulated, and which will not be affected by differences of temperature.

AUTOMATIC TOY SAVINGS BANK.—Wm. P. X. Smith, New York city.—This invention has for its object to furnish an improved toy savings bank for children, which shall be so constructed and arranged that when one part or figure of the device is pressed upon, a piece of money placed upon another part or figure may be thrown into the mouth of a third figure, which mouth opens at the proper time to receive it.

MACHINE FOR CUTTING IRREGULAR FORMS.—F. Keagey, Chambersburg, Pa.—This invention relates to improvements in machines for holding, adjusting, and feeding the pillars, balusters, or other articles to be dressed in irregular forms or plain sides on a table past a rotary cutter, by which the dressing is to be effected. The said invention consisting of a bed with centers for holding the blank, one of which is adjustable as to length, and provided with a dividing plate for adjusting the blank to the center; also a pattern for governing the action of the tool on the blank.

EGG BOX.—J. D. Michael, Baltimore, Md.—This invention relates to improvements in boxes for packing eggs for transportation and storage, and consists in providing packing boxes with tops, bottoms, and shelves or drawing boards capable of moving in or out of the same, and being attached at any point to confine the eggs spread evenly between them, so that they cannot move when the box is turned from side to side or otherwise handled. The said movable tops and bottoms are secured in their arrangement by bolts or rods passing through holes in the sides at or near the ends, and either through or above and below the said bottom.

MANUFACTURING GINGER SNAPS, ETC.—Daniel M. Holmes, Williamsburgh, N. Y.—This invention has for its object to furnish a simple, convenient, and effective machine by means of which ginger and other snaps may be made from soft dough, rapidly, convicntly, and accurately.

SELF-LOADING TOY PISTOLS.—Chester F. Smith, Torrington, Conn.—This invention relates to new and useful improvements in toy pistols, and consists in an arrangement in connection with the barrel and discharging spring of a magazine, which, being supplied with balls, will, on the spring being retracted and engaged with the trigger for firing, deliver a ball with the barrel in advance of the spring in readiness for discharging It also consists in a novel arrangement of the trigger for holding the ball from rolling out of the barrel at the same time that it holds the spring back. Also in an arrangement of the spring with the supply passage from the magazine to permit the discharge of more than one ball at a time.

RAZOR HONING MACHINE.—William Brown, Thomaston, Conn.—This invention relates to new and useful improvements in machines for honing razors and other blades. It consists of a bed for supporting the blades placed on trunnions, and a hone placed on the underside of a suitable stock having a slide working through a guide in rear of the bed for supporting the blade, the front end of the stock being taken in the hand and worked back and forth, and also laterally, by a kind of circular motion, whereby the hone is made to rub the side of the razor which is maintained parallel with the oscillating trunnions.

APPARATUS FOR DRAFTING CLOTHES.—Ira J. Ordway, West Edmeston, N. Y.—This invention consists in combining with a main linear measuring stick for laying off dimensions of length of the subject ordering new clothes, other measuring sticks, perpendicular to the main stick, or inclined to it, and intended for the purpose of laying off dimensions of width, or of inclined or curved length.

MOLE TRAP.—W. C. Akers, Petersburg, Va.—This invention consists of a weight provided with prongs, and moving in a guideway in a vertical frame, at the top of which it is held by a lever, retained by a catch, from under which catch the lever is thrust by the action of a vertical rod, jointed at its bottom to the end of a second lever, called the earth trigger, which is raised by the mole burrowing under it, the disconnection of the upper lever from the catch being followed by a fall of the spiked weight upon the animal.

PORTABLE RAILWAY.—J. K. Glenn, New York city.—This invention relates to a new running gear for vehicles of all classes, such as are used for transporting goods or conveying passengers through cities or from one place to another, and is peculiarly adapted for soft or swampy ground.

PROPELLING VESSELS.—Alfred Colburn Loud, San Francisco, Cal.—This invention relates to an improved device for propelling vessels, whereby increased speed as well as other advantages are obtained. The invention consists in mounting upon a horizontal shaft, two or more disk wheels at an angle varying from a right angle, fifteen degrees (more or less), so that the inner faces of such wheels or disks shall approach or meet each other upon one side and diverge from each other on the other side, the two or more disks forming (when thus secured to the shaft) a single wheel, which in general outline is in the form of a wedge. Propellers constructed in this manner are mounted on the paddle wheel shaft in place of the ordinary paddle-wheels.

STEAM PUMP.—Samuel Williston, James Sutherland, and Joseph Winslow Winslow, East Hampton, Mass.—The principal features of novelty are the use of secondary valves with their respective passages, arranged in combination with the main valve and the steam piston, to perform their three-fold functions of exhausting from one end of the main valve, admitting steam to the other end, and to hold it therein. The next improvement is packing the main and secondary valves by means of a small steam cylinder arranged in a recess, and provided with steam passages and steam space at the bottom of the recess. The steam piston is packed by means of a segmental ring and secondary spring ring. Steam is admitted to the interior of the piston through passages, and made to act on a valve arranged in rear of or behind the secondary spring. The pump cylinder is open at both ends and is inclosed in a case or envelope which is divided at the middle into two compartments. The water supply pipe and also the discharge valve are each provided with a set of clack valves communicating with the two compartments of the casing.

MARINERS' COMPASS.—Demetrius Bittle Strouse, Salem, Va.—This invention consists of a combination of three or more systems of magnetized needles or bars attached to one or more axles and arranged in different horizontal planes.

KNITTING MACHINE.—Mark Lamar Roberts, New Brunswick, N. J., and Fergus Peniston, New York city.—This invention relates to improvements in knitting machines, whereby it is designed to provide a machine capable of knitting plain tubular fabrics, such as bags for holding grain, hose for conveying water, or stockings, socks, and other similar articles of wearing apparel, to be operated either by hand or power, and which may be readily changed from the condition of a circular cam knitting machine for knitting plain tubular goods, in which condition it may be operated with great rapidity, to the condition of a family machine which may be used either for making tubular goods at a slower rate or articles of wearing apparel.

MANUFACTURE OF FELTED FABRICS, AND WEARING APPAREL AND OTHER ARTICLES FROM THE SAME.—John Falconer, New York city.—The first part of this invention relates to an improved method of laying the fibers for hats, felts, waddings, and other similar goods so that they may be crossed and interlaced in all directions, for the purpose of causing them to adhere more firmly together, and thereby produce fabrics of durable quality. The second part of the invention consists in forming seamless articles of wearing apparel and other articles from the fabric above described. This fabric is especially adapted for this purpose by reason of the interweaving of the fibers.

BRICK MACHINE.—Peter Haydon, Pittsburgh, Pa.—This invention relates to a new and improved machine for molding and pressing bricks, and it consists of an improved means for conveying the clay from the crushing mill to the press boxes, and also in a novel and improved construction and arrangement of parts for molding and compressing clay and discharging the same after being compressed.

STEAM BOILER.—J. E. Culver, Hudson City, N. J.—This invention relates to a new method of utilizing the heat force created in a steam boiler, and consists in the employment of a steam engine and an atmospheric engine for that purpose.

NEW BOOKS AND PUBLICATIONS.

HYDRAULIC MOTORS. Translated from the French Cours De Mecanique Appliquee par M. Bresse Professeur de Mecanique a l' Ecole des Ponts et Chaussees. By F. A. Mahan, Lieutenant U. S. Corps of Engineers. Revised by D. H. Mahan, LL.D., Professor of Civil Engineering, etc., United States Military Academy. New York: John Wiley & Son, 2 Clinton Hall, Astor Place.

This is a treatise of the mathematical kind which may prove a valuable college text-book but is by far too abstruse for the general reader. The mathematical formulæ are ingeniously rendered more difficult and perplexing by the profuse use of Greek letters. Why this practice is of late so generally on the increase is a still greater puzzle to common sense. There are good reasons why a Greek letter may be adopted as a symbol which shall be accepted the world over as meaning always one thing, as, for instance, the ratio of the radius of a circle to its circumference; but why they should be used in algebraic instruction in preference to the much shorter and more convenient Roman letters, is to us an enigma; unless a vain display of apparent profundity is aimed at. The work in hand is undoubtedly valuable, notwithstanding the fault we have pointed out, but the readers who have the requisite mathematical knowledge to read it with advantage, are few in comparison to all who would like a book on the same subject treated in a less ambitious style.

ASSOCIATION MONTHLY

Is the title of the new journal started under the auspices of the Young Men's Christian Association of this city. It is edited by R. C. Morse, and gives promise of being an interesting and valuable means of instruction to thousands of young men who enter into sympathy with this Association and its objects. Terms, $1·00 per year.

THE COURT CIRCLES OF THE REPUBLIC.

Such is the title of Mrs. Eliet's new book now going through the press of the Hartford (Conn.) Publishing Company. This fine work is to contain steel engravings of some of our notable ladies, accompanied by cleverly written sketches. It is a subscription work, and agents are wanted to dispose of it throughout the State.

WE are in receipt of the first numbers of "Nature," a new weekly illustrated journal of science, published by Macmillan & Co., London and New York. It is devoted to rather abstract scientific discussions and the record of scientific events. This new journal will be apt to find favor among the professed scientists of the day, but will hardly become a popular journal in the broadest sense. It is printed in excellent style.

ONE of the best of our exchanges is the "Commercial Bulletin," published by Curtis, Gould & Co., 129 Washington street, Boston. As a business and commercial paper it occupies a prominent position among American journals, and the high literary character of its general reading and its reliability as a guide in commercial matters are widely acknowledged.

THE RICHMOND AND LOUISVILLE MEDICAL JOURNAL is still under the direction of E. S. Gaillard, M.D., Louisville, Ky. It is a very able work and has a fine list of contributors, including several well known New York physicians. Monthly. $5.00 per annum.

APPLICATIONS FOR EXTENSION OF PATENTS.

SPRING PLATFORM FOR RAILROAD CARS.—Charles H. Lewis, of Malden Mass., has petitioned for an extension of the above patent. Day of hearing March 9, 1870.

WATER METER.—Andrew J. Sweeney, Boston, Mass., has petitioned for an extension of the above patent. Day of hearing March 9, 1870.

PREPARING PHOSPHORIC ACID AS A SUBSTITUTE FOR OTHER SOLID ACIDS.—E. N. Horsford, Cambridge, Mass., has petitioned for the extension of the above patent. Day of hearing, April 6, 1870.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING JAN. 4, 1870.

Reported Officially for the Scientific American

SCHEDULE OF PATENT OFFICE FEES:

On each caveat	$10
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Full information, as to price of drawings, in each case, may be had by addressing
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Patent Solicitors, No. 37 *Park Row, New York*

98,460.—ASPHALT PAVEMENT.—Carl P. Alsing, New York city.

98,461.—MACHINE FOR MAKING NETS.—Benj. Arnold, East Greenwich, R. I.

98,462.—GAS MACHINE.—S. R. Ball, Hyde Park, Ill.

98,463.—CHILD'S CHAIR AND TABLE.—P. G. Beckley, Newark, N. J. Antedated December 22, 1869.

98,464.—WATER INDICATOR FOR STEAM GENERATORS.—W. G. Bell, Pittsburgh, Pa. Antedated Dec. 30, 1869.

98,465.—EXTENSION TABLE.—William John Boda, Dayton, Ohio.

98,466.—COMPOSITION FOR DYEING AND COLORING LEATHER, HIDES, AND SKINS.—Charles Bond, New York city.

98,467.—CATTLE STANCHION.—N. W. Boody, Westbrook, Me.

98,468.—COACH LAMP BRACKET.—Thos. Boudren, Bridgeport, Conn.

98,469.—CHANDELIER.—Thomas Buckley, New York city.

98,470.—DRYER.—A. W. Cox and Wm. Gause, Indianapolis, Ind.

98,471.—CULTIVATOR.—B. S. Cox, Paulsborough, N. J Antedated Dec. 22, 1869.

98,472.—SWITCH STAND FOR RAILWAYS.—N. N. Dale, Plymouth, Ind.

98,473.—CARRIAGE AXLE.—David Dalzell, South Egremont, Mass.

98,474.—ICE SLED.—Levi Darozir (assignor to himself and N. Nalette, Worcester, Mass.

98,475.—SPOKE SHAVE.—Joshua Davies, Muskegon, Mich.

98,476.—GARMENT HANGER AND SIZE TICKET HOLDER COMBINED.—Isaac Desky and T. A. Jennings, Seneca Falls, N.Y. Antedated Dec. 24, 1869.

98,477.—ASH SIFTER, LEACH, AND SMOKE HOUSE.—D. W. Doan, Rochester, N. Y.

98,478.—AUTOMATIC VACCINATING INSTRUMENT.—Chas. H. Eccleston, Oxford, N. Y. Antedated Dec. 24, 1869.

98,479.—PAPER CLIPS.—G. W. Emerson, Chicago, Ill.

98,480.—CAST-IRON PAVEMENT.—Alonzo Farar, Longwood, Mass.

98,481.—SPRINKLING POT.—Warren L. Fish, Springfield, Mass.

98,482.—ROTARY PUMP.—J. T. Foster, New York city.

98,483.—STERRING PROPELLER.—F. G. Fowler, Norwalk, Conn.

98,484.—LAMP CHIMNEY.—S. W. Fowler, Brooklyn, N. Y.

98,485.—COVER FOR SEWING MACHINE.—E. F. French, New York city.

98,486.—HAY SPREADER.—C. R. Frink, Norwich, N. Y.

98,487.—MANURE DRAG.—Wm. Geahr (assignor to himself and George Duchman), East Earl township, Pa.

98,488.—GUARD FOR CARRIAGE STEPS.—R. H. Goodwin, Boston, and G. L. Gamage, Lynn, Mass., and R. J. P. Goodwin, Manchester, N. H.

98,489.—BURGLAR ALARM.—Hiram Green, Norwalk, Conn.

98,490.—SECTIONAL STEAM GENERATOR.—John Griffith, G. W Wundram, and T. M. Muller, New York city.

98,491.—MACHINE FOR MAKING ROPE.—B. S. Hale and J. B. Hale, Lowell, Mass.

98,492.—REIN HOLDER.—Jones Harding, Detroit, Mich.

98,493.—MODE OF SECURING LASH IN FLY NET.—Moses Hellman, Lebanon, Pa.

98,494.—BOLT WORK AND DOORS FOR SAFES.—J. C. Hintz, Cincinnati, Ohio, assignor to Charles Diebold and Jacob Rienzle.

98,495.—BRICK MACHINE.—J. S. Hobbs and L. R. Elder West Falmouth, Maine.

98,496.—FURNACE FOR DEOXIDIZING IRON ORE.—Abram W Honsinger, Rome, N. Y.

98,497.—DRILLING, RIVETING, AND WATCH JEWELING APPARATUS.—C. Hopkins, Philadelphia, Pa. Antedated December 30, 1869.

98,498.—ARRANGEMENT OF THE PENDULUM IN CALENDAR CLOCKS.—H. B. Horton (assignor to himself and Hervy Platts), Ithaca, N. Y.

98,499.—THILL COUPLING.—Bennet Hotchkiss, Fair Haven, assignor to himself and W. J. Clark & Co., Southington, Conn.

98,500.—KNITTING MACHINE.—Henry A. House, Bridgeport, Conn.

98,501.—LEAD PIPE COUPLING.—Jacob Hoyt, New York city. assignor to J. O. Morse, Englewood, N. J.

98,502.—BOX FOR COFFEE, SPICES, ETC.—H. W. Hutchins, Livermore Falls, Me.

98,503.—SAND CHAMBER FOR WELL PUMPS.—E. C. Johnson, Williamsport, Pa. Antedated Dec. 21, 1869.

98,504.—GAGE AND DIVIDER.—George Kenny, Nashua, N. H.
98,505.—SPIRAL SPRING FOR MATTRESSES AND FURNITURE.—S. P. Kittle, Brooklyn, N. Y.
98,506.—CASKET HANDLE.—Dennis Leonard, Winsted, Conn.
98,507.—CARD CLOTHING CLAMP.—J. O. Lewis, Worcester, Mass.
98,508.—CURTAIN FIXTURE.—John S. Lovejoy, Washington, D. C.
98,509.—TEA-KETTLE COVER.—Wm. C. Lovering, Taunton, Mass.
98,510.—STOP VALVE.—J. A. Marden (assignor to G. M. Gibson, and T. A. Johnston), Boston, Mass.
98,511.—CRUET.—T. H. Mead, Boston, Mass.
98,512.—MACHINE FOR ATTACHING RIVETS TO BUTTONS.—J. J. Merveap, New York city.
98,513.—INDICATOR LOCK.—E. M. Mix and J. E. Mix, Westfield, N. Y. Antedated July 27, 1869.
98,514.—LEATHER FASTENING FOR HARNESS.—T. G. Moore, Albia, Iowa.
98,415.—WRENCH.—Robert Morrison, New York city.
98,516.—IRON CORE FOR CASTINGS.—A. C. Mott, Philadelphia, Pa.
98,517.—MANUFACTURE OF ARTIFICIAL STONE.—J. M. Ordway (assignor to Sewell Brackett), Jamaica Plains, Mass. Antedated Dec. 18, 1869.
98,518.—COLLECTING GOLD FROM ORES.—A. F. W. Partz, Oakland, Cal.
98,519.—TILE MACHINE.—J. W. Penfield, Willoughby, Ohio.
98,520.—BED BOTTOM.—James Potter, Portland, Me.
98,521.—SHIRT SLEEVE.—W. A. Ramsay, Philadelphia, Pa.
98,522.—COMPOSITION FOR CONCRETE PAVEMENTS.—E. W. Ranny, New York city.
98,523.—PERMUTATION LOCK.—J. P. Schmucker (assignor to himself and J. D. Willis), Ashland, Ohio.
98,524.—STEAM TRAP.—W. A. Schneider, Albany, N. Y.
98,525.—WASHING MACHINE.—Jerome Scott, Charleston, Pa.
98,526.—METALLIC CAN BOTTOM.—H. W. Shepard, Mannsville, N. Y.
98,527.—BAG-STRING FASTENER.—E. B. Southwick, Mendon, Mich.
98,528.—HEAD-BLOCK FOR SAW MILLS.—A. W. Thompson, Saginaw, Mich., for himself, and as administrator of the estate of Henry Thompson, deceased.
98,529.—CARTRIDGE-LOADING APPARATUS.—F. A. Thuer (assignor to "The Colt's Patent Fire-Arms Manufacturing Company,") Hartford, Conn. Patented in England, April 9, 1869.
98,530.—SLEIGH SHOE.—T. B. Titus, Phelps, N. Y.
98,531.—HARROW.—Merrit Vanbibber, Tipton, Ind.
98,532.—STOP FOR CURTAIN ROLLERS.—Rudolph Wangeman, Chicago, Ill.
98,533.—EGG BEATER.—Lewis Williams, Terrysville, Conn.
98,534.—FIX FOR BOILING AND PUDDLING FURNACES.—J. D. Williams, Allegheny, Pa.
98,535.—MEDICAL COMPOUND.—A. D. Willis, Crawfordsville, Ind.
98,536.—PERMUTATION LOCK.—S. N. Brooks, Bernardston, Mass., administrator of Linus Yale, Jr., deceased.
98,537.—METHOD OF MANUFACTURING A FAGOT FOR STEEL-HEADED RAILS.—John Absterdam, New York city.
98,538.—CARRIAGE CURTAIN FASTENING.—James Adams, Newark, Del.
98,539.—MOLE TRAP.—W. C. Akers, Petersburg, Va.
98,540.—VULCANIZED INDIA-RUBBER CAR SPRINGS.—H. A. Alden, Matteawan, N. Y.
98,541.—LUMBER DRYER.—Joseph Allonas (assignor to C. Aultman and H. H. Taylor), Mansfield, Ohio.
98,542.—COMBINED SEEDER AND CULTIVATOR.—Clark Alvord, Westford, Wis.
98,543.—AXLE-BOX FOR CARRIAGE.—A. G. Baker and G. M. Ennis New Bedford, Mass.
98,544.—BEEHIVE.—S. D. Barber and James Wolf (assignors to said Barber and Hiram Cox), Mattoon, Ill.
98,545.—LOCK.—Ludwig Beer, New York city.
98,546.—RAILWAY RAIL CHAIR.—T. G. Bering, Harrisburg, Pa.
98,547.—BRICK MACHINE.—Thos. Bishop and Daniel Agnew, Vincennes, Ind.
98,548.—WEATHER STRIP.—J. T. Bliss and J. D. Davenport, North Providence, R. I.
98,549.—MECHANISM FOR STOPPING THE DELIVERY-ROLLERS OF SPINNING MACHINES.—Henry Bottomley and Peter Greenwood, Camden, N. J.
98,550.—MACHINE FOR CUTTING AND PRESSING THE HEADS OF METAL CANS.—Reuben Brady, New York city.
98,551.—RAZOR HONING MACHINE.—William Brown, Thomaston, Conn.
98,552.—WATER-WHEEL.—J. D. Bryson and W. R. Dunlap, Newcastle, Pa.
98,553.—BAG HOLDER.—J. M. Burke, Dansville, N. Y.
98,554.—MEDICAL COMPOUND.—W. R. Call and T. F. Griffin, Gloucester, Mass.
98,555.—VENTILATING MILLSTONE.—Constant Cerisier, Munigsur-Loire, France.
98,556.—WASHING MACHINE.—George E. Chamberlin, New York city.
98,557.—RAKE ATTACHMENT FOR REAPER.—M. C. Chamberlin and A. Clawson, Plainview, Minn.
98,558.—SAW MILL.—Thomas E. Chandler and John C. Bartholomew (assignors to Thomas E. Chandler and Franklin Taylor), Indianapolis, Ind.
98,559.—SCAFFOLD BRACKET.—James Chattin, Marion, Iowa.
98,560.—CULTIVATOR.—A. L. Chubb, Grand Rapids, Mich.
98,561.—WATER WHEEL.—F. O. Clarke, Unadilla Forks, N. Y.
98,562.—BIRD CAGE.—G. F. J. Colburn, Newark, N. J.
98,563.—DRAFT ATTACHMENT FOR HORSES.—Cyrus C. Cole, Phelps, N. Y.
98,564.—SHOULDER BRACE.—Henry N. Conklin, Indianapolis, Ind.
98,565.—HOMINY MILL.—William C. Coombs and James M. Gray, Memphis, Ind.
98,566.—CLOTHES WRINGER.—Wm. Cooper, Independence, Iowa.
98,567.—JOINT MOLD OR FLASK.—William Culliss, Philadelphia, Pa.
98,568.—SAWING MACHINE.—Jacob D. Culver, Bellmore, Ind.
98,569.—PLOWING AND HARROWING MACHINE.—Arthur Cunningham, Cincinnati, Ohio.
98,570.—GUARD FOR MACHINE FOR PICKING WASTE.—Charles J. Dean (assignor to himself and Francis B. Ray), Franklin, Mass.
98,571.—CONSTRUCTION OF CONCRETE ARCHES FOR BUILDINGS, ETC.—Charles Colton Dennett, Nottingham, England. Patented in England, August 15, 1863.
98,572.—BUCKLE.—Noah Dice, Xenia, Ind.
98,573.—FARM GATE.—John Dickason, Vevay, and George W. D. Culp, More's Hill, Ind., assignor to John Dickason.
98,574.—CLAMP FOR HOLDING STAVES.—Edmund Doremus, Rossdeal, N. Y.
98,575.—PRUNING HOOK.—William M. Doty, Woodbridge, N. J.
98,576.—BREAD AND MEAT SLICER.—Jacob Ensinger and Lewis Fertig, Dauphin, Pa.
98,577.—LOCK.—Edward Fay, Washington, D. C.
98,578.—WOODEN PAIL.—Leonard Asa Fleming, West Mount Vernon, N. Y.
98,579.—BREECH-LOADING FIRE-ARM.—George H. Fox, Boston, Mass.
98,580.—COAL STOVE.—H. J. Frizelle, East Saginaw, Mich.
98,581.—HAY RAKE AND LOADER.—Nelson Gabel, Minneapolis, Kansas.
98,582.—STOVE PIPE SHELF.—John H. Gerhart and Joseph S. McFord, Middletown, Pa.
98,583.—AUTOMATIC COAL SIFTER.—William Gluck, Baltimore, Md.
98,584.—CANT HOOK.—W. Q. Greely, St. Anthony, Minn.
98,585.—WASHING APPARATUS.—John T. Grose (assignor to himself and Wm. E. Kinnear), Upper Sandusky, Ohio.
98,586.—FRUIT JAR.—Wm. L. Haller, Philadelphia, Pa.
98,587.—GYMNASTIC APPARATUS.—William Hanlon, New York city, assignor to himself and George, Alfred, Frederick, and Edward Hanlon.
98,588.—GYMNASTIC APPARATUS.—William Hanlon, New York city, assignor to himself and George, Alfred, Frederick, and Edward Hanlon.
98,589.—LOUNGE AND BED.—August Hansen, San Francisco, Cal.
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REISSUES.

89,004.—LAWN MOWER.—Dated April 20, 1869; reissue 3,784.—Samuel Colt, Hartford, Conn., assignee of Joseph Arseiter.
31,578.—PAPER-FOLDING MACHINE.—Dated Feb. 26, 1861; reissue 3,785. Division A.—S. C. Forsaith, Manchester, N. H., assignee, by mesne assignments, of W. H. Milliken and John Milliken.
31,578.—COMBINING PAPER-FOLDING MACHINES WITH PRINTING PRESSES.—Dated February 26, 1861; reissue 3,786. Division B.—S. C. Forsaith, Manchester, N. H., assignee, by mesne assignments, of W. H. Milliken and John Milliken.
33,006.—MANUFACTURE OF BAR IRON.—Dated Aug. 6, 1861; reissue 3,787.—W. H. Perry, Sharon, Pa.

DESIGN.

3,810.—RUBBER ERASER.—W. N. Bartholomew (assignor to J. Beckendorfer), Newton Centre, Mass.

Inventions Patented in England by Americans.

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

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3,533.—HARNESS.—D. Waldhauer, New York city. December 4, 1869.
3,545.—SCREW PROPELLER.—M. Kolb, New York city. December 8, 1869.
3,549.—WORKING OF GLASS.—T. Hyatt, Atchison, Kansas. December 8, 1869.
3,562.—VISE.—J. Simpson, Cleveland, Ohio. December 9, 1869.
3,564.—FIRE-RESISTING SAFE, ETC.—J. P. Gray, —, Mass. December 9, 1869.
3,597.—PRESERVING DEAD BODIES.—G. W. Scollay, St. Louis, Mo. Dec. 11, 1869.

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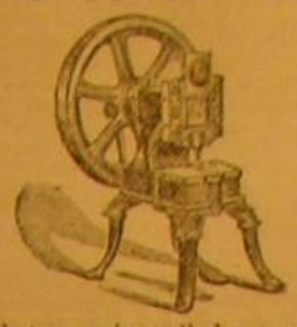
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From the San Francisco Times, Oct. 27.

The case of Nathan W. Spaulding *vs.* William Tucker has been on trial in the Circuit Court, before Judge Deady and a jury, during the past week. The suit was for the infringement, by the defendant, of a patent granted to plaintiff in 1863, for an improved method of inserting teeth in saws. The subject of the patent is the form of the socket in which the teeth are inserted, and the invention consists in rounding the bottom of the socket, so as to exclude angular corners so as to leave the plate stronger—that is, more secure against cracking from the socket. It seems that, prior to the plaintiff's invention, the universal method had been to make the sockets rectangular, which allowed the strain to be concentrated at a single point in the angle of the socket. The result was, that in case of any special resistance or obstruction, like iron, stone, or even hard knots, the plate was liable to crack, and did frequently crack at the corner of the socket.

The plaintiff's device seems to have obviated this objection to inserting teeth in the most effective manner, and this style of saw has since become the universal favorite.

The defendant, who is acting as agent of the American Saw Company of New York, has been selling saws in this city for something over a year past, having inserted teeth, and, as the plaintiff claims, of such likeness to his as to infringe his patent. This the defendant denies, and sets up the further defense that the plaintiff was not the first inventor of the device.

The whole subject was thoroughly discussed by counsel, the Court, and many experts. The case involved many intricate questions of law, and is evidently deemed by inventors and mechanics an important one, a large attendance of whom it attracted.

The jury returned a verdict for the plaintiff, and assessed the damages against defendants.

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