SCIENTIFIC AMERICAN

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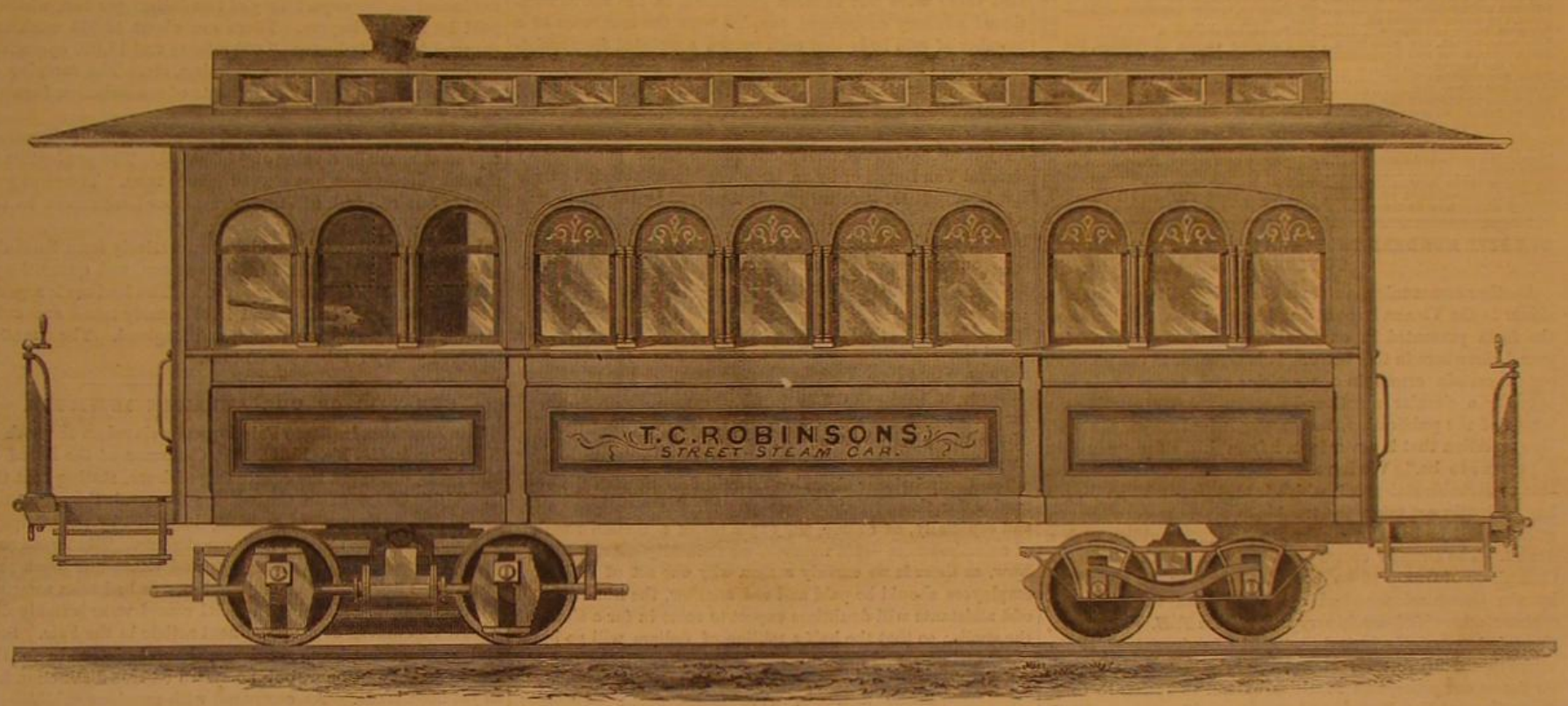
IMPROVED STEAM STREET CARS.

The long continuance of the pestilence which has made such sad havoc among the horses has demonstrated conclusively that inventions are needed for public conveyances, by the use of which we may become independent of equine labor. Among the difficulties, to be overcome in the application of steam to street car traction, is the propulsion of the vehicle around the sharp curves necessarily incident to the narrow streets of large cities; it is more particularly this obstacle which is claimed to be surmounted by the peculiar arrangement of machinery in the device herewith illustrated.

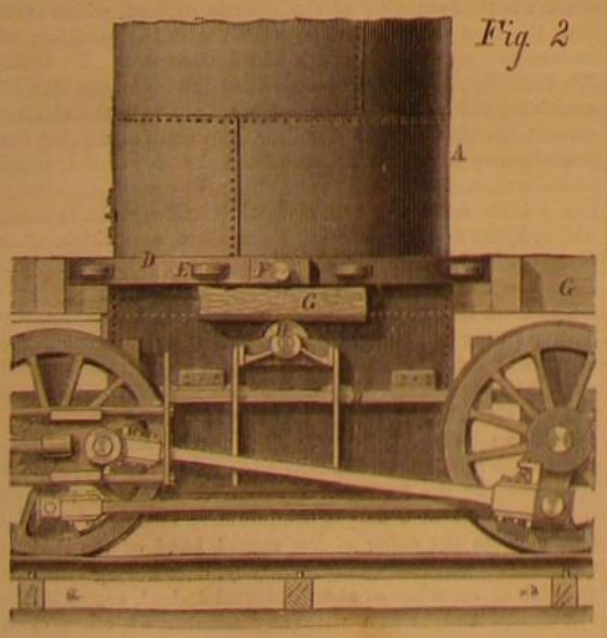


ROBINSON'S IMPROVED STEAM STREET CAR.

Briefly, the invention consists in making the boiler act as a transient bolt and, with the engine, to turn with the truck as the latter adapts itself to bends of the rails, so that the power is always applied in the most effective manner.

Fig. 1 shows a general view of the completed car, and by referring to the elevation and horizontal plan, Figs. 2 and 3, the following detailed description will be readily understood: A is the upright boiler, constructed so as to have a large heating surface, resting on and firmly secured to the truck frame, B. Above the lower portion of the boiler, and above the fire box, is affixed an inner transient ring, C, shown more

Fig. 2



clearly in Fig. 3. D is the outer transient ring in which are placed eight metallic cylindrical rollers, E E, held with their axes vertical. These project beyond the inner surface of the ring, D, and impinge upon the inner transient ring, C, so as to admit of the rotation of the former around the latter. Two trunnions, F F, on either side serve to support the ring, D, and at the same time allow it to freely oscillate in the bearings on the car frame, G. H, Fig. 2, is one of the ordinary car rolls, secured to the truck frame and sustaining the car frame, the latter being reinforced at the points of contact by a metal wear plate. The steam cylinder is not shown, but the piston rod is seen at the left of the engraving, communicating, by means of the crosshead in the guides, with the connecting rod which, with the parallel rod, actuates the driving wheels in the usual manner. It is clear from the above that the truck, and with it the boiler and engine, can freely turn, with the friction rollers of the outer transient ring, while the trunnions, F F, permit of the adaptation of the machinery to any angle of grade.

In Fig. 1, a somewhat different form of engine is exhibited, designed to present fewer working parts, and consequently to be less costly. The horizontal cylinders are placed almost centrally between the driving wheels, their piston rods connecting with the la ter directly by mean s of the slotted guide pieces. The driving wheels communicate with the guide pieces by their crank pins, which are receivd and work in the longitudinal slots. At the rear of the supporting frame is placed a condensing apparatus, which is used in connection with the engine.

The cars may be constructed of any dimensions to accommodate a required number of passengers. The advantages claimed are simplicity, compactness, strength, utility, and cheapness. Hard coal, it is stated, may be used as fuel at an expense of one third less than that of employing horses.

We are informed that the invention has been in successful operation on the Portland and Gorham Railroad for some time past. It is covered by three distinct patents. Further information may be obtained by addressing T. C. Robinson, & Co., care of the Sanborn Machine Company, No. 78 Duane street, New York city.

The Metropolitan Museum of Art.

There at last is a fair prospect of the permanent establishment in this city of a museum similar to the South Kensington museum in London: a collection of works of art, original and copies, free to the study and inspection of the public. A site for the building has been obtained, on the corner of 79th street and Fifth avenue. In addition to the fine paintings which have been placed in the present temporary gallery, duplicates of the best specimens of the splendid collection in the above mentioned English museum are to be added. We also learn that the celebrated collection of antiquities made by General Di Cesnola, our late consul at Cyprus, has been purchased. It is believed that these Phœnician relics are the first that have been discovered of that early maritime people, and the various specimens will materially aid specialists and antiquaries in furnishing clearer pictures of Eastern life and manners, three thousand years ago.

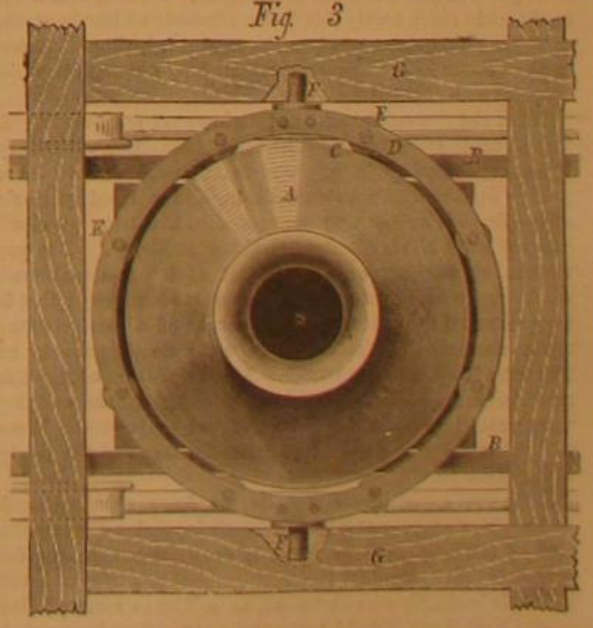
A central building will first be erected, to which additions will be made as they are required. In the main part there will be four galleries, each ninety-five feet long and lighted from above. The ground floor will be an open court, surrounded by gardens and fountains and affording ample room for the statuary vases and monuments.

We note with much pleasure the enterprise with which this plan has been advanced Museums such as this go far toward the education of popular taste, besides affording to artists and all workers in decorative art the most faultless models for imitation.

How to Clear Muddy Water.

Experiments have been made in Australia with the view of finding means of clearing the muddy waters of reservoirs. The purest waters are, as a rule, those in which mud and organic matter remain longest in suspension. Water stood in a bottle in the laboratory for more than six months without depositing the clay held in suspension. The soluble matter was chiefly chloride and carbonate of sodium, and was present in only small quantity. Another water stood for three months with like results. Both waters contained more clayey than organic matter, and were rendered clear by an addition of chloride of calcium. One part of this salt in 1,000 of water cleared it in less than an hour; 1 part in 2,500 of water, in five hours; 1 part in 5,000, in six hours; 1 part in 10,000, in twenty-four hours. When, however, the water contained more organic matter than inorganic or clayey matter in suspension, the calcium salt did not act so readily, but was aided by an addition of lime; as little as two grains of quick lime cleared a gallon of water in twelve hours. Three or four

Fig. 3



grains of alum or chloride of aluminum answered the same purpose; but there are many objections to the use of alumina salts.

LOOK TO YOUR JOURNAL BOXES.—A block of grain warehouses, including a large elevator, were destroyed by fire in Brooklyn, N. Y., November 20 The fire is supposed to have been caused by the over-heating of a journal box from friction. Loss, half a million of dollars.

Scientific American.

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OUR FIVE HUNDRED THOUSAND DOLLAR COMMISSIONER TO VIENNA.

Another communication from the United States Commissioner to the Vienna Exposition, designed as a refutation of the facts presented in our editorial of last week, will be found elsewhere in this issue. It is devoted to the pointing out of certain errors in our article; and exception is first taken to a circular mentioned therein. After quoting the words of the publication, our correspondent makes the positive assertion that it never issued from his office "nor does it purport to be." We have but one comment to make upon this remarkable statement, which is that General Van Buren has evidently not taken the trouble to read the document in question; if he had, he could not with truth publish such a denial. The circular comes apparently from the Advisory Committee of Group 13—a body supposed to be appointed by the Commissioner—and concludes with these words: "Manufacturers of machinery *will address T. B. Van Buren, Commissioner of the United States, 51 Chambers street*, or the undersigned" (Professor Thurston, of the Stevens Institute). So far as our perceptive faculties extend this *seems* to come from General Van Buren; and even were his name omitted, the fact of Professor Thurston—who, by the way, is to be addressed only in the alternative—being his agent renders the Commissioner legally responsible for such official emanations.

"In all my statements upon the subject," our correspondent continues, "I have endeavored to give a careful and true account of what has been done," etc. Then we must sympathize with the General in the unfortunate failure of his well-meant efforts in this direction. In the sentence immediately preceding the words above quoted, he makes, innocently we are sure, assertions which are wholly without foundation, and on which he further enlarges in the succeeding paragraphs of his letter. We are informed: First, that the Austrian government has made concessions. Second, that a valuable trade mark treaty has been effected, which is strong evidence of Austrian good will. And third, that exhibitors in the Vienna Exposition are protected by a certificate which operates as a full patent.

What the "concessions" are we have yet to discover. As for the trade mark treaty—which, in connection with everything else relating in any way to Austria, seems to be regarded by the Commissioner through rose-tinted spectacles of the deepest hue—being any proof of Austrian good will or affection for this country, is sheer nonsense. The provisions of our law on the subject of international trade marks make the matter one of simple reciprocity; that is, we guarantee to protect the trade marks of a foreign nation if that nation will in return engage to do the same by us. The offer is open to the world. Large numbers of Austrian manufacturers export goods to the United States, and they want protection here for their marks; consequently it was to Austria's direct *interest* to take advantage of the treaty, and she did so.

As to that exposition certificate, we have repeated again and again, and proved our assertions beyond all peradventure by the best evidence, that it does *not* ensure one *iota* more of security against the infringement or piracy of inventors. It is simply an enactment, as a Vienna correspondent of the New York *Herald* truly states, "to allow inventors to bring their inventions to the Exposition and exhibit them and take a patent under the old law before the 31st day of December," after the show is concluded. It is manifestly *not* a patent, nor can we see how any one can trace in it the remotest resemblance to such; it may be refused by the Director General to any inventor or exhibitor *without appeal;* and it merely places the limit of the time during which an invention may be introduced into Austria without being patented at one year. It does not modify the obnoxious laws, nor is it anything beyond a decoy to deceive persons who, like the Commissioner, are inexperienced in Austrian patent law practice. These facts seem perfectly self-evident, and we cannot understand by what course of logic General Van Buren expects to persuade himself or any one else endowed with reasoning faculties to the contrary.

Our correspondent remarks that the opposition of a portion of the press, which by the way includes three of the New York dailies beside ourselves, will postpone or prevent the success of his endeavors in Washington. We hasten to say that such is precisely our intention, just so long as he persists in manœuvring to obtain any such exorbitant sum as half a million of dollars, the greater portion of which, according to his own showing, will be needed to pay his expenses and those of his assistants in Vienna. Now, in regard to these assistants: General Van Buren flatly denies that he has sixty-five sub-commissioners, or whatever they may be termed, or even one fifth of that number. The General should not rely so implicitly upon his memory. We have before us a circular: date November 15, 1872: signature T. B. Van Buren: contents, a description of the importance of the Exposition and a list of an advisory committee (of which the Hon. S. B. Ruggles is Chairman) composed of *thirty* gentlemen. Thirty is more than one fifth of sixty-five. The last mentioned number, let us explain, we specified under the impression that there were but thirteen gentlemen in the above mentioned advisory committee, coupled with the assurance of a member of said body that each person appointed four assistants, which made up a sum total of sixty-five. Now, however, it appears there are twenty-eight advisers, not including the chairman and secretary; consequently, instead of there being sixty-five officials, there are now one hundred and forty-three. Was the above described circular published by General Van Buren or by an irresponsible somebody? Or is it a forgery? Or were we grossly deceived by the gentleman who informed us that the Commissioner not only appointed but requested him to serve on the advisory committee? Or does our correspondent now mean to repudiate the whole document, and with it the gentlemen therein named? After thus disposing of our "error," the General proceeds to observe that the few persons he has appointed are scattered about the large cities distributing programmes, etc. We were not aware that New York had lost so many of her prominent citizens, or that such gentlemen had undertaken agencies for the Vienna Exposition; for we recognize very nearly all of the thirty advisers as well known residents of the metropolis.

The Commissioner closes his communication with the suggestion for the government to pay all the bills generally, and especially, of course, the expenses of a certain number of commissioners—said number, we naturally infer, is thirty. Now, as there is no earthly reason why one set of volunteer employees should be paid and not another, the hundred and odd assistants will doubtless expect to come in for a share of the spoils; so that the half a million of dollars will go but a short distance, and the unfortunate exhibitors in the end bid fair to be of very secondary consideration.

ASTRONOMICAL NOTES.

Under this heading, we publish in another column a variety of interesting astronomical information furnished for our readers by Professsor Maria Mitchell, Astronomer of Vassar College. From these notes, it appears that the surface of the sun has for some time past exhibited the presence of large numbers of dark spots, the movement of which across the great luminary attracts the attention of observers. These spots may now be seen through an ordinary opera glass, care being taken of course to protect the eyes by the interposition of proper colored media.

The precise character of these sun spots is still unsettled. Although to the eye of man they appear as dark or black bodies, it is certain that they are in reality very luminous; but they are less luminous than the surrounding portions of the sun's surface, and hence they appear dark to the eye, just as the most brilliant gas light appears black when interposed between the eye and the sun. The prevailing opinion based upon the spectrum observation, is that the spots are composed of thick luminous masses or clouds of gases of various substances, among which are found iron, calcium, barium, magnesium, sodium, hydrogen, aqueous vapor. Some observers think the spots have a semi-fluid consistency, while Zöllner regards them as a kind of slag or scoria.

The positions and appearances of various heavenly bodies, to be seen on these clear winter evenings, as mentioned by our correspondent, will be read with general interest.

A REMARKABLE TEST PLATE.

One of the devices used by microscopists to test the correctness and power of their lenses consists of a glass plate, upon which lines of exceeding fineness are engraved by the diamond. For this purpose a small ruling machine is used, all the parts whereof must be made with unusual nicety. In Europe the test plates made by M. Nobert, of Prussia, have long been celebrated for the fineness of their ruling, and in this country those of Mr. L. M. Rutherford, of New York city. The expense of the best Nobert plates has been $100 each, and the finest rulings heretofore done have been 120,000 lines to the inch. There are few microscopists who have ever been able to see or resolve the lines of these plates owing to the difficulty of properly lighting the plate. Dr. Woodward, of the United States Army, is among those who have succeeded in doing so. He has not only seen them but has photographed the lines.

Professor F. A. P. Barnard, President of Columbia College, in this city, has lately received from Nobert a new test plate, ordered some two years ago, at an expense of $200, which surpasses in the fineness of its ruling anything heretofore produced. It is a slip of glass 3½ inches long and 1¼ inches broad, in the center of which the unassisted eye may discover what appears to be a mark perhaps the fiftieth of an inch in width. But when placed under the microscope this mark is found to be composed of a great number of parallel lines. The plate, in fact, contains twenty test bands, that is to say, twenty series of lines. Each series contains such a number of lines as will occupy or more than occupy the field of view of the microscope. The fineness of each band or series varies from a ratio of three thousand lines per square inch up to *two hundred and forty thousand* lines per square inch; this last band contains double the number of lines ever before ruled on a test plate. Nobert is said to have remarked, on sending this plate, that if the microscopist, on seeing these lines, found that they were not sufficiently fine, he would engage to rule a still finer plate. When Professor Barnard succeeds in seeing them, doubtless he will let us know.

ITALIAN INDUSTRIAL PROGRESS.

With the exception of 10,000 tuns of refined sulphur derived from the Roman mines, all of that material obtained from Italy comes from Sicily, and is exported in a crude state. The total value of the sulphur is nearly $5,200,000, not including the export duty of two dollars per tun, which is paid by foreign buyers. There are about 19,000 workmen engaged in this industry, 5,000 miners and 14,000 operatives employed in transportation, refining, etc. The carrying of the sulphur from the mines to ports of embarkation furnishes labor for 20,000 additional workmen.

The iron drawn from Italy and the articles made therefrom represent annually a value of $4,000,000. The production of the founderies does not exceed 22,000 tuns. The total product is but one fifth of the entire amount consumed in the country.

Lead and zinc are derived almost exclusively from Sardinia. Their extraction requires 10,000 workmen, and quantities to the value of $2,400,000 are produced. The lead ore is argentiferous but the silver is found in extremely small amounts. The zinc is exported to Belgium and England. The quantity obtained yearly reaches 60,000 tuns.

THE FAIR OF THE AMERICAN INSTITUTE.

The American Institute Fair formally closed on the 20th of November last. Mr. N. C. Ely, Chairman of the Board of Managers, delivered the concluding address, stating that the Exhibition had been on the whole successful, though at one period its receipts were seriously impaired by the stoppage of public travel through the horse disease. The usual congratulatory remarks to managers and exhibitors were pronounced, after which such premiums as had been awarded were published. Medals of special award were lavishly distributed on almost every prominent article in the Fair. Several recommendations, we learn, have been made for the Grand Medal of Honor, but no award of this distinction has as yet been made. As compared with previous exhibitions, the Fair has been fully up to the standard in the variety of entries and important inventions presented, though it was hardly expected that such would be the case, owing to the excitement of the late elections directing public attention into other channels.

As there still remain a few articles of merit to be noticed, most of which were recent additions to the Fair, we give brief descriptions of those which seemed to us most interesting.

ELECTRIC CLOCKS

were exhibited in various styles by Messrs. Himmer and Autenrieth, 371 Pearl street, New York. The chief obstacle which inventors of electric clocks have heretofore had to encounter is the inequality of the electric current, which even from the most constant battery varied with the condition of metals, temperature, strength of solutions, etc. To avoid this difficulty, Mr. Himmer conceived the ingenious idea of combining the constant action of a weight with the electric current, so that, in his own words, "in place of driving the pendulum by the direct action of the electric current, when passed over helices of wires and charged by magnetic attraction, a little weight, of not more than half a grain, is used, which, by its descent, drives the pendulum, and which, after every oscillation, is lifted up to its former position by the electromagnetic power of the battery."

The clock is in fact wound up after every oscillation, the battery lifting up the weight a distance of only some quarter of an inch. As the latter is very light, an extremely small electric power is wanted to accomplish this labor For this purpose Mr. Himmer has invented the constant battery described in a recent number of this journal. Another advantage of the application of electricity to clocks is the possibility of moving the hands of any number of clocks through the oscillations of a single pendulum. This is effected by attaching, to the arbor of the second hand of the clock, a notched cam or break circuit, whereby, once during every revolution of the arbor or at any interval desired, connection is established and broken with any number of other clock works.

THE WOODBURY BRUSH MACHINE,

one of the most remarkable and ingenious inventions that has ever come under our notice, has been exhibited in actual operation. This device was fully explained in a recent number of our journal; its operation consists in inserting the the bristles in solid brush backs in such a way that it is impossible to remove them. During the tests made before the judges, the machine made tooth brushes and coarse scrubbing brushes with equal facility, placing the bristles in ebony,

ivory, and wood with wonderful accuracy. It received the highest praises in the official report of the experiments, and well merits, if it does not receive, the best award in the gift of the Institute.

THE CHAMPION SPRING MATTRESS,

manufactured by Messrs. F. C. Beach & Co., 141 Duane street, New York, deserves notice as one of the best of the many entered for exhibition. It is composed wholly of metal, no wooden slats or frames being used. It is therefore very durable. Helical steel springs are used, so connected as to make a perfectly elastic soft and level bed. This mattress is remarkably light, its largest size weighing but twenty-five pounds, and it rolls up like a blanket, is easily moved and transported. Just the thing for housekeepers. The springs are inlaid with a waterproof fire enamel so that the bed is serviceable in any climate.

THE SAWYER PLAITING MACHINE

will doubtless prove a valuable invention to manufacturers of shirts and similar garments made with numerous plaits. The device consists of two cylinders, in the lower one of which a heated iron bar is placed. As the cloth is passed between, a sharp steel blade is caused to rise and form a plait or fold of any desired width, which is smoothed perfectly flat by the action of the rollers.

THE AMERICAN WOOD PANELING MACHINE

is a novelty that cuts panels in hard or soft wood with remarkable accuracy. The board to be operated upon is placed on a table, which is so arranged as to be easily movable in any direction. On the plank, by a simple means of adjustment, are attached pieces which give shape to the panel and which guide the cutting instrument. The latter works vertically and its operating blade resembles an auger point, only constructed somewhat on the principle of solid cutters for sash molding; so that, when caused to revolve and pressed down upon the board, which is moved under it, it cuts a molded groove. By allowing the instrument to remove certain portions of the wood, either a raised or a sunk panel may be made, leaving nothing further to be done beyond smoothing the work by hand in the ordinary manner.

NEW PLAN FOR A LOCAL FIRE DEPARTMENT.

The town of Easthampton, Mass., has an excellent plan for a local fire department, which may be advantageously copied by communities who cannot raise funds sufficient to introduce regular water works, or do not desire to maintain steam fire engines in connection with a reservoir. In the above mentioned town, the Valley Machine Company, there doing business, are building a large bucket plunger steam pump with a capacity for discharging 500 gallons per minute, from which pipes have been laid through the streets, connecting with hydrants placed at suitable distances apart. These pipes are always kept full of water by means of a small auxiliary pump, and in addition to their fire purpose serve to supply the hotel of the place. The large pump, which, we may here add, was invented and patented by William Wright, for many years master mechanic in the Woodruff & Beach Iron Works at Hartford, Conn., is to be connected with a boiler in one of the manufacturing establishments of the town, where steam is always kept up, so that a stream of water can be obtained in a moment, in case of fire, by merely coupling the hose to a hydrant.

The citizens of Easthampton, in lieu of devoting a large sum yearly to the maintenance of a fire department, in addition to defraying the expense of the above described machine, set aside an amount annually for the extension of the pipes, so that each year a broader area is protected.

SCIENTIFIC AND MECHANICAL POSSIBILITIES.

Gas wells in various localities indicate that immense deposits of coal oil and petroleum exist in the earth, which may be at great depths; and New England may yet count it among her treasures, and large and enduring deposits, which few now dream of, be found. We may burn it for fuel as well as for illumination; by its use steam boats may cross the ocean, and locomotives fly by its aid. We are just beginning to learn the power of this new servant that man has awakened from the sleep of ages. The country also abounds in limestone, sandstone and bituminous shales, which, by scientific and mechanical aid, may afford an almost never ending supply of this wonderful material.

And notwithstanding the seemingly advanced state of the means of transportation, it is inadequate to the present wants of man. Steamboats and railroads do not even meet the wants of our own country. New England and the Middle States want Western and Southern products; and, *vice versâ*, the West and South want Eastern products at cheaper rates. Can the possibility of aerial navigation be doubted? Every year is bringing us nearer to the practical solution of this great problem.

If a light motive power is required, science may yet discover a cheap method of separating aluminum from our clay, some of which contains as much as 30 lbs. of this most wonderful material to the tun. This metal is three times stronger than steel and as light as chalk. On the very surface of the earth, we daily walk over a material from which the machinery for a motive power may be constructed of about one tenth the weight of iron or steel. In the oxygen of the atmosphere is abundant fuel which may yet be used to rarify the air for a motive power; other powers also exist in Nature, which will, no doubt, yet become the servants of man. One discovery opens vast and expansive avenues, leading to unexplored regions where munificent creative Nature hold in store rich treasures which the scientific hand may drag from her dark *arcana*.

He who engages his mind, his time, or his fortune in the development of scientific means for bringing forth from Nature's rich stores that which will add to the enjoyment, happiness and comfort of man is entitled to the greatest honors that can possibly be bestowed by an appreciative world. J. E. E.

REMARKABLE MAGNETIC STORMS AND AURORAS IN EUROPE.

On October 14 and 15 last, a brilliant aurora borealis was observed in Paris. At Brest, at 10h. 34m. on the evening of the 14th, the magnetic storm burst. M. Sureau, who was at the time closely watching the needle of the galvanometer, which was gently oscillating between 2 and 3 degrees, saw it leap suddenly to 25 degrees. All the working apparatus was suddenly attacked, and all the sounding machinery instantly set in motion, making a deafening noise, while the electro-magnets were strongly excited. It was also remarked that the currents acting on the telegraphic wires of Brest were directed from west to east. During October 16, 17 and 18, the disturbances in the telegraphs became general throughout France and probably through the greater part of Europe. The telegraphic service in France was thrown into complete disorder, necessitating the forwarding of the telegrams for Italy through the mails. These perturbations, which lasted three days, were, says *Les Mondes*, of a totally different character from those of the 14th and 15th of the same month. They were nothing more than instantaneous contacts, derangements analogous to those produced by mixing the wires; there were no longer the prolonged contacts and well defined waves which accompanied the polar auroras.

With the disturbances throughout nearly the whole of Europe appeared violent storms with thunder and lightning, which, in connection with a great barometric depression in Spain and in the southwestern portions of the continent, together with an exceptionally chilly temperature, have been remarked as extraordinary cosmic phenomena.

STEAM TRACTION.

Professor R. W. Thurston, of the Stevens Institute, delivered recently an interesting address before the Polytechnic branch of the American Institute. He showed conclusively that for heavy truckage on common roads and streets, the steam traction engine may be used with an economy of seventy-five per cent over the cost of employing horses. In other words, steam carts can be employed at only one fourth of the present expense of horse carts. During the subsequent conversation, the subject of steam street cars and carts was talked over, and one of the members expressed the opinion that the reason why horses were frightened at the steamers was because the animals were superstitious. They saw the machines were without horses, and instantly assumed that the movement was the work of the devil.

SCIENTIFIC AND PRACTICAL INFORMATION.

THE ELLIS VAPOR ENGINE.

A correspondent signing himself "Diameter," takes exception to a sentence in the letter signed J. A. H. E., on page 244 of our current volume, in which the writer says: "The theory that heat is converted into power in an engine, and thereby used up and lost, does not prove true in practice, as the experiments of Mr. Ellis fully show." J. A. H. E.'s pen must have slipped a little here. The Ellis engine is intended to save some of the heat that would otherwise be wasted. The difference of pressure—that is, of the heat—between the steam in the first cylinder and the bisulphide vapor in the second is a measure of the work done in the first cylinder, and the abstracted heat is converted into work. But as long as any heat remains in the vapor, more work can be obtained from it; and when all the heat is gone, no more work can be obtained. There is nothing in the Ellis engine to combat the theory of the convertibility of forces, and we do not think J. A. H. E. would maintain that there is.

DRYING AND COLORING NATURAL FLOWERS.

When blue or violet flowers are exposed to the smoke of a lighted pipe or cigar, a very surprising change of color takes place, the flowers becoming a magnificent green resembling Schweinfurt green, without any injury being done to the form of the flowers; and the deeper the original color, the darker is the green. Candy tuft (*Iberis umbellata*) and night violet (*Hesperis matronalis*) take an especially beautiful color. This phenomenon is caused by the small quantity of ammonia present in tobacco smoke, which converts blue and violet into green in the same manner as solutions of the alkalies do. The smoke blown from the mouth will not produce the same effect, because the ammonia is absorbed by the saliva of the mouth. Unfortunately this beautiful appearance does not last long; the flowers which have been exposed to the slightly increased temperature of the burning cigar wilt and become of a dirty yellowish brown color. The experiment is much more satisfactory when weak ammoniacal gas is used. To do this, insert the flower in the tube of a glass funnel in such a manner that the rim of the funnel projects an inch above the flower. A few drops of ammonia are dropped on a plate, and the funnel containing the flower is inverted over it; in a few minutes the most beautiful change of color takes place. Nearly all blue, violet, and light carmine flowers are changed to a magnificent Schweinfurt green. Dark carmine red pinks are colored black, the carmine flowers of *Lichnis coronata* become dark violet, while all white flowers turn sulphur-yellow. Variegated flowers show the most striking changes of color, the white petals turning yellow, and the red petals on the same flowers, green. If red fuchsias with white calices are treated with ammonia, the calix becomes yellow, and the red part, green and blue. After the change of color has taken place, put the flowers at once into fresh water, and they will retain their beautiful colors from two to four hours, according to the amount of ammonia taken up. Gradually, however, their former colors return, the green leaves passing through blue to the original color, without wilting. Lovers of flowers can in this way produce, as it were by magic, a *flora* which does not exist in Nature.

If the ammonia be allowed to act on the flowers for one or two hours, they acquire a permanent dirty chamois color, without wilting or losing shape, even when dried. Asters, which have no odor, acquire a sweet aromatic odor as soon as saturated with ammonia.

To give blue, violet, or red asters a beautiful red color, so that they can be dried to be used in winter for wreaths, it has heretofore been customary to immerse them in, or sprinkle them with, dilute nitric acid. This method did not produce very perfect flowers, because the wax in the petals of the flower prevented the acid attacking them equally. This produces irregularity in color, and when dry the form of the flower is also irregular, so that many of them are wasted, being unfit for use. These disadvantages are overcome by using hydrochloric acid vapors. Any wooden box can be used for the purpose. The box should first be provided with strings on which to hang the asters, and a piece of glass inserted on opposite sides of the box to watch the change of color. Then suspend the asters by pairs or double pairs, with the stems tied together, and in such a manner that the flowers hang down. On the bottom of the box are placed one or two plates of ordinary hydrochloric acid, according to the size of the box and number of flowers, and the box is closed. Small flowers are evenly colored in two hours, larger ones require four to six hours exposure to the acid. Red and blue asters become carmine red without injury to their form. It is necessary to examine the box from time to time, and to remove the flowers as soon as the change of color is completed.

After being removed from the box, the flowers are suspended in a similar manner in an airy but shaded room to dry. When dry, they are preserved in a dark dry place.

PURIFICATION OF DRINKING WATER.

Some time in 1871, Dr. Bischoff, Jr., took out an English patent for removing organic matter from drinking water by using a filter of spongy iron prepared by heating hydrated oxide of iron with carbon. This iron sponge not only purifies the vilest sewage water from organic matter, but also precipitates any copper present. It has, however, been found to possess this disadvantage, that the water so purified contains so much iron that it soon turns brown, and the iron separates in a copious precipitate in the form of the hydrated oxide of iron. This threatens to limit the usefulness of the discovery.

SOLDERING IRON AND STEEL.

Dr. Sieburger publishes the following methods for soldering iron and steel:

If large and thick pieces of iron and steel are to be joined, sheet copper or brass is placed between the perfectly clean surfaces to be united, which are then tightly wired together. The joint is covered with wet clay free from sand, and dried slowly near the fire. When the mud is dry, the joint is heated by a blast to a white heat and cooled, suddenly if iron, slowly if steel. When brass is used, it requires less heat, of course, than copper.

For objects of moderate size, hard brass solder is made by fusing together 8 parts of brass and 1 part tin. Soft brass solder is composed of 6 parts brass, 1 part zinc, and 1 part tin.

For soldering small iron or steel articles, a hard silver solder composed of equal parts of fine silver and malleable brass is used, the mass being protected by borax. Soft silver solder differs from this only in the addition of $\frac{1}{16}$ part tin.

Very fine and delicate articles are soldered either with pure gold or a gold solder composed of 1 part gold, 2 parts silver, 3 parts copper.

A CHEAP FIREPROOF SAFE.

A correspondent sends us a suggestion for a cheap fireproof safe, which he proposes to construct as follows: "Sink a well, six or eight feet deep, in the basement, and place in it a round or square boiler tube which should rise a little above the surface. In this tube place another, a little smaller and shorter, so that there will be space (at least two inches all round) between the two. Close the inner tube with a watertight door packed with a soft rubber ring, and let water fill the space and flow over the inner tube. Let there be an inch pipe from the bottom of the inner tube, leading under the walls of the building and rising out of the ground. The external end of the pipe will serve to admit air to the inner tube, and should be covered to prevent the admission of dust. Let a waste pipe lead from the top of the outer tube, and arrange a cock so that the water over the door of the inner tube may be drawn off. Fix two guide rods to the inner tube, and let an elevator with shelves pass up and down the rods, to lower your books into the well. The elevator when loaded can be counterbalanced with a weight. When you have placed your books on the shelves and lowered them into the well, close the door and let the water flow in till the whole is covered. As long as there is water in the outer tube, the inner one cannot become hotter than 212°. It will be easy to arrange so that the water can be turned on or let off without descending to the basement."

THE steam canal boat Success, built on Captain Goodwin's plan, illustrated not long ago in the SCIENTIFIC AMERICAN, lately arrived in this city from Buffalo, after a profitable and successful trip—her first voyage.

IMPROVED STEAM ENGINE.

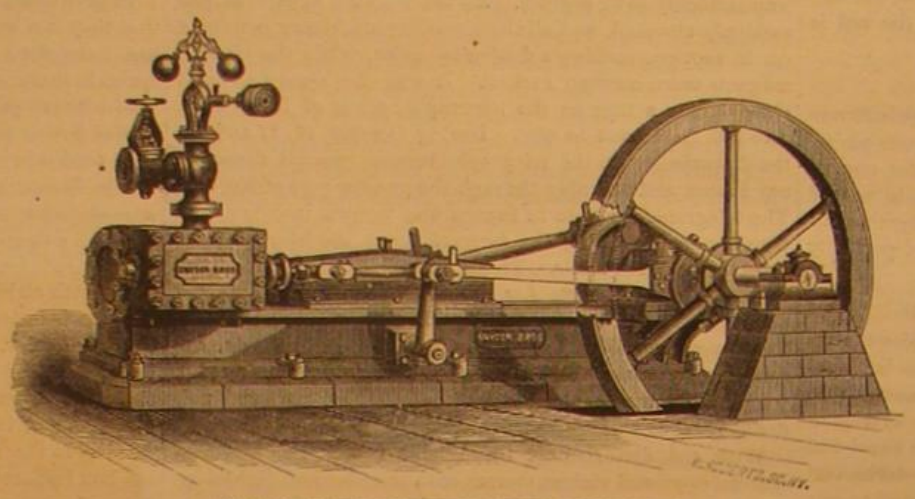
The steam engine of which we present an illustration is built for the purpose of being carried far from machine shops and skillful engineers; and the manufacturers have spared no pains or expense to get up an engine that will lessen the care of the engineer, and reduce the liability of derangement to the lowest figure.

The parts most exposed to wear are made of steel and bronze, and the balance, of the best hammered and cast iron. All the wearing parts are made very large, so as to present a large amount of surface to do the work.

It is a plain straightforward horizontal steam engine, without independent cut off, the introduction of which would complicate the engine and render it more likely to get out of order. But those which have been in use have exhibited an economy in the use of steam that many of the more complicated independent cut off engines cannot excel.

An idler rock arm is put in between the eccentric rod and the valve steam, so as to allow the engine to be run at a high rate of speed, and avoid all springing which so seriously interferes with the motions of the valve on high speed engines as commonly built.

The fly wheel with wrought iron arms is acknowledged to be the cheapest in construction and has the greatest proportion of its weight in the rim just where it is most effective. The defect of those heretofore made has been that they were not stiff enough sidewise. This fault Messrs. Snyder Brothers have overcome by spreading the arms or spokes apart (sidewise) at the hub, so as to brace against each other.



SNYDER BROTHERS' STEAM ENGINE.

The second difficulty in ordinary wheels is the shrinking of the cast iron away from the arms and leaving them loose. This they have also overcome, and the arms of their wheels are solidly welded to the rim and hub; or, when preferred, they put a pulley fly wheel on their engines.

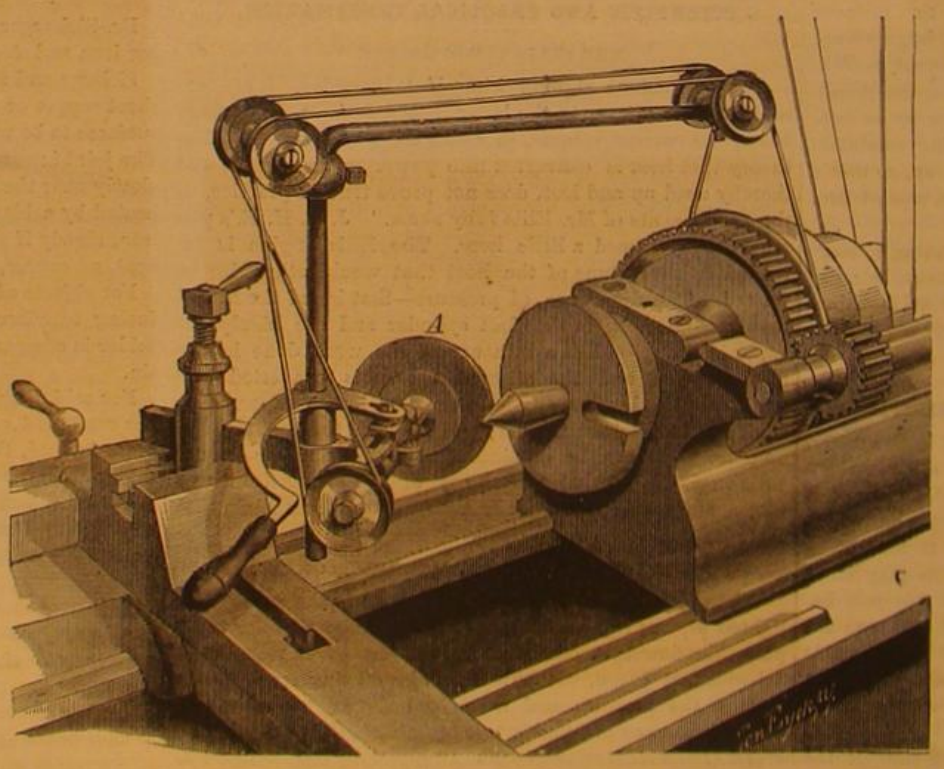
The piston is self-packing and the manufacturers state that it requires no care. One of them, 22" diameter, has, they state, been running in a saw mill for six years without repairs or care, and the interior of the cylinder to-day is as bright and smooth as a looking glass.

These engines are built to run at a high rate of speed, so as to develop as great an amount of power at as small a cost as possible; and to render this speed admissible, every part is finished with the greatest accuracy and made of the very best material. For further particulars address Snyder Brothers, Williamsport, Pennsylvania.

LATHE CENTER GRINDER.

It is a common practice to leave the revolving or "live" centers of turning lathes soft, in which condition they are exceedingly liable to bend or indent and, by producing imperfect work, cause serious defects in the turned portions of machinery. The device herewith illustrated is designed to grind the lathe centers after they are hardened, by means of a Union emery wheel placed in an ingenious appliance readily affixed to the lathe. The cut shows the invention in position, A being the grinding wheel, which it will be seen can be placed in the tool post and as easily adjusted to its work as an ordinary turning tool. It is guided by the handle shown, and is actuated by the belt passing over the idlers and receiving motion from the cone pulley.

The simplicity of this device, its ready adjustability, and the facility with which it may be applied to engine lathes of all the various sizes and styles, will render it a useful and convenient addition to every workshop. An operative of ordinary skill can with its aid, it is claimed, true a pair of centers after they have been shaped and hardened in from two to four minutes and so perfectly that not the slightest variation can be detected. For further particulars address the Union Stone Company, No. 93 Liberty street, New York city, and 16 Exchange street, Boston, Mass.



LATHE CENTER GRINDER.

Kid Skins and Kid Glove Making in England.

When dried, the skins feel hard and brittle, and have to undergo the process of staking (the next stage) to render them again elastic. This is done, says *The Leisure Hour*, by means of a semi-circular smooth edged iron plate fixed upright on the top of a stout piece of timber, across which the workman draws the skin, first in one direction and then in the opposite, manipulating it well with both hands until it is soft and elastic. It is then passed on to the parer, who shaves it to a like substance all over by fixing one half of the skin under a strong cord round an ash pole, grasping the loose end with his left hand, and carefully shaving it with his right by means of a circular knife of quoit-like shape and extraordinary keenness, removing the skin, reversing it on his pole, and shaving the other half in like manner, when, after a little polishing or stoning off, and padding down, it is finished. We may here remark that at every stage the work is inspected by a competent foreman before it is passed on to that which follows. The skins are now removed to another room, where they are examined and sorted for cutting into such kinds of gloves as they are best fitted for in quality, size, substance, etc.; they are thence sent to the cutter (in lots, generally, of from four to five dozen) with full instructions for his guidance respecting every skin. The cutter, taking one skin at a time, stretches it to the fullest extent, and cuts it up by measure into plain oblong pieces of the required size, which he submits to be stamped while stretched out, as a proof of his correctness in measuring and marking, before finishing them off in the form he is required to give them. From the cutter these oblong pieces, called "tranks," are sent to the puncher, who, taking two or three pairs at a time, and placing them on the knife to which they correspond in size and shape (being so numbered by the cutter), puts them under a press, when the form of the glove is instantaneously produced, with all the necessary slits and openings, button holes, gussets, etc., for enabling the sewer to put them together. The thumbs and the forgettes or fourchettes, the pieces put between the fingers, are punched separately. The "tranks" now go to the trimmer, who, with a very fine cutting pair of scissors, removes any little roughness that may have been left in the punching, after which they are supposed to be finished, though they have yet to be again closely examined, so as to correct any faults and prevent any defective pieces being sent out to the sewer. Having passed this examination they are handed to boys, who fold each pair with its complement of thumbs, forgettes, and other pieces inside, and put them up into half dozen or dozen packets, each packet with full instructions for making, written on the band; the sewing materials are then added to each packet; and after being duly entered out, they are taken by traveling clerks to the various sewing stations throughout the county of Worcester, and into parts of Warwickshire, Oxford, Hereford, Gloucester, Devon, and Somerset. Each clerk will take out daily the number of dozens required for his particular station, and bring home made goods to a like extent, the quantity varying with the population of the different localities. All these goods when brought in from the makers have yet to receive the last finish, that is, the "topping," button and button holing, etc., and this is done by hands in the city of Worcester, within easy reach of the manufactory. The gloves are now completed; but they must still be "dressed," or put into straight and attractive form; they are then subjected to their final examination by an expert and, when passed by him, have the firm's name stamped inside one glove of each pair; after which, being neatly made up, banded in half dozens, and put into small boxes or cases, they are labeled and sent off to the London warehouse, whence they are distributed to every part of the kingdom, the colonies, America, etc. Messrs. Dent and Co. now employ nearly seven hundred hands within the walls of their manufactory, and about five thousand sewing people, etc., outside.

A WISE man's thoughts walk within him, but a fool's without.

Shell Mounds on the California Coast.

San Pablo is about fifteen miles from Oakland, and lies almost due north, and the road follows the beach. When within three miles of the town we came to a shell mound, says a correspondent of the St. Louis *Globe*, rising up from the plain to almost the dignity of a hill, and which is now covered with a growth of shrubbery. There is no telling when or by whom that mound was raised, but it is almost a mile long and half a mile wide.

Fragments of pottery made of red earth, not to be obtained anywhere in this State, are found on the surface and near the top; and about two years ago Mr. McHenry, the owner of the land, dug a trench, and at a depth of twenty feet, sixty feet in from the west, near the base, found numerous skeletons of Indians of all sizes, and some bones of dogs and birds, and many implements of stone. One baby had been rolled in a monstrously long piece of red silk, like the mummies, and had been covered with a coating of a sort of asphaltum. Mr. McHenry also found in other parts of the hill evidences enough to show that this mound was a burying place for some extinct tribe of Indians, as the skulls are different from all others known in some particulars.

Where the red silk came from would puzzle any one to know, as this must have been a primitive race, judging by the rude implements and utensils. All the skeletons were in a sitting posture, with their faces turned northward. The shells that form this mound are oyster, clam and mussel shells, all having been exposed to the action of fire, and nearly all broken fine. Very rarely are entire shells found. The same kind of mounds, though not so large, are found near San Mateo, on the San Francisco side. They are all near the shores of the bay, and have been made of shells of the oysters and mussels that the Indians used as food, and which they evidently roasted to open.

The Horse Distemper.

By the account of an observer who has recently come from New York, we are confirmed in our impression says the *Field*, of London, that the disease among horses in America is identical with the well known influenza or distemper of horses in this country. Three horses said to be affected with the epizoötic have just been landed in Liverpool from New York, and we are informed that two of the three are in good health; the other has only a slight cough. It appears that the animals manifested the usual symptoms—loss of appetite, nasal discharge, cough, and sore throat—at the commencement of the disease, but rapidly improved under simple treatment, and at the termination of the voyage two of them had quite recovered.

Influenza exists, we understand, among horses in Liverpool, and certainly also in London, although not to any remarkable extent. Cases of the disease came under our notice several weeks ago. In the event, therefore, of the affection assuming the epizoötic form, it will not be necessary to trace its origin to importation of horses from America. The Irish Government issued an order on November 5, prohibiting the landing at any port in Ireland of a "horse, mare, gelding, foal filly, ass, mule, or jennet from or which, at any time after the 30th day of September, has been in any part of America."

No legislative action has been taken by our Government in the matter, nor under all the circumstances does it appear to be necessary to interfere with the very limited importation of American horses into this country.

Influenza, like epizoötics in general, only spreads rapidly and extensively when the conditions are favorable; the occurrence of a few cases every spring and autumn excites no attention.

Sea Sickness in the Horse.

It would be a happy incident for the poor animal if it could always relieve itself by vomiting. Alas! it cannot; this relief is quite exceptional. The sufferings of a sea sick horse are intense. The stomach tries to relieve itself, dry retchings follow, and reach such a climax that the blood is driven into the head and into the brain, and finally the poor animal succumbs to apoplexy and dies in great torture.

New Process of Bleaching Animal Textile Fabrics.

MM. Samal and Berouson have recently patented, says the *Chronique de l'Industrie*, a new method of bleaching animal textile fabrics by means of a feeble solution of the sulphurets of sodium and potassium. These products act in a remarkable manner in removing the gum in preparing silk and in scouring wool. In practice, in the first case, the bath should be boiling; in the second, the temperature of the alkaline sulphuret should not exceed 50° C. The more difficult it may be to remove the gum and prepare the silk, the less the solution should be sulphuretted; in some instances the protosulphuret may be employed.

The inventors have also used in the same manner the aluminates of soda and potash.

[From Journal of the Franklin Institute.]

TRANSMISSION OF MOTION.

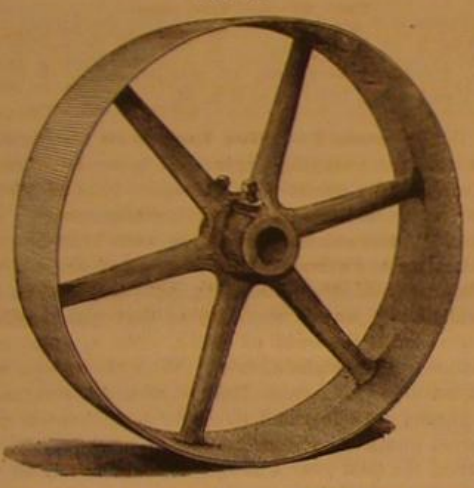
A Lecture delivered by Coleman Sellers, at the Stevens Institute of Technology, Hoboken, N. J., February 19th, 1872.

NUMBER IV.

When very long lines of shafting are constructed of small or comparatively small diameter, such lines are liable to some irregularities in speed, owing to the torsion or twisting of the shaft as power is taken from it in more or less irregular manner. Shafts driving looms may at one time be under the strain of driving all the looms belted from them, but as some looms are stopped the strain on the shaft becomes relaxed, and the torsional strain drives some part of the line ahead, and again retards it when the looms are started up. This irregularity is in some cases a matter of serious consideration, as in the instance of driving weaving machinery. The looms are provided with delicate stop motion, whereby the breaking of a thread knocks off the belt shaft and stops the loom. An irregular driving motion is apt to cause the looms to knock off, as it is called, and hence the stopping of one or more may cause others near them to stop also. This may in a measure be arrested by providing fly wheels at intervals on the line shaft, so heavy in their rim as to act as a constant retardant and storer of power, which power is given back upon any reaction on the shaft, and thus the strain is equalized. I mention this, as at the present time it is occupying the thoughts of prominent millwrights, and the relative advantage and disadvantage of light and heavy shafts is being discussed and is influencing the practice of modern mill construction.

I have mentioned the method of uniting bars of round iron so as to make long lines of shafting, in considering the theory of the coupling. I have given you an insight into the principles involved in a successful bearing for the shafts to revolve in, and I have dwelt a little on the shafts as regards size and velocity. I will now call your attention to the pulleys or band wheels. See Fig. 18. The best belts or bands used on these wheels are of leather, kept in good con-

FIG. 18.



dition by the judicious use of oil. Belts of leather are made of single thickness of leather for some purposes, and of two or more thicknesses for the endurance of harder strains. In general, main driving belts are made double thickness, and belts for transmission of power to machines, with some exceptions, are made single thickness. The terms double and single belts have come to be applied to leather bands in the trade, while India rubber belts, now quite extensively used, and often to advantage, have their grades indicated by one ply, two ply, three ply, etc., as indicating their thickness. It is of the utmost importance, for considerations of economy in running as well as first cost, that pulleys should be made as light as is consistent with strength. Pulleys that are to sustain the weight of double belts must be made heavier and stronger than those that are to sustain the weight of single belts; and the use to which the pulley is to be applied must influence its proportions. In the early practice of making cast iron pulleys, it was believed necessary that the arms should be made something like the letter S on the plane of the pulley. The idea was that they would be less likely to break from shrinking strains in the casting. It is quite evident, however, that a straight arm, such as one in the samples shown you (see Fig. 18), representing a straight line from the center to the circumference, will take the least metal; and I can state as a fact, after very long experience, that pulleys made with straight arms are the strongest, with equal proportions, provided proper precaution be taken in selecting the iron to be used in making, and regulating the conditions of cooling. The straight armed pulley can be made with the least possible metal and the greatest possible strength for the metal. Its form is the best able to transmit the peculiar strains brought to bear upon it, and at the same time it is the most pleasing form to the eye. In machinery, as in Nature, fitness to intended purposes has much to do with our ideas of beauty. The arms should be oval, so as to present the least resistance to the air in running, and they should be as light as is possible to make them, consistent with strength. This is of the utmost importance, as the weight of the pulleys on the line shafting often is very great, and this metal must revolve with the shafts, and its revolution costs in proportion to its weight. This cost of rotating the mass of metal is a constant cost irrespective of the work done, hence the need of carefully considering the weight and its reduction to the minimum. Pulleys should be turned truly round, and they should be cylindrical only in the case of belts having to be shifted sideways on their face; for stationary belts the pulleys should be made higher in the center, the curvature of the face being, say, ⅛ in. per foot. In trade, pulleys for stationary belts are termed "high," for shifting belts "straight," on the face. They should be also very carefully balanced. This may be done by turning the rim outside and inside, or it may be done by attaching a mass of iron to the lightest side of the pulley. The former practice holds with large driving pulleys, the latter with the smaller pulleys on the line. Large driving pulleys, when over 3 feet diameter, should always be carefully fitted to the shaft, and be held from turning by a key fitting sideways, never bearing top and bottom. Very large pulleys, say for belts 12 inches wide and over, should be forced in the proper place in the shaft by a forcing press, in the same manner as I stated car wheels are fitted to their axles. The various transmitting pulleys on the line may be so bored as to slide on to their respective shafts and be held by set screws. Pulleys are now made in most large machine shops of so many sizes that they present the readiest means of regulating the speed of the machinery. Some establishments are filled with patterns varying by ¼" in diameter for smaller sizes, say under 12", then by ½ in. up to 18" or 20", and after that by one inch up to 3 feet, and by two inches up to 6 feet in diameter. This variety answers all the purposes of trade. Pulleys made smooth on their faces transmit more power than when rough, and are less destructive to the belts used upon them. The power that can be transmitted by a leather belt running on a smooth cast iron pulley is dependent upon the strain of the belt upon the extent of surface of pulley encompassed by the belt, and the direction that the belt is led to and from the pulleys; but a very safe approximate rule is to assume that every 1,000 feet of motion per minute of each inch in width will transmit one horse power with a single belt. This can be doubled by the use of double belts, but with more severe strain upon the journals. The subject of relative sizes and widths of pulleys, and the various conditions of belt direction, would in itself be enough to fill an hour's lecture, so I cannot enlarge upon it to the extent I would like.

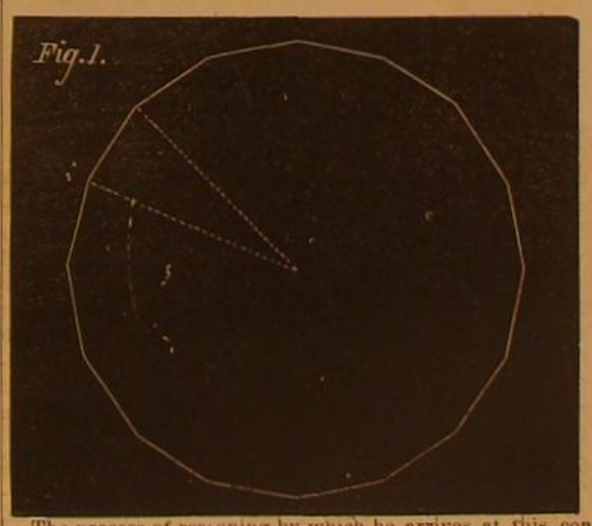
Correspondence.

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

Bursting Strain of Cylindrical Boilers.

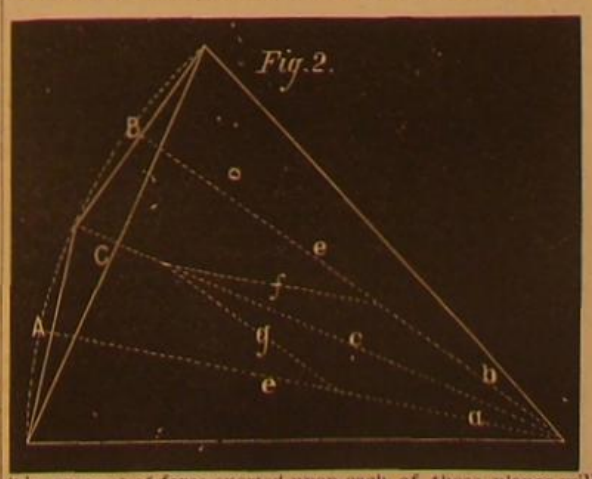
To the Editor of the Scientific American:

I generally get the SCIENTIFIC AMERICAN every week, but do not always have time to read all the articles contained in it. In looking over your number of October 19, 1872, a few days since, I observed an article, which I had not before seen, on cylindrical boilers: and as the conclusions at which your correspondent arrives seem to me to be very erroneous and calculated to mislead, I wish to offer a few remarks on what I think may be regarded as the true solution of the question. He states that the force tending to disrupt a cylindrical vessel by internal pressure is not as the diameter, but as the circumference; that is to say, with a boiler 20 inches in diameter, with an internal pressure of one pound per square inch, the strain upon the shell would not be 20 pounds for every inch of its length, but 20×1·57=31·4 pounds.



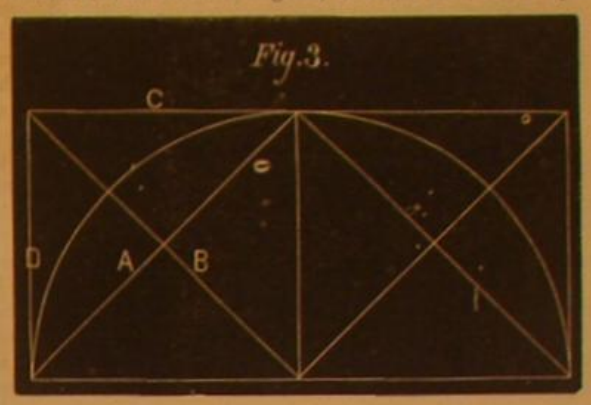
The process of reasoning by which he arrives at this conclusion is not stated; but it appears to have been given in some former articles. Let us then examine this question by the old fundamental law of the composition and resolution of forces, and see what is the answer which it gives to us.

Let us for the sake of illustration suppose the circumference to be divided into a number of planes or chords of arcs.



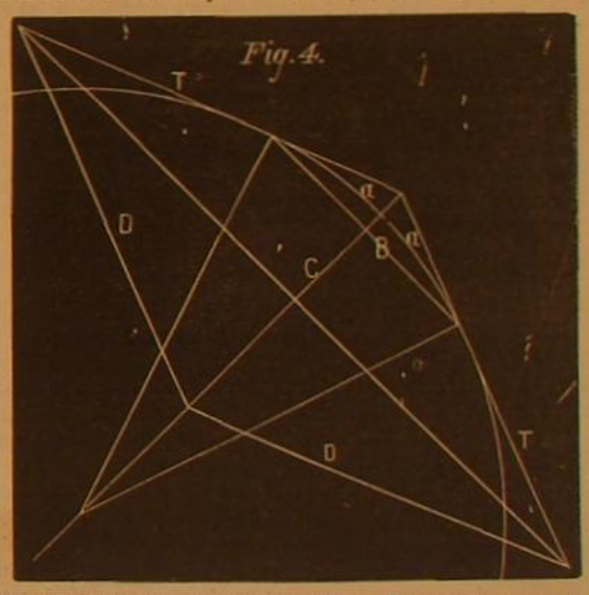
The amount of force exerted upon each of these planes will evidently be in proportion to its length; any two of these forces may therefore be resolved into one, and that force will be exactly equal to the chord of the arc inclosed by both the planes.

Thus A B represents two chords of equal lengths, and the dotted lines, c c, the direction of the force exerted upon them. Mark off a and b equal in length to A and B, and complete the parallelogram a b f g; and by the resolution of forces, the diagonal C of the parallelogram will equal the sum of the forces, and that will be equal to the length of the chord C. We have now found that the sum of the two forces on A and B is equal to the force on the chord, C, of the sum of the two arcs which they inclose. By taking another arc of the same length as C, we can in the same manner reduce these forces also to one, which will be equal to the chord of an arc twice the length of the arc enclosed by C. We can proceed in this manner until we have resolved all the forces into two inclosing arcs of 90° each; and these finally resolved into one will be found to be exactly equal to the diameter. Again, we shall find if we analyze these forces by the same rule that the strain on the shell of the boiler is the same on every part of the circumference, and that that strain is equal to the force due to the radius or half diameter. Take for instance the semicircle shown in the annexed diagram, in which the chord A rep-



resents the amount of force exerted upon the arc of 90° which it encloses, and the line B, the direction of the force and (being of the same length) also its amount. This force, B, will be held in equilibrium by the two forces represented by the lines C and D, each of which is equal to the radius.

Now take any other portion of the circle, and, by applying to it the same rule, we shall obtain the same result. Take any portion of the circumference as the arc, a d. Join the two extremities of the arc by the chord line, B, and from the extrem-



ities draw also the two tangents, T T. From the intersection of the tangent lines, mark off the line, C, equal to the length of the chord. B, and this line will represent the direction and force of pressure acting upon the arc a a.

From the end of the line, C, draw the lines, D D, parallel to the tangent lines, T T, which complete a parallelogram of which C is the diagonal, and which therefore holds in equilibrium the forces represented by the tangent lines T T, which tremities of the arc by the chord line B, and from the extremlines are equal to the radius of the circle. Any arc of the circle, greater or less, will give the same result. Thus we have a ready method of ascertaining the strain upon parts of boilers which are curvilinear in form, as we have only to find what would be the radius of the circle of which such curve forms a part; and that will give the amount of strain it endures. S. S.

New York city.

Prevention of Fires.

To the Editor of the Scientific American:

The Boston calamity, like that of Chicago, will doubtless bring out a vast number of suggestions, some wise and some otherwise.

It seems to be agreed that the fire in this case originated from the steam engine used to operate the elevator; and the flames, being drawn up the elevator shaft, were at once communicated to the Mansard roofs, which were of wood and beyond the reach of the fire engines.

This has called forth a vast deal of denunciation of the Mansard roof, which is all very well, so long as people will build them of tinder, and out of the reach of engines. But it seems to me that people, in their anxiety to condemn these roofs, have overlooked a much more important matter, and that is the danger and folly of locating steam engines in buildings, in the reckless manner that is now practiced in all

cities. Had it not been for the steam engine there would have been no fire; and it seems to me that it would be much more reasonable to condemn their use than to pitch into Mansard roofs so vigorously.

The amount of property and life annually destroyed in this country, by the use of steam engines, in the compactly built and settled portions of our cities is frightful. Now all this may be prevented by the substitution of either water or air engines for the steam engines. We have both, that are as perfect as steam engines and of are course perfectly safe. True, there is not provision for their use as yet, but that can soon be remedied. Let it once be settled, by law, that no steam engine shall be permitted in any thickly settled portion of a city, and provision will soon be made for the others, both water and air. As to water engines, they can be and are now used to a considerable extent, by simply connecting them to the city water pipes. Of course, the supply of water is not sufficient at present for their general adoption, simply because no such idea was contemplated when the water works were established, and no provision has been made for them. It is, however, a very simple matter to do this; and if there was a demand for it, created by prohibiting the use of steam engines, the supply would soon be furnished. Take, for instance, New York, Boston, Chicago, or any other large city; how easy it would be to lay water pipes for this special purpose, and force water through them by pumps! Sea water would do for this purpose, and the engine for pumping it could be located at any convenient point along the wharf. The water, after being used for the purpose of operating the engines, could then be used to sprinkle the streets, clean the gutters, slush the sewers, and for many other purposes, and thus improve the sanitary condition, while at the same time lessening the demand on the regular water supply for such purposes, which in most cities is fast becoming deficient. There is no doubt that it would pay for any city to increase its water supply for the express purpose of furnishing power, charging a reasonable price for it. It is cheaper than steam power as at present used, and is infinitely safer. In those towns and cities where the Holly system has been adopted, all that is required is to increase the pumping capacity, as the present pipes will answer. If it were intended at the outset to do this, it would be better to increase the size of the pipes, or perhaps have a separate set for that special purpose.

Compressed air may be used in the same manner, but not so well, because it is far more difficult to confine, as it will escape where steam will not; and it is far more difficult to keep the air pumps in working order. One advantage of the air would be better ventilation of shops and buildings, as the escape air might be utilized for this purpose; but I doubt whether it would be of as much use, in a sanitary point of view, as the water.

It seems to me that if "an ounce of preventive is worth more than a pound of cure," this is a remedy well worth our notice. I have no doubt the time will come, when we shall have power conveyed, all through our principal cities, for manufacturing and shop purposes in this way, more especially for all the lighter kinds of work, elevators included; but to effect it, the use of steam must be prohibited.

Washington, D. C. W. C. DODGE.

The Vienna Exhibition.

To the Editor of the Scientific American:

In the presumption that you desire to be correct in your statement of facts in connection with the American department of the Exhibition, will you permit me to point out certain errors in your editorial of November 30?

You say that "In a widely distributed circular issued *from General Van Buren's office*, we find the following remarkable statement: The Austrian government is exceedingly desirous that the United States shall be well represented, and makes *extraordinary concessions* to American manufacturers. The Austrian patent law is practically abrogated for the six months following, and inventors are protected by a special ordinance against piracy of their inventions." Now, sir, the circular from which you have taken this extract I find, upon enquiry, was published by Professor Thurston, of the Stevens Institute, at Hoboken, and bears his name and address in full. It was never issued from this office, nor does it purport to be.

The expressions commented on are perhaps a little stronger than may be warranted, and yet it remains true that concessions have been made and that patents are granted without cost to exhibitors, to be in force during the Exhibition and for two months afterwards. In all my statements upon the subject, I have endeavored to give a careful and true account of what had been done for the protection of our inventors and of what I was striving to accomplish. I have never hesitated to say that the policy of the patent laws of most European countries was piracy and not protection, but I have claimed that the disposition of the Austrian authorities in connection with the proposed Exhibition was to modify existing statutes so as to protect inventions sent to Vienna from this country.

In referring to the treaty upon trade marks, I have never claimed any connection with it, but have spoken of it as being a step in advance and as evidencing a more liberal spirit. So, too, with the law which permits an exhibitor to take out without cost a certificate which operates for the time as a full patent. I admit, and have always done so, that these are not sufficient, that the obnoxious feature of the Austrian patent law, which compels the manufacture of the article in Austria within one year from date of patent, remains. And I have striven to obtain a treaty removing or modifying that provision, not "by simply sending a draft to Washington," as you allege, but by months of correspondence with the proper authorities of both countries and by visiting Washington to urge speedy action. And I have faith to believe that favorable results may be looked for; but I must be pardoned for judging that the violent opposition of some portions of our press and threats of ruining the prospects of our American department at the Exhibition—if they have any effect—will serve to postpone or prevent the success of my endeavors.

You say again that I have appointed sixty-five assistant commissioners. By what authority, may I ask, is this statement made? Not one fifth of that number have yet been appointed; and they are scattered about in some of the larger cities of the Union, and are engaged in distributing programmes of instruction, giving explanations and receiving and forwarding applications for space, etc.

In regard to an appropriation, I propose to ask that the expenses of a certain number of commissioners be paid, not to exceed a limited sum; and that these commissioners shall give their time and labor to the duties of their positions. A proportion of this commission will be composed of some of our most distinguished scientific men, who will thoroughly examine and report upon all parts of the Exhibition.

I propose also that the Government shall bear the expense of receiving, storing, shipping, freightage, and placing all goods sent to the Exhibition and returning them, of fitting up the American department, of the rental of space, of the construction of a model school building, of the necessary office work and rental in this city, and all the absolutely necessary attendant expenses. If this is refused, of course the Exhibition, so far as we are concerned, will fail, in which failure I shall be but little more concerned than any other citizen; but as a citizen, I should deeply regret such a disgrace produced by such causes. THOS. B. VAN BUREN,

United States Commissioner for the Vienna Exposition of 1873.

[For the Scientific American.]

ASTRONOMICAL NOTES.

OBSERVATORY OF VASSAR COLLEGE.

[For the items of meteorological and astronomical observation and for some of the computations in the accompanying notes, I am indebted to students.

The times of rising and setting of the planets are for the latitude of Vassar College, and are approximate only, no account having been taken of refraction or dip of the horizon, the aim being to furnish to everyday readers the means of recognizing the planets, and of following them in their apparent daily motion from east to west.—M. M.]

The following notes are from the records of the Observatory of Vassar College, from November 1 to 15, 1872:

THERMOMETER AND BAROMETER.

Highest thermometer at the time of recording was at 2 P. M., November 1.....59°
Lowest thermometer 7 A. M., November 5.....25°
Highest barometer 7 A. M., " 5.....30·46 in.
Lowest " 2 P. M., " 7.....29·57 in.

The highest wind was from the northwest, November 12, at 9 P. M.

QUANTITY OF RAIN.

	Inches.
November 3	0·07
" 5 and 6	1·25
" 12	1·675
" 14	0·365
Amount November 1 to 15	3·36

SUN SPOTS.

The spots on the sun have been very numerous, and some of them very large. On November 5, five groups were seen by the aid of a glass of low power. One of these groups was very much extended across the disk. On the 7th, this had stretched along for more than half a diameter, and, on the 10th, was easily seen with the eye (protected, as it always should be, by smoked glass). On the 11th it seemed to reach its maximum; on the 16th, it was still to be seen, although the sun's motion on its axis had carried it nearly out of sight. Even with a low magnifying power, more than thirty individual spots could be counted in this remarkable group. They must have been formed rapidly, as the record of November 4 makes no mention of unusual agitation. At this date (November 16), spots of good size are coming on, and will probably be seen for some twelve days.

OCCULTATION.

November 10, at 7h. 55m. 38·9s. the moon occulted, or seemed to pass over, the star 30 *Piscium*, a star of the 5th magnitude. As the moon was not full, its dark limb seemed to approach the star, which disappeared instantaneously as they met.

POSITIONS OF PLANETS FOR DECEMBER, 1872.

MERCURY.

Mercury passes the meridian, or souths, at 1h. 20m. December 1, and at 10h. 27m. on December 31. On the 1st of the month it sets after the sun, about a quarter before six, and on the last of the month it rises before the sun, a little before 6 A. M.

VENUS.

Venus (at this time, November 16, so brilliant in the southwest), sets on December 1 at 6h. 44m., and on December 31, at 5 minutes before 7.

MARS.

Mars is very small, but can easily be known by its ruddy light. It rises December 1, about half past one in the morning, and keeps nearly the path of the celestial equator, setting about half past one in the afternoon. On December 31, Mars is much further south, being 4° north of the bright star *Spica*.

JUPITER.

Jupiter, the most interesting of all the planets, rises at this time (November 16) about midnight; it is becoming more and more favorably situated for observation, and on December 1 will rise a quarter before eleven, and on the 31st, before nine in the evening.

The best time for observing any planet is when it souths; Jupiter souths, or comes to meridian, in the early morning hours all through December, but it is in northern declination, and in this latitude has a good elevation some hours before meridian passage. By the last of December, it can be well seen in the evening. It is in the constellation *Leo*, between *rho* and *gamma Leonis*, nearer to *rho*.

JUPITER'S SATELLITES.

The four moons of Jupiter can be seen with a glass of low power, and their transits, occultations and eclipses, which occur very frequently, render the observations of this planet intensely interesting. The shadow of the largest of these moons will be thrown upon the face of the planet after midnight on the 21st, appearing generally as a round, black spot. The 4th satellite, which is next to the 3rd in size, will be eclipsed on the 24th and will emerge from the shadow of Jupiter at 11h. 47 m. 48s., Washington time.

Seen in large telescopes, the belts of Jupiter are continually changing, and are, some reddish and mottled by dark and white spots, some dusky and broken into irregular stripes.

SATURN.

Saturn is no longer well situated for observation. It is among the stars of *Sagittarius*, and sets at 7h. 11m. on December 1, and at 5h. 29m. on the 31st. Its ring can be seen with a glass of low power.

URANUS.

Uranus is in the constellation *Cancer*. It rises on the 1st about 8:30, P. M., and is well situated for observation. An ordinarily good telescope will show its disk. It comes to meridian at 3h. 50m. on December 1st, and 1h. 49m. on December 31,

NEPTUNE.

Neptune is in good position, but a very good glass is needed to show it to be a planet. It rises on December 1 at 2h. 19m., comes to meridian, or souths, before 9 P. M. (8h. 46m.), and sets a little after 3 A. M.

The Great Pumping Engine in Chicago.

An immense pumping engine has lately been completed and successfully operated in Chicago. It is of 1,200 horse power, and consists of two machines connected by a single shaft. The two steam cylinders are each 70 inches in internal diameter and allow a 20 feet stroke of piston. The steam chests are provided with double puppet-balanced valves, and the unhooking gear is arranged so that both engines may be controlled at the front of either. The flywheel is 25 feet in diameter and weighs 33 tuns. With the exception of the great machine at Haarlem, Holland of which the diameter of the cylinder is 12 feet and stroke 10 feet, there is probably no larger pump in existence.

During the past year Chicago has laid nearly 20 miles of water pipe; which is more than has ever been placed in the city during a similar period.

Chinese Arithmetic.

The Chinese have a most ingenious method of reckoning by the aid of the fingers, performing all the operations of addition, subtraction, multiplication, and division, with numbers from 1 up to 100,000. Every finger of the left hand represents nine figures, as follows:—The little finger represents units, the ring finger tens, the middle finger hundreds, the forefinger thousands, the thumb tens of thousands. When the three joints of each finger are touched from the palm towards the tip they count one, two, and three of each of the denominations as above named. Four, five, and six are counted on the back of the finger joints in the same way; seven, eight, and nine are counted on the right side of the joints from the palm to the tip. The forefinger of the right hand is used as a pointer. Thus, 1, 2, 3, 4 would be indicated by first touching the joint of the forefinger; next the the hand on the inside; next the middle joint of the middle finger on the inside; next the end joint of the ring finger on the inside; and finally the joint of the little finger next the hand on the outside. The reader will be able to make further examples for himself.

Action of the Brain.

M. Fournié communicates to *Les Mondes* the following interesting experiment on the cerebro-spinal nervous system of animals. He says: "I wished to determine a process which would permit me to injure any portion of the brain without destroying life. With this view I made a small hole in the skull of a living animal by means of the instrument used in surgery for osseous sutures; then across this hole I introduced the needle of a hypodermic syringe (*séringue Pravas*), and, at the point of the brain I wished to destroy, I injected a caustic solution, chloride of zinc colored blue. The part touched by the fluid was injured; consequently it ceased to fulfil its functions. After the subject had reposed, I noted the symptoms presented for some twenty-four hours and then killed the animal. I discovered readily the injured part by the induration of the tissues and the blue coloration. The experiments show plainly that simple perception resides in the optic couches (*couches optiques*), that distinct perception and memory require the integrity of the cortical periphery, and that the lesion of the circumvolutions is not accompanied by paralysis of the members but only by weakening." The author proposes to extend these experiments with a view of arriving at further important results.

NVENTIONS AND SUGGESTIONS FOR THE PREVENTION OF FIRES.

Next to saying "I told you so" there is no mental effort which conveys more unalloyed pleasure to the human race than to calmly suggest and expatiate upon means by which calamities might have been avoided, after such misfortunes have taken place. The recent fire in Boston gives rise to many instances of this fact, and the daily journals are filled with editorials and communications, some conveying excellent ideas worthy of careful attention, others suggesting plans as ridiculous and impossible as can well be imagined. The Chicago fire, though a severe lesson, served but to interrupt our sleep of fancied security; the Boston conflagration has been the means of a thorough arousing of the whole nation; and, as a result, plans innumerable for the avoidance of similar disasters are being devised.

A number of these suggestions, some found drifting about in the columns of periodicals, others obtained directly from their originators, we have gathered together; and below we briefly give their general details.

A word at the outset as to roofs, and in particular the Mansard, which, like Mrs. O'Leary's cow in Chicago, has been the special object of public malediction. The blame should not be placed on the architectural design—no one will deny that the roof is handsome and that its ornate pavilions are a great improvement over the squat coverings of former times—the fault lies in bad material and worse construction; flat roofs, if made of thin beams, protected by a single sheeting of tin or slate, would be exactly as unsafe. That we can build proper roofs on the French plan is amply evidenced by the one in process of construction on the new *Staats Zeitung* building and on the Masonic Temple in this city. A mere glance at the massive iron beams and stone window casings of these edifices will remove all doubts of the structures being dangerous.

The main objection to the Mansard is its hight from the ground, but if we provide a proper supply of water and suitable means of forcing it where it is needed, this can be overcome.

Like Chicago, Boston has demonstrated the value of brick over every other building material, as a fireproof substance, and consequently many of the plans suggested are based on the construction of brick walls.

A daily contemporary editorially says that parapet walls should be placed between the houses, eight or ten feet high and pierced with a few apertures so arranged as to admit a free play of hose pipe. These partitions are designed not only to check the advance of the flames but also as barricades behind which the firemen can obtain shelter.

A recent invention consists in building two immense walls of solid brick masonry intersecting in the center of every block. At the point of intersection the partitions are highest, their upper edges sloping off to the corners of the building. The idea is to confine the fire to one quarter of the square and so prevent its spread.

Another proposition is to carry the walls of a building three feet up above a flat roof, forming a reservoir which is to be flooded with water from below by a force pump.

One of the best plans is that derived from the French, and consists in making all partitions and floors of solid plaster and iron.

A scientific contemporary advocates the construction of partitions analogous to sectional iron boilers. Iron enclosed water spaces are suggested, not to be over one inch in thickness and subjected to a hydraulic pressure of three or four feet head. The sections are to be flooded in case of fire.

Various plans are published having in view increased water facilities. It is proposed to carry river water through the streets in large mains, from which pipes are to extend through the houses and above the roofs, having suitable hose connections in every story, by which, the water being under pressure, a thorough flooding can in a short time be effected.

Another idea is to erect reservoirs on elevated positions into which salt water is to be pumped and distributed by pipes throughout the city.

A very similar device is to build towers along the ridge that forms the backbone of Manhattan Island, and supply fresh water drawn from the Hudson river some distance from its mouth.

In Chicago wells are suggested, which, communicating with the river, are to be sunk at suitable points and an increased quantity of water thus obtained.

Another design, for utilizing salt water, is to locate a powerful pumping engine in every fire district, which, in connection with a large standing pipe, is to maintain such a constant pressure at every hydrant as to obviate the necessity of fire engines.

One excellent idea is the pressing of the ferry boats into service, placing them under the orders of the Chief Engineer and requiring them to carry donkey engines of uniform power, with hose nozzles regulated to a standard gauge. In case of fire, the vessels are to congregate at some fixed point and act in concert in forcing water into the city.

Additional mains from the Croton reservoir are suggested, by which the supply is to be economized by forbidding tapping except in certain localities.

A well known engineer considers it practicable to force salt water, in time of emergency, through the regular fresh water pipes, which he would have constructed of double their present size.

One of the best devices for the application of water is that published some time since, in this journal, consisting in a large number of perforated pipes extending entirely through the building. By merely turning a cock, thousands of fine streams are thrown in every room.

A recent invention on this principle consists in permanently affixing a perforated pipe at the summit of the roof, allowing the water to run over the latter, and thence down the side of the building.

A further improvement is a portable system of perforated tubes, which can be readily laid along a roof or rested on supports within the building and thence connected with the engines. This plan has the advantage that the firemen can thoroughly drench buildings even at their highest portions, which otherwise they would be unable to approach on account of the heat.

We have encountered two ingeniously ridiculous ideas. The first is the proposition that our fire department be provided with rolls of thick woolen blankets, sufficient to surround a block of houses. With these the fire is to be smothered by hand, while the cloth is kept wet by the engines. The second inventive genius thinks that a woolen veil, saturated with water and placed between a fierce conflagration and threatened buildings, will instantly avert all danger.

From all the plans, ideas and suggestions above enumerated, and from the experience we have so dearly earned, a few general conclusions may be safely drawn. Of these the chief is that a city to be fireproof needs both properly constructed buildings and a thoroughly efficient water supply. No matter how well organized a fire department may be; if the houses are built of inflammable material, disasters greater or less must ensue. And on the other hand, even if edifices be never so well constructed, if the water supply and its mode of application be not as nearly perfect as can be, similar consequences will follow. In the construction of fireproof buildings, brick should be preferred. Walls should be thick and solid. Avoid hollow partitions and floors of wood or lath and plaster. Employ iron beams and either solid plaster or surfaces of plaster packed with nonconducting and noninflammable material within. Provide double iron sliding shutters to all windows. Place iron trap doors on the elevator shaft at every story, and thus be able to cut off the immense draft it produces. Introduce a reliable system of perforated pipes or similar devices for sending water throughout the structure, and provide hand fire extinguishers ready for immediate use.

For the high buildings of large cities, steam fire engines have been proved inefficient. Therefore an additional supply of water must be provided, drawn from the rivers, kept under constant pressure capable of throwing the highest necessary stream. The water supply should be so introduced as to be available as furnishing power for elevators, supplying small manufacturers and others, thus enabling them to dispense with steam apparatus and its attendant dangers.

Blowing up buildings with gunpowder is a last resort and should never be left in such unskillful hands as it was at Boston. Fire must be fought by men practised in the warare, and never delegated to the inexperienced, however willing.

Lastly, in every city in the country is needed a well considered code of municipal regulations in regard to precautions of every kind against fire, enforced by heavy and severe penalties, and in addition, a rigid and efficient system of inspection to see that such regulations are fully observed.

What is Slate, and how was it Formed?

That slate may have been once mud is made probable by the simple fact that it can be turned into mud again. If you grind up slate, and then analyze it, you will find its mineral constituents to be exactly those of a very fine, rich, and tenacious clay. Wherever the top of the slate beds and the soil upon it is laid bare, the black layers of slate may be seen gradually melting, if I may use the word (says the Rev. Charles Kingsley in "Town Geology"), under the influence of rain and frost, into a rich tenacious clay, which is now not black like its parent slate, but red, from the oxidation of the iron which it contains. But, granting this, how did the first change take place? It must be allowed at starting that time enough has elapsed, and events enough have happened, since our supposed mud began first to become slate, to allow of many and strange transformations. For these slates are found in the oldest beds of rocks, save one series, in the known world; and it is notorious that the older and lower the beds in which the slates are found, the better—that is, the more perfectly elaborate—is the slate. The best slates of Snowdon (I must confine myself to the districts which I know personally) are found in the so-called "Cambrian" beds. Below these beds but one series of beds is as yet known in the world, called the "Laurentian." They, occur, to a thickness of some 80,000 feet, in Labrador, Canada, and the Adirondack mountains of New York; but their representatives in Europe are, as far as known, only to be found in the northwest highlands of Scotland and in the island of Lewis, which consists entirely of them. And it is to be remembered, as a proof of their inconceivable antiquity, that they have been upheaved and shifted long before the Cambrian rocks were laid down "unconformably" on their worn and broken edges.

Mechanism.

How much the people of England owe to the development of mechanistic germs, says Dr. Rigg in a recent lecture, may be inferred from the statement that if the work of machinery on this little island home of ours for one day had to be accomplished by single human power, the population of the whole globe would hardly suffice to do it. Where such stupendous results are evolved, many minds must have contributed to the common stock; and if what those who are competent to form an opinion tell us be true, namely, that man, in this nineteenth century of the Christian era, is in mental and physical power as he was nineteen centuries before that era commenced, then the conclusion is obvious, that he who would contribute new ideas to these contrivances which minister to our comforts and our wants, must investigate the contrivances that have been already made.

Investigation should never be dormant; and yet it does sleep, and soundly too, until a "strike" or a "lock out" reminds society that machines and not men are in all respects best adapted to do much of the work now slowly and slovenly produced by manual labor. They do it, too, with an accuracy, a perfection, and a speed which the direct application of human skill seldom attains. In the bodily frame is mechanism for various purposes; in the machine, for one purpose only. "Strikes" and "lock-outs" often bear unexpected results in the introduction of mechanical contrivances which, in time, extinguish particular classes of manual labor.

An inventive turn of mind is, and always has been, common to a very large portion of mankind. Such minds are prone in this century, as doubtless they were in former ones, to live in isolation from that which is without. Hence, whatever seems to originate in themselves is regarded by them as a novelty, and therefore, as such, is concluded to be of value. Many a day, many a night, and many a fortune have been expended on contrivances and experiments which generations long past had emphatically pronounced to be delusions and snares. A sure remedy for this is in the study of that which has been done. It has often fallen to my lot to *try* to disabuse an inventor of the idea that a specific suggestion had in it either originality, novelty, or utility. The very kindest attempt to do this is as thankless an office as a man can undertake. In placing, therefore, before you a multiplicity of illustrations, it has been in the hope that they may be suggestive of further inquiry.

[From the Quarterly Review.]

THE CONSCIOUSNESS OF DOGS.

A dog feels anger precisely as we do, and after provocation is sometimes vindictive and sometimes placable, according to his individual character. He is susceptible of hatred of the bitterest kind. He is so excruciatingly jealous, that his life becomes a burden in the presence of a favored rival. His envy continually leads him to eat what he does not want least another animal should take it, and to illustrate the fable of the dog in the manger. Gluttony holds out to him temptations under which even his honesty sometimes succumbs; but, on the other hand, from drunkenness he is nobly emancipated. A dog mentioned by the Rev. Thomas Jackson ("Our Dumb Companions"), having been once made so drunk with malt liquor that he was unable to walk up stairs, ever after declined to taste the pernicious beverage, and growled and snarled at the sight of a pewter pot. Again, as to love, Don Juan was a cold and unenterprising character compared to a dog; and as to maternal affection, the mother dog feels it with heroic passion, starving herself to death rather than forsake her offspring. Gratitude may be almost said to be a dog's leading principle, supplying first the spring of allegiance to his master, and ever after reconciling him, with true magnanimity, to take evil from the hand from which he has accepted good. Regret and grief he feels so deeply that they often break his heart. Fear is a passion which dogs exhibit with singular variation, some breeds and individuals being very timorous, and others perfect models of courage, the latter characteristics and fortitude seeming to be more characteristically canine. A greyhound has been known, after breaking his thigh, to run on till the course was concluded. As to hope, no one can observe the dog watching for his master's step, as in Landseer's picture of "Expectation," without admitting that he knows the sentiment as well as we. Pride in a successful chase may be witnessed in every dog, and even felt in the quickened heartbeats of a greyhound when caressed and praised. That dogs have personal vanity appears from the fact that they are so manifestly dejected and demoralized when dirty and ragged by long exposure, and recover their self-respect immediately on being washed and combed. Chivalry and magnanimity may nearly always be calculated upon in dogs, and wife-beating is an offence to which the four-footed beast never descends. The stories are endless of big dogs generously overlooking the insults of small curs, or taking them into water and giving them a good ducking as a punishment for their impertinence, and then helping them mercifully back to land. Sense of property, bifurcating into both covetousness and avarice, is common to all dogs. The kennel, rug, collar, water basin, or bone once devoted to his use, no dog can see transferred to another without indignation. Frequently he "covets his neighbor's house," and attempts to ensconce himself in it surreptitiously; and almost universally he covets his neighbor's bone, and purloins it, if he dare. Even from avarice he cannot be wholly exonerated, observing his propensity to bury his treasures. Shame, after transgressing any of the arbitrary rules imposed on him, a dog displays with ludicrous simplicity; but of the deeper sense of violated modesty which in human beings accompanies the commission of sin, the dog evidently knows nothing whatever. Humor, so far as it can proceed without language, the dog catches readily from a humorous master, and also the enjoyment of such games as he can understand. As a baby crows with glee at "bo-peep," so a dog barks with delight at "go-fetch." Make-believe runs and false starts, romps and ticklings, throwing a ball for him to catch on the grass, or a stick to fish out of a lake, all supply him with pleasures perfectly analogous in their nature to that which boys and men find in blind-man's-buff and prisoner's base, lordly cricket, and lady-like croquet. Lastly, faith in a beloved superior is perhaps the most beautiful and affecting of all the attributes of a dog.

HOW MONEY IS MADE.

The most interesting of all the public works in Washington is always closed to the public. It is that of making money, carried on in the upper stories of the Treasury Building. A rigid rule excludes all visitors from this bureau of the Treasury Department. The rule is an eminently reasonable one. Millions of dollars in notes, currency, and bonds, are here undergoing a process of manufacture. It is true that precautions might be taken to prevent light-fingered gentry from carrying off any of this valuable stock; but this is not enough. No rule can prevent employees from abstracting something from the immense piles of money if the public are admitted. To prevent the possibility of such abstraction, no workman or workwoman is allowed to leave the room in which he or she works until the money or stock has been counted, and all that has been brought in through the day is found to be safely there, or to be duly accounted for. If anything is missing, no one can leave the room till an investigation is had and the offender is found. But if a score of visitors have passed through the room, an opportunity is left to the suspected person to lay the theft off upon the visitors, and even to employ a visitor as an accomplice in the theft. For the last two or three years, therefore, no one has been allowed in that part of the Treasury building in which the manufacture of money is carried on, without a permit from the Secretary of the Treasury himself. The Government, however, is glad to have the public know what it is doing, and how it performs its duties. Therefore, through the courtesy of the Chief Clerk of the Treasury Department, a representative of the press was recently permitted to visit the mechanical establishment of our money-making institution. His description, accompanying the annexed engravings, we copy from the *Christian Weekly*.

BANK NOTE ENGRAVERS AT WORK.

To obtain accurate information as to the manufacture of currency and postage stamps, it is not enough merely to visit the Treasury Department; three great printing establishments combine in the manufacture of every bank bill issued by the United States—the Treasury Department, the American Bank Note Company, and the National Bank Note Company. Through the kindness of Mr. J. Macdonough, the superintendent of the latter company, the writer had the opportunity of spending half a day in their manufacturing establishment, which occupies the whole of the upper floors of the Cooper Institute. Many of our illustrations are taken from sketches made there; and the whole article embodies, though necessarily in a very brief form, the results of observation in both visits. Although we are chiefly concerned in the description of the manner in which American money is made, our observation took a wider scope. In more senses than one America makes money for the whole world. Though the United States Treasury Department only prints for the United States Government, the two bank note companies print not only for our own banks, but also for foreign countries. The National Bank Note Company were, at the time of our visit, printing bonds and paper money for Japan, the South American Republics, and several European governments. Indeed, New York city may be almost said to be the center of the manufacture of paper money for the world.

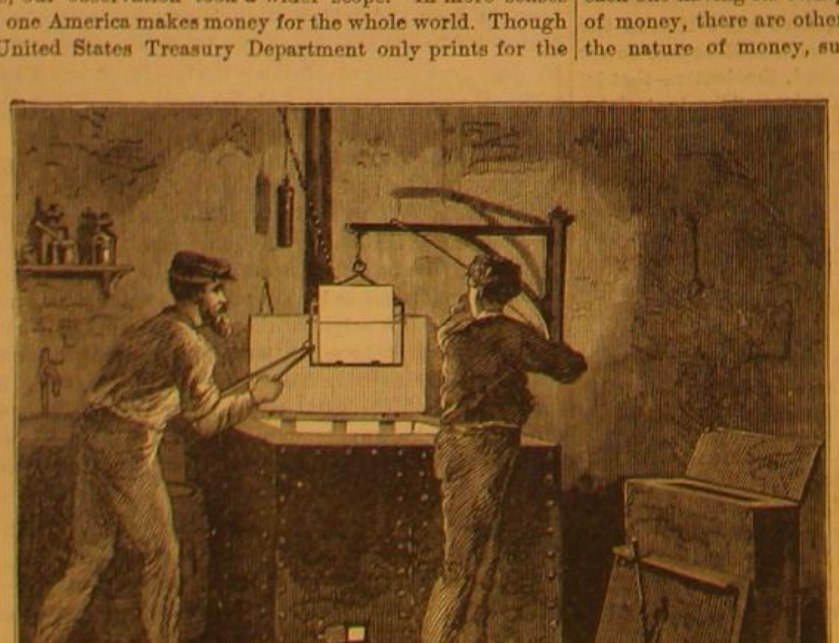
The printing of money in its various forms is a much larger and more complicated operation than most of our readers imagine. There are, first, the bonds of various descriptions and denominations, which serve in commercial circles in lieu of money; second, the bills which are issued directly by the United States Treasury, and which embody a promise to pay on demand, at the Treasury, to the bearer; third, the fractional currency of ten, twenty, twenty-five, and fifty cent pieces, all of which are printed for the United States, for no bank ever issues fractional currency; fourth, the national currency, that is, the notes issued by banks and redeemable by them, but secured by a deposit of United States bonds in the Treasury Department. There are four kinds of money, each of which is, in turn, divided into various denominations, each one having its own peculiar design. Besides these forms of money, there are other forms of paper value which are in the nature of money, such as postage stamps and internal revenue stamps of various kinds and of all values, from one cent upwards. The extent to which this latter business of stamp printing is carried on is indicated by the single fact that the National Bank Note Company, which prints all the postage stamps for the United States, prints 500,000,000 in a year, and sometimes sends off as many as 13,000,000 in a single day—a large wagon load. The reader will hardly expect to get a clear and comprehensive view of these complicated operations in an article confined within two pages of a newspaper; if he does he will be apt to be disappointed.

THE ROLLER DIE.

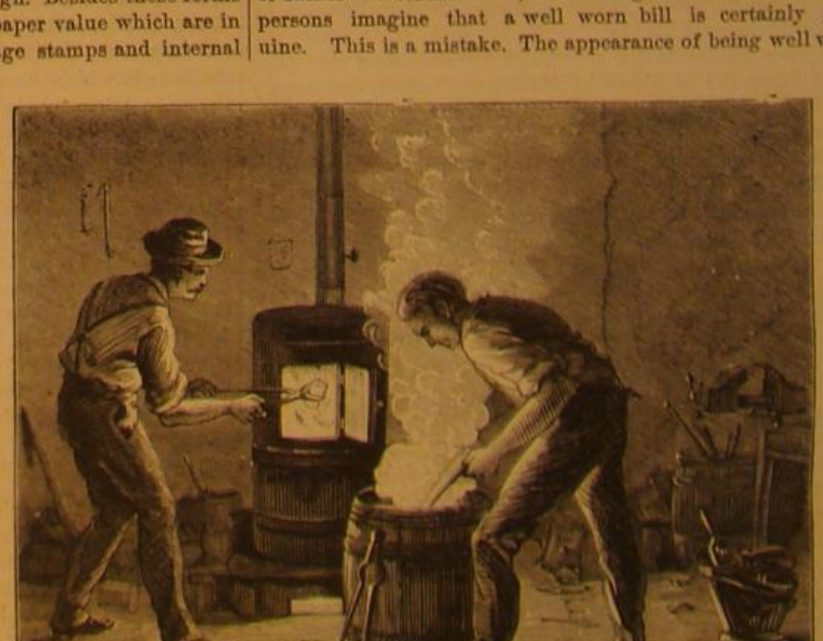
The circumstance which gives to this manufactory its peculiar character and its peculiar interest is a singular one; it is the fact that all over the country are shrewd men, and often men of large resources and extensive capital, who are watching for the opportunity to imitate the legitimate paper money. The utmost skill and the most elaborate system of precautions are necessary to produce an article which private coining cannot successfully imitate. It is this skill which gives to the manufacture of money a character quite different from that of any other branch of mechanical industry. Nor is less precaution taken to prevent the many hundreds who are engaged in the various processes from abstracting any of the money for their own use.

The first precaution is in the manufacture of the paper itself.

If the reader is so fortunate as to have a fresh piece of fractional currency in his pocket, a ten cent or twenty-five cent piece, and will take it out and examine it, he will detect what at first sight appear to be imperfections in the paper on which it is printed. It is full of little specks and shreds of what seems like colored silk. But if he attempts to pick these shreds off, he finds that they are in the texture of the paper itself, and cannot be got off without tearing the paper to pieces. This is the first precaution against counterfeiting. All the money made by the United States Government is printed on this peculiar paper. It is made only at one mill, in the vicinity of Philadelphia. It is a penal offence for any other manufactory to make it. It cannot be made without large and heavy machinery. All the paper on which United States money is printed is manufactured at this one mill. The machine, by means of an automatic register, keeps an account of every sheet of paper manufactured. For every sheet which this tell-tale instrument declares has been made, the proprietors of this mill must account to the United States Government, so that none of the paper can get into the market except by the United States authority. If the reader finds his fractional currency, or his United States note, printed on this paper, he has one evidence of the genuineness, and one which the counterfeiters find it very difficult to copy. They avoid the difficulty by so soiling their bills that this feature, or rather the absence of it, is no longer discernible. Many persons imagine that a well worn bill is certainly genuine. This is a mistake. The appearance of being well worn



HARDENING THE PLATES.



HARDENING THE DIES

is one easily counterfeited. The national currency, that is, the bills which are issued by the national banks and not by the United States Government, are not printed on this paper.

The next step in the manufacture of money is the printing. If the reader will examine with care a United States bank note, that is, one which embodies a promise to pay, not by a bank, but directly by the United States Government, he will observe that the back is printed in green, which gives to it its title of greenback, while the front, besides the figure and the pictures and the red stamp, which combine to cover the surface pretty effectually, has upon its groundwork a tint, also of green.

The paper when it comes from the manufactory goes to one of the bank note companies of New York, which prints the green back; the sheet so printed is then sent to another bank note company, which prints a green tint upon the face of the note; and the half-printed note is then forwarded to Washington, where the process is completed by printing the pictures, the number, the denomination, the signatures, the words, and the red stamp. The company which receives the paper from the mill gives a receipt for the paper received, which is the voucher of the mill owner to the United States. That company must then turn over to the other company notes equivalent to the full amount of paper received, and must account to the Government for any that are mutilated in the process of printing; and the second company, which gives, in turn, a receipt for the incomplete bank notes, must give to the Government as much as it has received from its associates in in the work. Thus, if there were a fraudulent workman in either company he could not defraud the Government without a confederate in the other company, and both must have a third confederate in the Treasury Department. In short, it would seem to be impossible to foist upon the market any money manufactured for the Government, which it has not duly received and got the value for, without a gigantic conspiracy, involving not only the Treasury Department itself, but also the two greatest bank note engraving corporations in the United States, and probably in the world. Not even a dishonest Secretary of the Treasury has it in his power to defraud the Government by manufacturing money for his own use.

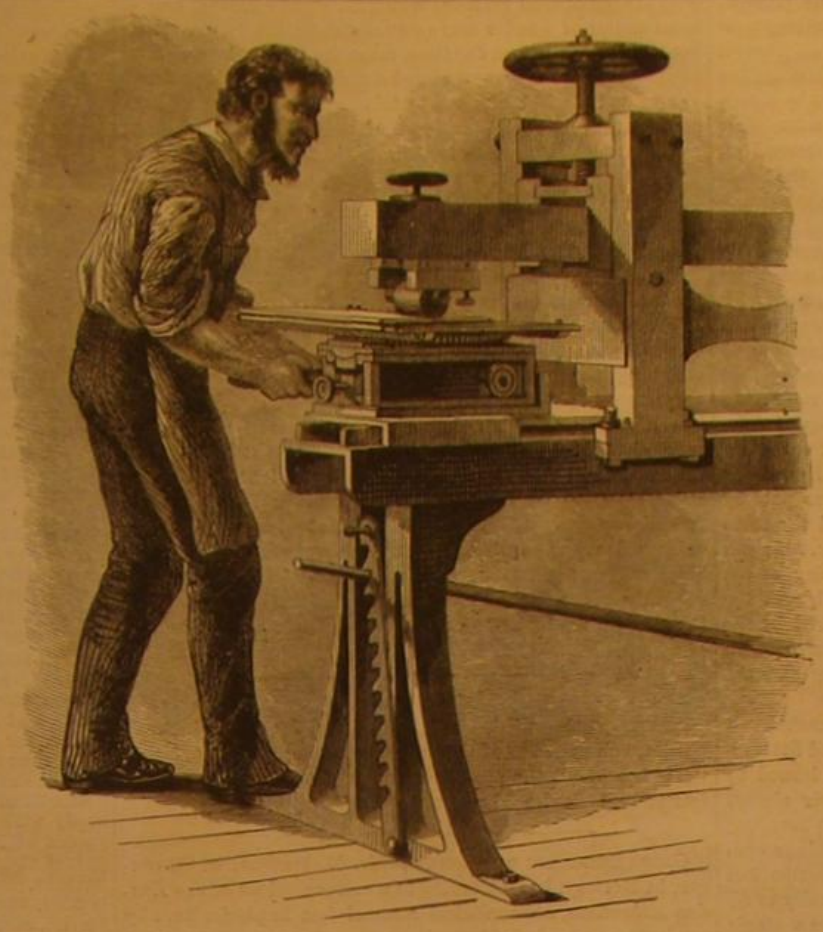
The bill having now passed through three hands—the paper manufacturer and the two bank note engravers—comes into the Treasury Department, where it undergoes the third series of operations, to still guard against the counterfeiters.

The United States Treasury never prints the green back nor the tint upon the face of the bill; but in all the subsequent operations the method is substantially the same, whether the bill be a United States bill printed by the United States Treasury, or a national bank note printed by the National or the American Bank Note Company. One description, therefore, must suffice for both.

The first safeguard in these printing operations against counterfeiting is the portrait. There are no artists in their profession superior to those who are employed in the designing and engraving of bank notes. By the side of these genuine artists the counterfeiters are blunderers. In a good bill the portrait is always the accurate likeness. To secure it, a daguerreotype is first obtained. This gives a picture on a metallic plate. The features are then drawn lightly on the plate with a sharp-pointed instrument by an artist, who follows accurately the outlines of the portrait. From this outline an impression is printed. The operation of printing, from what is little more than the scratch of a pin, is a delicate one, as may be well imagined. The impression thus obtained is transferred by a chemical process to a steel plate, which is covered with a preparation of wax, the better to receive the impression. The artist then has before him a steel plate covered with wax, on which the outlines of the portrait which he is to engrave have been mechanically transferred from the sun's own painting. These outlines are then traced on the steel beneath by a sharp tool; the wax is removed, and the face is still presented in outline on the steel. The shading is then completed by the workman, who, to accomplish his task successfully, must possess at once the artistic skill of a draftsman and the mechanical skill of a perfect engraver.

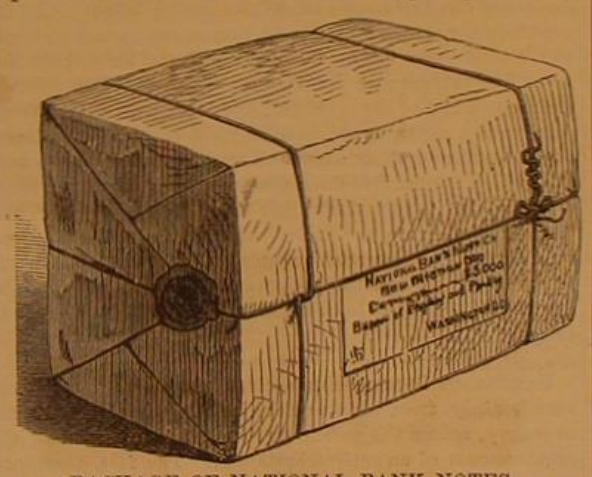
This work of engraving is one which requires the utmost accuracy of eye and steadiness of touch. Both in the Treasury and in the bank note company's buildings, there is a large room devoted to the engravers, whose eyes are carefully screened from the light, which is skillfully adjusted to their work by large muslin curtains which surround each workman on three sides. On our visit to the Treasury Department our lady companion asked an old man, who was busily engaged with the engraver's tools, if his work was not very injurious to the eyes. "I have been at work at it these fifty years," said he, "for I am over seventy years old, and you can judge for yourself;" saying which, he pushed his glasses up from his eyebrows, and turned on her a pair of eyes as bright and clear as one often sees beneath the brows of eighteen.

The work of engraving even a single bank note



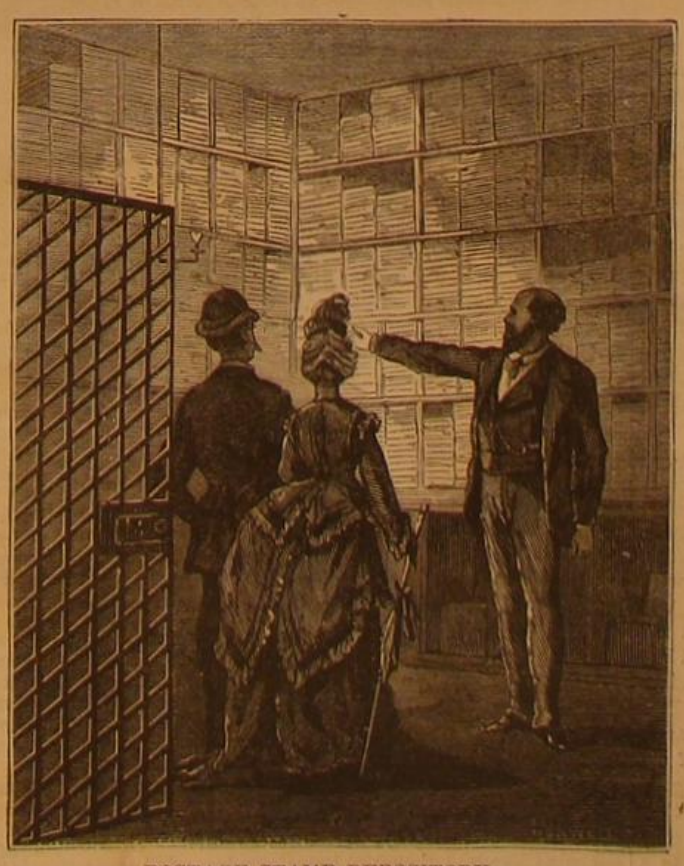
THE TRANSFERRING PRESS AND ROLLER DIE.

plate requires very diverse kinds of skill. One artist has success with portraits, another with buildings, a third with lettering, another with ornamental work. No one artist ever engraves an entire note; several different artists are always employed to each bill. The processes by which their various operations are combined in one constitute, perhaps, the most



PACKAGE OF NATIONAL BANK NOTES.

curious and interesting of all the various operations in the manufacture of paper currency; but we despair of explaining that process, even aided as we are by the pencil of the artist. We shall make the attempt, but we assure the reader that the operation will not be understood by him, however



POSTAGE STAMP DEPOSITORY.

successful we may be in describing it, without careful attention on his part. The possibility of the feat, we can give it no other name, almost passes our belief, although we have seen it performed. After the design of a bank note is fixed upon, it is given out in separate pieces to separate artists. There lies before us, as we now write, a two dollar treasury note; on it is a picture of Jefferson, a picture of the Capitol at Washington, the printed lettering, "United States will pay to bearer two dollars," the signatures, John Allison, F. E. Spinner, the large figure 2 in one corner, and a great quantity of twos printed in very fine lettering all around the margin, and moreover an elaborate ornamentation in various parts of the bill. One man probably engraved the portrait of Jefferson on one piece of steel; another workman, at a separate desk, engraved, on a separate piece of steel, the printed letters; a third the signatures; others the view of the Capitol building, and still others engraved the small letters on its margin, while still another probably engraved the large figure 2, and one or two more did the ornamental work. Each of these bits or pictures and lettering was engraved, the reader will understand, on a separate piece of steel. Sometimes as many as thirty steel plates are combined in a single note. It is the process by which this combination is effected that is so extraordinary.

The reader must not imagine steel to be necessarily a hard piece of metal. Hard and soft are but relative terms, and the steel of the engraver is made hard or soft, according to his desire. Steel rollers are prepared. They are softer than the steel plates on which the separate fragments of the bank note lines are engraved by the separate artists. By a powerful pressure the various pictures which the artists have engraved are impressed on these steel rollers. They take the impression much as subsequently the bank note itself takes the impression, or as a piece of wax would take it. The work of the artist is, of course, reversed, and the picture, or rather the fragment of the picture, appears on the roller in a legible form, as it will subsequently appear on the note. The artist now has his bank note still in fragments, that is, in separate pieces, but on separate rollers instead of on flat plates. These rollers are now hardened by the action of fire, and thus prepared for the next process. It is the process of transferring. Our artist gives to the reader a picture of the transferring machine. In this machine a flat plate of soft steel is placed, the roller containing some fragment; the portrait, for example, is adjusted by the workman in its proper place over and upon the steel plate, and a pressure of from fifteen to twenty tuns is brought to bear upon it. This pressure transfers the portrait to the steel plate below. The roller is then taken out and the next roller put in its place. This is adjusted so as to bring it in its proper place, and the pressure is again applied. The roller itself is moved gently back and forth by the hand of the operator so as to distribute the pressure equally on all parts of the picture. Thus one roller after another is introduced, the operator depending on his skill of eye and hand to adjust perfectly the various fragments of the complete design to each other until the whole bank note is impressed upon the soft steel plate. The skill and accuracy required in the operation are almost beyond conception. The most powerful magnifying glass brought to bear upon the bank bill fails to show where the various parts of the completed picture have been joined.

This plate is now to be prepared for the press by being hardened. For this purpose it is taken to the furnace and there immersed in a fireproof box containing carbon, and plunged into the furnace. When the requisite heat has been obtained, it is taken out and dipped quickly into oil or brine, or transferred to a vise, which screws its surface hard upon a plate of lead, where it is left to cool. This operation is one requiring the utmost judgment, skill, and dexterity. The heat must be of just the required amount, neither too much nor too little, and when the heated plate is ready to be taken from the fire it must be transferred so instantly from the carbon box to the plate of lead or liquid that the air shall have no opportunity to perceptibly cool its surface. This annealing being completed, the plate is ready for the printer.

We ought not to pass by the engraver's operations without mentioning the geometric lathe. The reader will observe, on many of the national bank notes, and on almost all of the United States bank notes, a series of very intricate and involved lines, running to and fro in involutions which defy imitation. In the bank note before us, as we write, the figure 2 is printed on a background formed by these snaky lines. This is done by means of the geometric lathe, an instrument which, by a singular combination of wheels, can be set to marking out almost any conceivable combination of curved lines. The number of combinations is practically without limit. The machine is an expensive one, and can only be made by machinery; the counterfeiters are supposed not to possess one, and they are not able to imitate successfully its work. To the casual observer, the portrait is the best test of a counterfeit bill; to the detective, the lathe work under a magnifying glass affords the final test.

We have left but a word to speak of the printing process. This does not differ very widely from other printing processes, except in being done wholly by hand. Two persons operate the press together. The first inks the plate and so prepares it for the press, adjusts it in its place, and by a turn of the wheel applies the pressure; a second cleans the plate off and prepares it for a second printing. This is done, first, by wiping off the remaining ink with a cloth, and then polishing the plate with whiting, rubbed on with the palm of the hand. Long experience has demonstrated that there is no such polisher as the human hand; but it gets fearfully dirty in the operation. In Washington a register, analogous to that attached to an ordinary gas meter, is connected with every machine, which thus registers every impression taken. This register is locked and the key is in the possession of the superintendent, who thus has a means of proving that no money has been abstracted from the printing room. In the printing room at the Treasury Department eighty of these presses are in simultaneous operation; in one of the print rooms of the National Bank Note Company of New York there were one hundred and sixteen. The men are paid by the piece, and work with marvelous rapidity, and the room presents a very striking picture of busy activity. It can hardly be credited, but it is the fact, that the wiping of the plate by the hand sensibly wears away the steel, and the difference in value of different workmen is measured by the skill with which they succeed in polishing the surface with the least wear—producing the greatest cleanliness and the least attrition of the plate.

The money is now substantially ready for the market. It only remains to print upon it the seal of the United States—a red stamp, which is affixed to all bills, whether issued by the United States or the National banks, and is always printed at the Treasury Department—to add the number, which is changed with every printing by an ingenious contrivance, which our space does not permit us to describe but which gives to every note its own number—and finally to divide the notes, which are printed six or eight on a single sheet and must be separated, an operation which is done in Washington by an ordinary bookbinder's cutting machine but which requires the greatest skill in its manipulation, in order not to mutilate any portion of it. The money is then packed in boxes; if printed by a private bank note company, it is sent to Washington to receive the Government stamp; if in the Treasury Department, it is sent down to the Treasurer, where it is stowed away in vaults, ready for use. Just before our visit to the Treasury Department there had been a careful counting of the money in the vaults. It amounted to $1,038,000,000: or, if the reader gets no very clear idea from figures expressed in billions, and we confess we do not, he may get a better conception from the statement that it comprised ten cords of paper money.

There are some of the products of the press room which, however, never get to the Treasurer. These are the mutilated and imperfect bills. Along with these are bonds and bills worn out by long use and sent to the Treasury to be redeemed. These are carried to a furnace room a few rods from the main Treasury building, and there, in the presence of a committee appointed to witness their destruction, they are burned, the smoke being forced through water to prevent any part of the charred paper from being carried off and picked up for future presentation.

The most wonderful thing concerning these operations remains to be told—the accuracy with which they are conducted. A single sentence from the report of Mr. George B. McCartee, chief of the Bureau of Engraving and Printing, sums up the results of this painstaking care: "It affords me great pleasure to state that, in the engraving, printing, and finishing of $890,483,995, notes, bonds, and other securities, and 104,140,286 stamps during the year (1871), not one note or sheet of paper has been lost to the government."

The Cat Show at The Crystal Palace.

There can be very little question as to when the first animal show occurred. According to Archbishop Usher's calculation, it was in the year 2349 B. C., and the place where it was held was Noah's Ark. It lasted for at least nine months, says *Land and Water*, and must have been a hard time for Noah and his family if the antediluvian animals wanted anything like the attention that their descendants get in these days at the Regent's Park. How they fed the *carnivora* at all, and how they stowed away enough green food or hay for the *graminivora*, is an interesting subject of inquiry which I must pass over for to-day. Further on in history there were grand beast shows at Rome. Sulla exhibited 100 lions, Scaurus a hippopotamus and five crocodiles, Pompey 600 lions and twenty elephants, Julius Cæsar several giraffes, Augustus a snake fifty cubits long, Trajan 11,000 animals in all, and Probus 1,000 ostriches, among other live luxuries. In all these cases the enjoyment of the Roman citizens, who were the principal witnesses of the show, was hightened by the death of the curious beasts which had cost their exhibitors so much money and trouble; and the same strange principle was adhered to later in history, when the Smithfield Club, so lately as in 1798, took to exhibiting fat cattle, which were killed by the butcher instead of killing each other. It was not till 1838 that the Royal Agricultural Society hit on the brilliant idea that an animal need not be killed because it had been exhibited, and as soon as mercy prevailed over sacrifice the system became popular.

The fourth cat show, which lately closed its doors, was an improvement, both as to the quality and the number of entries, on any previous. The arrangements were very good and the comfort of the animals so strictly studied that they suffered as little as possible from their confinement, and only lifted up their sweet voices occasionally. But five days in a cage is a great trial for a cat which is used to liberty, and it is no matter of wonder that some of the prisoners were looking very weary before the time came for their release. Perhaps variety of color was the most striking feature of the show. White and black, tabby and tortoiseshell, and their various combinations, are familiar to all of us, but here in addition were mouse color, whity brown, bright reddish yellow, pale grey, pug dog brown, a greenish grey, like a Scotch hare, and other strange shades, causing the visitors to play desperate havoc with the tenth commandment. Cats and kittens all told, and without including certain interlopers in the way of puppies and birds which were in the cages with the cats, there must have been about four hundred animals in the show, the largest and finest being No. 257, a monstrous tabby tallow cask of a cat, with a splendid skin, weighing nearly twenty-two pounds, and superior in all respects to the well known "Museum Street Jack," the heavy weight champion of previous shows, who never quite reached twenty pounds in weight. Perhaps the handsomest cat exhibited was No. 281, a magnificent *brun doré* from Paris, "Fritz" by name, only two years old, and with a face like an eagle owl's, beautiful to the last degree, and capable of looking exquisitely savage on very slight grounds. Most cats are self-satisfied enough, but "Fritz" was absurdedly consequential, and held his dainty little nose in the air with the look of an opera *prima donna* obliged to sing in a barn.

Erratum.

In our article entitled "Scientific and Mechanical Possibilities," on page 329 of the current volume, it is stated that "it is not within the possibility of mechanism to bore 4,000 feet more." It should read: "Is it not," etc.

CROSS BREEDING OF FISHES.—Mr. B. Hanson, of Stavanger, in Norway, has, according to a correspondent of the *London Athenæum*, accomplished a novel feat in pisciculture by producing a new hybrid species, a cross between *Salmo alpinus* and *Salmo eriox*, the former species spawning four weeks before the latter. Mr. Hanson's manner of bringing together the spawning maturity of the two species is ingenious. When *Salmo alpinus* has been spawning for some time, Mr. Hanson secured a female fish in an interesting condition, and imprisoned her in a perfectly dark tank, where he left her alone. In a like manner Mr. Hanson, as soon as possible, secured the sire of the first couple of *Salmo eriox* he found in mature condition for spawning, and put him under a similar arrest, and kept a close watch over both until the time of the sire came. In this manner Mr. Hanson has succeded in rearing, with only a loss of one per cent, in his spawning boxes (supplied from a subterranean well which flows with a uniform temperature of +5½° Réaumur all the year round) a new species, which attains full development in four years, and is remarkable for its exceeding vigor and wildness in water, and its palatableness on the table. Mr. Hanson entertains sanguine hopes of this species becoming self-productive in course of time, contrary to all experience of hybrid fish, because he has already caught in his pond several individuals with roe in them."

DANGEROUS DIETS.—The failure of the potato crop in England is likely, from what we read, to bring about an epidemic of scurvy, unless the public can be better informed of the requirements of an antiscorbutic diet. The fact, therefore, cannot be too widely made known that pease pudding, haricot beans, and boiled rice, which have been suggested in the journals as substitutes for potatoes, will not prevent the occurrence of scurvy. In the absence of the potato, an excellent antiscorbutic, fresh green vegetables or fruits will be requisite, or the health will certainly fail, even though fresh meat be taken. Amongst the vegetable material which may be used, the *Lancet* states, are the various forms of cabbage, lettuce, oranges, lemons, onions, mustard and cress, dandelion, and sorrel. The experience of the crews of vessels on long voyages has shown, over and over again, the uselessness of the pea and bean tribe in preventing scurvy.

VELOCITY OF NINE-POUNDER SHOT.—Experiments have recently been made to determine the velocity of the nine-pounder shot when fired with various charges of powder. From the nine-pounder gun of 8 cwt., with 3½ lbs. of rifle large grain powder, a velocity of about 1,500ft. per second was registered, the gun being quite uninjured. In order to obtain these results on service a stronger carriage is required, and will probably shortly be made. The carriage on which Sir J. Whitworth's new gun was fired on the sands at Southport has endured the strain of the heavy charges exceedingly well.

AIR was compressed by Professor Tyndall, by means of a column of water 260 feet high, to one eighth of its original volume (120 lbs. to the square inch) and then allowed to escape. As it rushed out, it expanded so violently and caused such an intense cold that the moisture in the room was congealed in a shower of snow, while the pipe from which the air issued became bearded with icicles.

SCIENCE is studied by the observation of facts. But observation is not easy. It requires more memory and a further perspective than most men possess. Experiment, too, is necessary, which is a series of questions put to Nature, and no witness can be found more difficult to examine.

MANUFACTURE OF LETTER ENVELOPES.—One establishment in New York city, that we know of, is now turning out nine hundred thousand letter envelopes daily.

DECISIONS BY THE COMMISSIONER OF PATENTS.

Horse Rake Patent.

CALISTA E. COX, EXECUTRIX.—*Extension.*

In the matter of the application of Calista E. Cox, executrix of the estate of Harvey W. Sabin, for extension of patent No. 7,813, for improvement in horse rakes, granted December 3, 1850. Extension granted for seven years from June 8, 1872.

Preserving Hops.

BATES *vs.* SEEGER & BOYD.—*Interference.*

Appeal from the Board of Examiners-in-Chief in the matter of the interference between the application of Benjamin Bates and the patent of Seeger & Boyd for an improvement in preserving hops.

To pack goods of various kinds in bottles or cases made airtight, in order to preserve their contents more effectually, has been common from time immemorial, and cannot be monopolized under a patent.

THACHER, Acting Commissioner:

The patent was granted to Seeger & Boyd, December 12, 1871, application therefor having been filed the 20th of October preceding.

The application of Bates was filed January 13, 1872.

The patent contains two claims. The first is in interference, and is as follows, viz:

As a new article of manufacture and trade, hops ground or pulverized and incased in airtight packages, as and for the purpose set forth.

The gist of the invention is the airtight package. Neither party claims here the article itself, and, in fact, there is proof in the case that it is entirely destitute of novelty.

I can find nothing whatever patentable in what Bates has done. Covered cans and boxes, and corked bottles, are the most common devices in the world for securely keeping solids and liquids of every description. There is no more reason for granting a patent for a bottle or can of ground hops than of ground pepper, ground spice, or any other pulverized substance.

It will undoubtedly be said that objections of this nature apply with equal force to what is called an invention in the patent of Seeger & Boyd. I freely admit it. Why such a patent should ever have been allowed is beyond my comprehension. It has been the practice to hermetically seal cans, bottles, and packages of every description from time immemorial, and for the purpose of preserving their contents in their original condition. The result in this case is precisely what every one would have expected; there is no new discovery whatever. Not even *special skill* is required to practice the wonderful art described; much less is there the least demand for the exercise of *inventive genius*. A mere child can put ground hops into a bottle and cover the cork with sealing wax.

The grant of such patents, for what is utterly unworthy to be called invention, is a fraud upon the public, and is to be condemned in the strongest terms.

Unfortunately, the patent of Seeger & Boyd is beyond the control of the Commissioner, and it therefore becomes necessary to formally pass upon the question of priority.

Judgment on this point must be given in favor of the patentees.

Lead Pencil Eraser.

Appeal from the Board of Examiners-in-Chief in the matter of the interference between the applications of Samuel D. Hovey, Joseph Ilfelder, Philip Hufeland, J. Reckendorfer, and T. H. Muller for letters patent for an improvement in eraser attachments to lead pencils.

THACHER, Acting Commissioner:

The inventor of a short paper sleeve, which serves only to connect an India rubber eraser to a pencil, and does not cover the rubber so as to protect it and make it firm, is entitled to a patent for what he has invented only, and not for such a one as would embrace the latter feature.

Notwithstanding the patent thus allowed, a subsequent inventor of a paper sleeve, made long enough to cover and protect the rubber and strengthen the connection, may have a patent for it.

Where there is reason to doubt whether the only invention to which the successful party in an interference is found to be entitled is new, his application should be referred back to the Examiner to investigate the question.

The testimony in interference cases should be so construed as to conform to the preliminary statement of the party producing it; and such as is inconsistent with it should be disregarded.

The date of an invention originated abroad can be carried back no further than the time when specimens embodying it are shown, on satisfactory evidence, to have reached this country.

Judgment in favor of Hufeland.

DECISIONS OF THE COURTS.

United States Circuit Court, District of Connecticut.

RUSSELL AND ERWIN MANUFACTURING COMPANY *vs.* MALLORY *et al.*

A suit in equity, brought by the Russell and Erwin Manufacturing Company against Mallory, Wheeler & Co., under letters patent granted to Rodolphus L. Webb, December 31, 1867, for "improvement in reversible locks and latches."

Before Judges WOODRUFF and SHIPMAN.

DEFENSES NOT SET UP IN THE ANSWER—COMBINATIONS—ABANDONMENT—ESTOPPEL—WEBB'S PATENT FOR REVERSIBLE LOCKS AND LATCHES.

If Webb's reversible latch was new and useful it was patentable, and his patent is not to be held invalid because he only claims the latch *when used in an outer case containing also lock mechanism*—and this even though there be no relation between the latch and the lock.

The statute secures to the inventor an interval of two years in which to test the usefulness and the value of his invention by putting it into use and on sale, without being thereby barred of his patent; and it necessarily follows that, from the mere lapse of the period mentioned, no presumption of abandonment can arise.

When by express enactment an inventor may have two years of trial in the public markets, putting his invention in use and on sale, and yet be entitled to a patent, there is no reason for concluding that he may not also have the like period at least within which to offer his right as an inventor to others—submit the invention to that test of its usefulness and value—and yet be entitled to his patent.

Where it appeared that, during a period of delay in applying for a patent, the first inventor had asserted a continuous claim as such, and a purpose to secure a patent on his invention, and had shown some, though inadequate, appreciation of its value, although another meanwhile had made the same invention and put it on sale: *Held*, that there was no *abandon-*

ment of the invention by the first party, either as a useless experiment or by a surrender of it to the public.

Where an inventor makes no secret of his invention, cherishes and declares his purpose to procure a patent therefor, and exhibits it to those who, being engaged in the manufacture of articles of a similar character, are competent to judge of its value, in the hope that they may purchase, he himself being in no situation to engage in manufacturing, he is not *estopped* to assert a right to the invention and to claim a patent because his application is not made until nearly two years have elapsed.

Apart from the question of *abandonment*, the mere fact that, prior to the application for the patent, some one has obtained knowledge of the invention and placed the thing invented on sale, whether innocently or fraudulently, does not cut off the prior right.

As between the first inventor and the prior manufacturer no equity can be urged in favor of the latter, except that the former cannot claim damages or profits arising before his patent is granted.

The circumstance that such prior manufacturer is also an original inventor, and believes himself to be the first inventor, does not affect the question. He is in no better situation than one who ignorantly and innocently supposes that the invention is open to the public.

Infringement was admitted. The defenses urged at the hearing were non-patentability of subject matter, lack of priority of inventorship, abandonment of the invention, and estoppel, as is fully set forth in the opinion of the Court.

Patent sustained.

B. F. Thurston and *C. E. Mitchell*, for complainants.

C. F. Blake and *C. R. Ingersoll*, for defendants.

Supreme Court of the United States.

Lamp Patent.

CARLTON *et al. vs.* BOKEE.

In equity. Appeal from the Circuit Court of the United States for the District of Maryland.

MR. JUSTICE BRADLEY delivered the opinion of the Court:

William Carlton and the Bridgeport Brass Company, as assignees of Christian Reichmann, filed their bill in equity in the court below to restrain the defendant, maker of the Comet burner, from infringing a patent for an improvement in lamps, granted to Reichmann on the 21st of September, 1858, and reissued to Carlton and one Merrill on the 11th of August, 1868. The lamp as patented to Reichmann was one of a large number of attempts made about that time to utilize petroleum and its various products for purposes of illumination. The old lamps adapted to sperm oil, lard, and other gross and sluggish oils were unfitted for the use of so volatile and dangerous a substance. In them the flame was set close to the lamp, and the tube holding the wick was projected downward into the oil, so that the heat of the flame might be communicated thereto in order to render it susceptible to the capillary attraction of the wick. Such an arrangement as this with petroleum would have produced a speedy explosion. This article required that the flame should be elevated as far as possible above the lamp, and that the metallic wick-tube should not communicate any heat to the fluid. This was one object to be attained in the burners required for the use of the new illuminator. Another was some contrivance for concentrating a current of air upon the flame itself so as to consume as perfectly as possible all the rapidly escaping volatile gases, both as a saving of light and as a preventive of the disagreeable odors which they would otherwise diffuse.

Two well known burners are conceded to have been in use before Reichmann's invention, which have a material bearing on his claims—the Vienna burner and Stuber's burner. These have been exhibited to us. The Vienna burner contained the flat wick-tube, the ratchet wheel attached thereto (but covered and not exposed as in Reichmann's), and a slotted dome above the wick for the flame to pass through, and a chimney. But the dome was not supported by slender arms, as in Reichmann's, but was connected with a gallery which supported the chimney and surrounded the wick tube and dome, and rested on the lamp or cap below, so that all the light of the flame below the dome was inclosed and lost, and could not issue out, as in Reichmann's burner. The Stuber burner, invented by John Stuber in 1856, and made in considerable quantities in that and the following years at Utica, New York, was an improvement on the Vienna burner in this, that the gallery was so low as to leave a considerable open space under the dome for the reflected light to pass out in a downward direction, and the dome was supported by slender arms; but these arms were attached to the gallery and not to a sleeve fitted on to the wick tube. It differed, therefore, from Reichmann's in these respects: The chimney was supported on a low gallery instead of the dome itself, and the dome was supported by arms attached to this gallery, instead of arms attached to a sleeve on the wick tube. Therefore, with these burners before us, all the invention we can discover in Reichmann's burner is the peculiar mode of supporting his dome by slender arms attached to a sleeve fitted on to the wick tube, and the elevation of the chimney on the outer edge of the dome. The latter peculiarity, as we have seen, is a defect which rendered the burner nearly useless.

We are constrained to hold, therefore, that the Comet burner is not an infringement of Reichmann's original patent or of the invention which is exhibited in his original specification.

It is proper next to inquire as to the bearing of the reissue patent on the question in litigation between the parties. The defenses made by the defendant against this reissue are, first, that it was obtained illegally, wrongfully, and by false pretenses, and because it seeks to claim things of which Reichmann was not the original and first inventor. Secondly, that the original patent itself was void because the only thing in it which Reichmann had any pretense of inventing was anticipated by a man by the name of Michael H. Collins as early as 1843.

The specification of the reissued patent describes the burner of Reichmann substantially as was done in the original patent, being interspersed, however, with observations as to the uses and objects of particular parts, evidently borrowed from subsequent experience and events. The single claim of the original patent is expanded into seven distinct claims. If they mean anything more than the claim in the original patent, they are void. Being identical with that, they are needlessly multiplied, and by exhibiting a seeming of claims to which Reichmann was not entitled, they are calculated to confuse and mislead. We think it proper to reiterate our disapprobation of these ingenious attempts to expand a simple invention of a distinct device into an all-embracing claim, calculated by its wide generalizations and ambiguous language to discourage further invention in the same department of industry and to cover antecedent inventions. Without deciding that a repetition of substantially the same claim in different words will vitiate a patent, we hold that, where a specification, by ambiguity and a needless multiplication of nebulous claims, is calculated to deceive and mislead the public, the patent is void.

Our conclusion, therefore, is that the Comet burner is no infringement of Reichmann's reissued patent so far as that patent is valid.

Decree affirmed.

J. H. B. Latrobe and *B. R. Curtis* for appellants.

C. F. Blake and *C. M. Keller* for appellee.

United States Circuit Court, Eastern District of Pennsylvania.

ADAMSON *vs.* DEDRICK.

MCKENNAN, Circuit Judge:

This was a suit in equity, brought by William Adamson against Charles H. Dedrick, under the provisions of section 58 of the Patent Act of 1870, for the purpose of setting aside certain letters patent granted to the defendant June 18, 1872, and alleged in the bill to be for the same invention as the patent granted to complainant January 31, 1865.

The invention, as set forth in defendant's patent, had for its object the economizing of time, labor and material in the manufacture of the soles and heels of boots and shoes, and it consisted in cutting, from the raw hide, pieces approximately of the form required and applying the tanning process to these pieces alone. There was thus saved the additional time, labor and material that otherwise would have been required in tanning the "waste pieces;" the cuttings, being in the condition of rawhide and not of tanned leather, were valuable for glue and other purposes, and it was claimed that the soles and heels produced were of better quality.

The complainant's patent was for precisely the same invention, except that he did not limit himself in the application of this process to the manufacture of boots and shoes: his claim being for—

"Cutting from raw or untanned hides or skins, or parts of the same, pieces of the size or about the size and form required for useful articles of tanned leather, and tanning the said pieces after they have been thus cut from the raw or untanned hides, as and for the purpose herein set forth."

The bill was filed on the 24th day of July, 1872, and the writ of subpœna issued thereupon was duly served upon the defendant; but the defendant failed to enter an appearance, and thereupon—namely, on the 17th day of October, 1872—the Court, upon motion of C. Howson, Esq., counsel for complainant, granted a decree declaring said patent of Dedrick wholly invalid, inoperative, and void.

Guard Plates for Stoves.

STUART *et al. vs.* SHANTZ *et al.*

MCKENNAN, Circuit Judge:

A guard plate for stoves, consisting of a series of projecting or deflecting shields, united by ornamental tracery, and so arranged as both to conceal the fire pot and to direct the radiant heat downward toward the floor, is essentially different in form, operation, and effect from a fender consisting of a series of hollow frustums of cones so arranged that the hot air passes obliquely upward and outward from the stove.

That the effects claimed to be produced by the patented invention are produced to a useful and valuable extent, an inference from the public recognition of its merits.

This was a suit in equity, brought by David Stuart and Richard Peterson, trading as Stuart, Peterson & Co., against Enos S. Shantz and Oliver B. Keeley, trading as Shantz & Keeley, for an alleged infringement of certain letters patent for guard plates for stoves granted to complainants, as assignees of David Stuart and Alexander Wemyss, on the 18th day of May, 1868.

As the defendants sought to justify their infringement by setting up a license under a patent granted to W. L. McDowell, April 28, 1863, which was earlier than the date of the invention by Stuart and Wemyss, the validity of complainants' patent was directly called in question. The case was thus made to turn upon a comparison of McDowell's invention with that covered by complainants' patent.

Patent sustained.

C. Howson and *F. Sheppard*, for complainants.

Frank Wolfe, for defendants.

A Perpetual Motion.

A correspondent, Mr. H. R. Birdsall, of Green, New York, sends us a description of a perpetual motion, constructed by an adventurer, which worked so well that he succeeded in obtaining sums of money ($2,500, $1,800 and others) from various simpletons, and then left "to secure his European patents. He has not returned, and a visit to his deserted apartment has revealed a hole in the wall and certain surreptitious mechanism by which the perpetual motion was driven. The beautiful device which elicited the subscriptions of the inhabitants of Chenango county was a self-moving pump, and, actuated by some concealed clock springs, it was the delight and wonder of the vicinity.

NEW BOOKS AND PUBLICATIONS.

ENCYCLOPEDIA OF PRACTICAL RECEIPTS AND PROCESSES, containing *6,400* Receipts, embracing Thorough Information, in plain language, applicable to almost every possible Industrial and Domestic Requirement. By William B. Dick. Price $5. New York: Dick & Fitzgerald.

This is a handsome volume of practical information, partly original and partly collected from the best and most trustworthy sources. Many directions for processes, originally published in our columns, are here collated and compared with other information on the respective subjects. The chief recommendation of a book of this species is the accuracy of the information therein contained; and an investigation of the contents of this encyclopedia has impressed us most favorably as to the value of the processes and recipes, which have been selected with much labor and care. It is a well gotten up book, and is worthy of a place in the library of any home, workshop, factory or laboratory.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From October 21 to October 31, 1872, inclusive.

BOOT HEEL.—J. R. Ryerson, Maine.

CIGAR MAKING MACHINE.—G. W. Tanner (of Providence, R.I.), London, Eng.

CUTTING SCREWS.—J. M. Carpenter, Pawtucket, R. I.

ELECTRIC TORCH.—W. W. Batchelder, New York city.

MAKING GUN COTTON.—J. W. and I. S. Hyatt, Albany, N. Y.

MANUFACTURE OF OAKUM, ETC.—T. H. Dunham, Boston, Mass.

MARKING INSTRUMENT.—S. Holman, Philadelphia, Pa.

OBTAINING ANTHRACENE.—J. C. F. Cheever, New York city.

PAPER FILE, ETC.—W. A. Amberg, Chicago, Ill.

PISTON VALVE.—T. Critchlow, Baldwin, Pa.

STEAM GENERATOR.—J. M. Hicks, New York city.

SUBMERGED PUMP.—A. J. Reynolds (of White Plains, N. Y.), London, Eng.

TELEGRAPHING APPARATUS.—D. Craig, New York city.

UMBRELLA, ETC.—A. & I. Hersberg, Philadelphia, Pa.

VISE.—T. Hall, Florence, Mass.

Facts for the Ladies.—Mary J. Clock, New York, has used her Wheeler & Wilson Lock-Stitch Machine fifteen years, averaging, for the first five years, more than $300, making boys' suits and general sewing. See the new Improvements and Woods' Lock-Stitch Ripper.

Business and Personal.

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

Patent for Sale, through agents or otherwise. Article for domestic use, of universal application, made by wood-workers. Already tested and of undoubted value. Owner has not time to push it. Address, Useful & Ornamental, Box 3754, P. O., New York.

For Sale, two Patents. Address H. S. Ball, Spartanburg, S.C.

Wanted—A responsible party to manufacture a patent spool holder for Sewing Machines. Machinists who would like to make a contract for the above, can learn particulars by addressing F. A. K., Station A., P. O., New York.

Dobson's Patent Scroll Saws make 1100 strokes per minute. Satisfaction guaranteed. John B. Schenck's Sons, 118 Liberty St., N. Y.

Permanent Photograph Printing, just what is wanted by Manufacturers. Send for Circular to Amer. Photo Relief Printing Co., 1002 Arch St. Philadelphia, Pa. John Carbutt, Sup't.

Valuable Patent Right for Sale. The amusing Toy Attachment for Pianos, illustrated in SCIENTIFIC AMERICAN, October 28th, 1871. Address G. L. Wild & Bro., 420 11th St., Washington, D. C.

Boston Fire! Goodnow & Wightman, 23 Cornhill, were not burned out, and are ready to fill all orders for Tools and Materials. Catalogues were all burned, but will have more in about two weeks.

First Class Steam and Vacuum Gauges, Engine Registers, Davis' Recording Gauges. New York Steam Gauge Co., 46 Cortlandt St., N.Y.

Water Front for Factories, Rope-walks, Lumber-yards, &c.—Lots for Sale or Lease. Blocks of lots on Newtown Creek, near East River, adjoining New York and Brooklyn Cities; prices $300 to $1,000; terms easy. Apply to S. R. Schieffelin, No. 15 East 26th St., New York.

Water Wheel Regulators—warranted, or no sale. Address F. B. Bowen, Pawtucket, R. I.

Soluble Glass, Water Glass, Liquid Quartz, Silicates of Soda and Potash for Concrete Cements, Fire and Waterproofing, manufactured by L. & J. W. Feuchtwanger, Chemists, 55 Cedar St., New York.

Oxide of Manganese, highest test, from our own mines, for Steel manufacturing, Patent Dryer, Paints and Glass, at lowest prices, by L. & J. W. Feuchtwanger, 55 Cedar St., New York.

Nickel Salts, double Sulph. and Ammonia, especially manufactured for Nickel Plating, by L. & J. W. Feuchtwanger, Chemists, 55 Cedar St., New York.

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

Wanted—A Small New or Second Hand Iron Planer for light work. Apply to J. H. Killey & Co., Hamilton, Ont.

Four Brick Machines, Combined with Steam Power (Winn' patent), makes 40 M. per day, for sale at a bargain. Address the manufacturers, John Cooper and Co., Mount Vernon, Ohio.

Absolutely the best protection against Fire—Babcock Extinguisher. F. W. Farwell, Secretary, 407 Broadway, New York.

Hydraulic Jacks and Presses—Second Hand Plug Tobacco Machinery. Address E. Lyon, 470 Grand St., New York.

Steel Castings "To Pattern," from ten pounds upward, can be forged and tempered. Address Collins & Co., No. 212 Water St., N. Y.

Heydrick's Traction Engine and Steam Plow, capable of ascending grades of 1 foot in 3 with perfect ease. The Patent Right for the Southern States for sale. Address W.H.H.Heydrick, Chestnut Hill, Phila.

The Berryman Steam Trap excels all others. The best is always the cheapest. Address I. B. Davis & Co., Hartford, Conn.

Wanted—Copper, Brass, Tea Lead, and Turnings from all parts of the United States and Canada. Duplaine & Reeves, 700 South Broad Street, Philadelphia, Pa.

The Berryman Heater and Regulator for Steam Boilers—No one using Steam Boilers can afford to be without them. I. B. Davis & Co.

T. R. Bailey & Vail, Lockport, N. Y., Manf. Gauge Lathes.

Windmills: Get the best. A.P.Brown & Co., 61 Park Place, N.Y.

The Berryman Manuf. Co. make a specialty of the economy and safety in working Steam Boilers. I. B. Davis & Co., Hartford, Conn.

Williamson's Road Steamer and Steam Plow, with Rubber Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1809.

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

Belting as is Belting—Best Philadelphia Oak Tanned. C. W. Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

Boynton's Lightning Saws. The genuine $500 challenge Will cut five times as fast as an ax. A six foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

For Steam Fire Engines, address R. G. Gould, Newark, N. J.

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

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

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

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

Presses, Dies & all can tools. Ferracute Mch. Wks, Bridgeton, N.J. Also 3-Spindle axial Drills, for Castors, Screw and Trunk Pulleys, &c.

Gear Wheels for Models. Illustrated Price List free. Also Materials of all kinds. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

Machinists; Illustrated Catalogue of all kinds of small Tools and Materials sent free. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

Gatling guns, that fire 400 shots per minute, with a range of over 1,000 yards, and which weigh only 125 pounds, are now being made at Colt's Armory, Hartford, Conn.

Perfection—Patent Ears for Elliptic Spring Heads. Address George P. Cleaves, Concord, N. H.

A New Machine for boring Pulleys, Gears, Spiders, etc. etc. No limit to capacity. T. R. Bailey & Vail, Lockport, N. Y.

Winans' Boiler Powder, 11 Wall St., New York. Certain cure for Incrustations—17 years best in the market.

Notes & Queries

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

1.—Will some one please inform me how small birds are stuffed, and what is used?—A. A. O.

2.—Why do steam boiler plates crystallize over the fire, while feeding the furnace in front has a tendency to harden the iron?—B. F. M., of Ohio.

3.—How can I remove stains of blood or oil from the feathers of stuffed birds?—W. R. F.

4.—What properties are essential or indispensable in a soil or clay for making good brick?—H. C.

5.—Will some one give me directions to make a telescope for my rifle? The distance between the center of dovetail on front end and the rear peep sight is 29¼ inches.—C. E. R.

6.—If a tube of 36 inches hight from its base, and an inch in diameter and graduated in a hundred parts, stands at zero in still water, how high will the water rise in the tube if placed in a stream of water running at the rate of 12 miles an hour?—S.

7.—What articles are used and what is the proportion of each, in the composition of the white powder used for stamping with perforated patterns for braiding and embroidery? What is the paper or parchment used for making perforated patterns? What kind of machine is used for perforating?—J. M.

8.—I recently made a Leyden jar, by coating a two quart candy jar in the usual manner. I could not charge it; and when I insulated it and charged it through the knob, electric sparks could be drawn from the outer coating. I tried another jar of the same kind, with a similar result. Is it possible that the electricity could pass through the glass, and is some glass permeable by electricity? I have other jars which work well.—N. E. F.

9.—Upon what part of the face of a 4 feet mill stone, weighing 1,500 lbs. and running at a velocity of 180 revolutions per minute, will the least amount of power grind a given amount of grain in an hour, and what is the proportioned amount of resistance to the power at 12 inches, 18 inches, and 24 inches respectively from the center?—G. B. R.

10.—Will some one tell me if there is anything which will remove fly specks and other soils from gilt picture frames without also removing the gold? Is there any way of cleaning the light bronze gas fixtures without injuring the bronze? Can white window shades be done up with the same gloss and stiffness as when new?—F. E. V. E.

ANSWERS TO CORRESPONDENTS

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at $1·50 a line, under the head of "Business and Personal."

ALL references to back numbers must be by volume and page.

C. T. W., of N. Y., will find good recipes for preventing rust on and browning gun barrels on pages 154 and 266 of our volume XXVI.

J. R. S., of Mass., will find elaborate directions, with an illustration, for constructing cone pulleys, on page 100 of our volume XXV.

A Subscriber will find directions for building an ice house on page 130 of our volume XXV.

Will you or any one inform me if there is any method by which magnetism can be permanently retained in a piece of steel: or, in other words, is there any such thing as permanent magnetism; and at the same time mention, if it can be done, where I could get steel so magnetized?—J. P. Answer: Any magnetized piece of steel will retain its magnetism permanently. Any philosophical instrument maker will do the work for you. You can do the work yourself by rubbing the piece of steel with one of the poles of a common horseshoe magnet.

F. O. B., of Ill., says: I would like to enquire whether air compressed into a vessel and allowed to cool to the temperature of the surrounding air loses any of its pressure in cooling. Also, if allowed to escape when cooled, into another vessel, it will lower in temperature to correspond to a reduction in temperature. Answer: Yes. Compressed warm air is reduced in pressure by cooling. Within certain limits of temperature and pressure, air expands 1-491 of its volume forevery degree of Fahr., of increased temperature and contracts accordingly by cooling. Contraction of volume of course reduces the pressure. Air under compression, when allowed to escape, is by its expansion reduced in temperature.

W. P. H. sends a diagram of a method of spacing a horizontal line into equal divisions, thinking that it is a new and quick method. By reference to Euclid, he will find that the method is not new.

J. H. S.—The mineral you send is calcite or carbonate of lime, and similar to coarse granular marble.

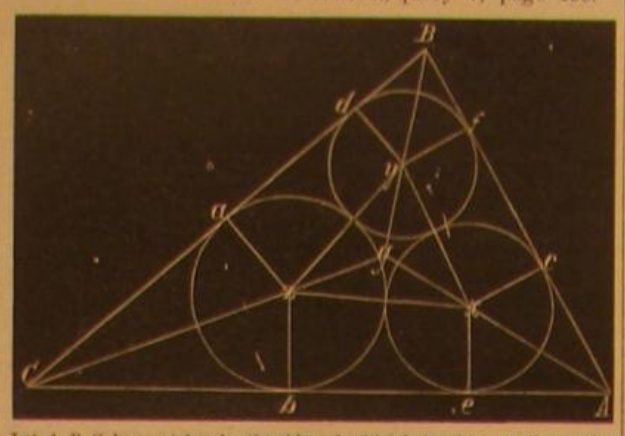
F. D. H. asks: How can I prepare bladders to be used as gas bags, rendering them soft and pliable? Answer: Try a little glycerin.

D. G. N., of Ark., will find the best method to run a 12 horse power engine to saw logs to be as follows: Belt direct from a six foot balance wheel to the saw pulley, which should be of 18 inches diameter; govern the steam by a butterfly valve by hand, shutting off steam just as the saw gets out the log; drill a ⅛ inch hole in the valve, which will just keep the engine moving, feed ½ to 1 inch at each revolution of the saw, and let it run as fast as the engine will carry it. I once sawed 5,000 feet per day, for 40 working days in succession, in this manner. But he must have a good foundation, as the engine will run 250 revolutions at times, with a 4 foot saw. We burned the saw dust as fast as made, but we had a 30 horse power boiler to an 8 inch cylinder engine, using steam at 80 lbs. We also did well with an 8 inch cylinder portable, with two boilers.—C. E. G. of Conn.

What is the reason that the old fashioned long stroke engines are all laid by, in places where they use stationary engines?—H. R. H. Answer: The reason why the high speed engines are preferred is because they develope more power from the same quantity of fuel, than the old fashioned engines. The theory is that the piston and rod, cross head and other reciprocating parts, if they have a high speed, act upon the principle of the fly wheel, absorbing the force of the steam at the commencement, and giving it at the end of the stroke. The practical effect is to do away with the unequal steam pressure experienced in ordinary engines, securing in lieu thereof a uniform rotative pressure on the crank. The strain on each dead center is avoided in the high speed engine, and a uniform smoothness of running is attained. In a competitive trial in England not long ago, of two engines with cylinders of the same size, using the same weight of steam per horse power per hour, the high speed engine developed 43 per cent more horse power than its low speeded competitor.

At what angle should a drill, to go the quickest speed through cast iron, be made? Will the same angle be the best for drilling wrought iron and steel?—C. E. G. Answer: for cast iron the cutting edge of the drill, should be on an angle of twenty to twenty-five degrees; for wrought iron the drill should be sharper. The cutting angle to be used is varied with the quality of the metal.

GEOMETRICAL PROBLEM.—To J. S. E., query 7, page 298.—



Let A, B, C, be any triangle, the sides of which being known, the angles may be found in the usual manner. From g, the center of gravity, draw lines bisecting the angles. Let x, y, z, be the centers of the circles. From x, y, and z, let fall upon the sides AB, BC, CA, the perpendiculars, xc, yf, yd, za, zb, xe. Join xy, yx, zx. Then,

AB equals Ac plus cf plus fB. (1.)
BC equals Bd plus da plus aC. (2.)
CA equals Cb plus be plus eA. (3.)

$$Ac = cx \text{ tang.} \frac{A}{2},\ cf = \left((yx)^2 - (cx - fy)^2\right)^{\frac{1}{2}},\ fB = yf \text{ tang.} \frac{B}{2}.$$

Substituting these values in equation 1, we have an equation in which the side A B is given in terms of the perpendiculars cx, yf. In like manner from equations 2 and 3 will result equations giving the values of BC and and CA in terms of dy, az and zb, xe. From these the value of Ax, By and Cz are easily obtained. J. S. E. can solve the problem thus indicated, taking care to use the table of natural tangents, etc., at his leisure.—H. F., of Ind.

M. S. of Va.—The mineral you send is asbestos. We believe the market is rather overstocked with the article at present.

What is the best way to rid a cistern of worms? The water is used for cooking purposes, and the worms are a source of great annoyance.—A READER. Answer: Tell us how your cistern is supplied and located, and what sort of worms you are troubled with.

Will you please inform me if there is an apparatus for producing light from electricity to take the place of gas?—G. E. B. Answer: Yes. The electric light is extensively used in England for lighthouses; but in this country it is not employed very much. The lecture rooms of some of the colleges have them. The electric light is expensive as compared with gas.

Has there ever been laid in this country a roadway pavement of the Scrimshaw or Abbott's concrete patent (or any other coal tar pavement) which has proved a success?—R. E. M. Answer. Yes. Such roads, properly made, are excellent. You will see examples of them in New York and Brooklyn. They are used quite extensively in the latter city.

Can your correspondent E. H., or some one else, tell me how to make good cider? I especially want directions for treatment after the cider leaves the press, and for preserving it by bottling or other means.—J. W. B. Answer: By placing a little of Professor Horsford's neutral sulphite of lime in the barrel, you can at once arrest fermentation at any point you wish, and keep your cider sweet for any desired length of time.

Please give me the figures for finding the capacity of a boiler which is 15 feet long, 4 feet diameter, and contains 30 four inch flues, and also the number of gallons of its capacity. Also the name and composition of the enclosed specimen of rock (rather poor) which was sent to me from some part of Baltimore county, Maryland.—I. P. H. Answer: The contents of the boiler, space occupied by flues deducted, will be about 975 gallons. To compute the volume of a cylinder multiply the area of base by the length. To compute the area of a circle multiply half the circumference by half the diameter. The mineral you send is asbestos.

What is carboline gas? In what manner is it produced, and how is it used?—A. S. Answer. We do not know of any such gas.

C. C. A., of Cleveland, asks: What galvanic battery is the best for all general use? Answer: The kind used at the telegraph office in your city.

W. R. H., of Ill., says:—We are preparing to build a church house in our vicinity forty-four feet long. What should be its width and hight to render it easy and agreeable both to the speaker and hearer? Answer: The width should be 30 feet and the hight 20 feet to the eaves and 20 feet more to the ridge. Lath and plaster on the under side of the rafters, making your ceiling the same pitch as your roof without any arch to the ceiling; then break it up by showing the principal trusses (three in number) extending across the roof. It is best to make these simply to consist of the two rafters and a short hammer beam at bottom on each side, and, in the absence of buttresses, connect these by a 1¼ inch iron tie rod. At the center of each tie rod, bring a rod down from the ridge to support the chandeliers, with an ornament at the intersection of the two.

Fig. 1.

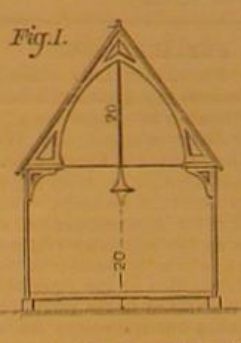
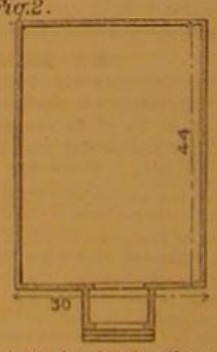


Fig. 2.



How can I cheaply obscure the window glass, to make it appear like ground glass?—L. Answer: Use a ball of putty and dab the glass.

W. P. says:—I send you a specimen of mineral; will you please say what it is, and its value? Answer: The incrustation on the stone is iron pyrites, of no value unless found in large quantities.

Can I coat a small part of a tin roof, that is leaky, with any thing to keep out the water for a few months, and if so, what?—L. Answer: Cover the cracks with rags dipped in melted asphaltum.

I want to make a marine aquarium. Can I compound a sea water that will do?—L. Answer: Probably not. But you can try. Ordinary sea water contains eight or nine different salts besides chloride of sodium. For quantities, consult any good chemistry.

Will you or some of your many readers inform me the origin and nature of the smoke of Indian summer? Also, is there a paper devoted exclusively to poetry; if so, where is it published?—W. S. H. In the fall of the year the burning of leaves, brush wood, and grasses loads the air, in some localities, with smoke, which in calm weather remains suspended in the atmosphere for some time. The ordinary blue haze, seen in the distance, is supposed to be due in part to the presence of minute particles of matter floating in the air, and in part to watery vapor suspended in the air.—We believe there is no paper published that is wholly devoted to poetry. But such a publication might be made a success, especially if it were wholly produced in verse. Such a paper would be in journalism somewhat like the opera in theatrical representation.

G. P. says:—Will you please inform me what is the fastest running time (well authenticated) ever made on any railroad in this country or in Europe? Answer: One of the fastest railway train records in this country is that of the special relief train, carrying men and steamers, which ran from Worcester, Mass., to Boston, November 10, 1872, during the recent conflagration. Distance 44 miles; time of run 45 minutes, being at the rate of over 63½ seconds per mile, or over 56½ miles per hour. It is probable that portions of the distance were made at a considerable faster rate of speed than the above, and other portions at less speed. A velocity of sixty miles an hour is often obtained on first class railways on straight portions of the track.

A. D. B. says:—The reservoir at the top of my house receives the water from Wenham Pond. My plumber declares that it would not be safe to apply a ball cock to the supply pipe, as he fears that the pipe would not stand the pressure. Does it not have to bear just as great a pressure with the arrangement the plumber has put in, namely, a cock in the lower story, which is opened by hand, and closed when a telltale pipe shows that the reservoir is full? Answer: The pressure in water pipes varies with the hight of the supply. If your house reservoir, supplied by cock, as stated, is 34 feet above the ground, the greatest pressure in your water pipes, at the surface of the ground, will not exceed 15 lbs. to the square inch. If Wenham Pond is 340 feet above your ground, then the pipe leading through your house up to the ball and cock at the reservoir would have to resist a pressure of nearly 150 lbs. to the square inch. So great a pressure in a dwelling house is not desirable, as the pipes, unless made of unusual strength, are likely to leak and do mischief. It is to avoid risk of leakage under high pressure, and consequent damage, that your plumber has put in the cock down stairs.

H. A. H. G., of S. C., says:—I enclose you a specimen of something, I don't know what; it is found tolerably plentiful a few miles from this place. You will do me a favor by answering what you think it is. Answer: The mineral is black tourmaline, of no use in the arts.

To F. A. S., query 17, page 314.—Get the regular transfer pictures, then cover the picture with a slight coating of varnish; let it stand 10 or 15 minutes, put your picture on the glass or wood, rubbing it gently so that the air is all pressed out, let it "set" a few minutes; then sponge it off nicely with water, taking care to let your paper get thoroughly wet, then raise the paper gently; when dry, varnish with finishing varnish.—A. A. O., of Iowa.

In answer to your correspondent from Tennessee, mentioned in your editorial on page 295, I will say that there are moments when a quantity of water is instantly converted into steam. If much steam escapes, the disturbance in the boiler mixes the water and steam, so that the water becomes instantly evaporated. This stirs up the mud in the boiler, as is frequently seen on trying the gage cocks. I believe this is the cause of many explosions.—F. B. C., of N. Y.

W. E. F., query 2, page 298, will find the following mixture to be the best lasting and cheapest wash paint for the preservation of shingles: Take two pecks of the best unslaked lime; slake it with boiling water, keeping it covered during the process. Strain the liquid through a fine sieve, and add to it one peck of salt dissolved in warm water, three pounds rice flour, boiled to a thin paste, stirred in boiling hot, one half pound powdered whiting, and one pound glue, well soaked and dissolved in a water bath. Add five gallons of hot water to the whole mixture and let it stand a few days; heat and apply it while hot.—F. S. B., of Me.

P., query 11, page 249, should use pulverized alum and saltpeter, in about equal parts, as a substitute for arsenic. By experience I find oakum superior to cotton or hemp in stuffing, as the tar it contains tends much to the preservation of the skin.—W. R. F., of Mass.

To J. W. S., query 13, page 314.—Silk is generally used, and is, I believe, the best material.—F. S. B., of Me.

J. F. S., query 29, page 314, can make litmus paper by taking 1 oz. litmus, 5 ozs. alcohol, 5 ozs. water. Put them in a ten ounce bottle, and shake them occasionally during five or six days, when a deep blue tincture will be obtained. Pour off the clear fluid into another bottle. To prepare the paper, pour a little in a plate, pass blotting paper through it in sheets, and hang it up to dry. This is for the acid test. For alkalies, take some litmus paper, pass it through weak vinegar, hang it up and let it dry. This is a very delicate test. Another test paper can be made by taking 1 oz. powdered turmeric wood, 5 oz. alcohol, 5 oz. water; prepared as the litmus paper.—W. M. F., of N. J.

Recent American and Foreign Patents.

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

LEATHER CUTTING TOOL.—John Sweezy, Elizabethville, Pa.—This invention has for its object to furnish an improved tool for cutting strips of leather for fly nets and for other uses, which will cut four, more or less, strips at a time, and will cut them equally true from a side of leather or other irregular piece as from straight pieces, and whether the leather be the thinnest morocco or leather three sixteenths of an inch thick; and it consists in the arrangement of the adjustable gage plate, and in the combination of a spring guard with the knife block and cup block formed on the respective handles of the instrument.

FEED WATER HEATER.—Nathaniel Jones, Buffalo, N. Y.—This invention relates to the class of feed water heaters consisting, in general terms, of a series of pans or troughs arranged with a series of heat radiators within a case, so that the water in flowing downward falls from the first series of troughs on to the radiators next below them, and from the radiators on to the troughs in the next series, thus alternating till the final receptacle is reached. The invention has for its object to furnish a heater in which the water pans and steam and water guides are arranged to secure the speediest utilization of a given amount of heat with the least complicated and expensive construction of the apparatus.

FOLDING BEDSTEAD.—H. Harrison Hill, Pontiac, Ill.—The invention relates to bedsteads that fold together by having the rails hinged to the head and foot and the slats pivoted to the rails; and it consists in vertical cleats on the inside ends of rails to strengthen rails and give sufficient thickness for one leaf of hinge.

LAMP CHIMNEY PROTECTOR.—Edward Stern and Sigmund Blau, New York city.—This invention consists in a lamp chimney protector, consisting of two bars pivoted together at one end and provided with hooks at the other, so as to be adapted to use in chimneys of varying size.

ORE SEPARATOR.—Johann Friedrich Utsch, of Iserlohn, Germany.—This invention relates to a new self-acting jig machine, in which separate chambers, having separate discharge openings at varying hights, are arranged for the reception of the several kinds of ore, salts, or other material which are to be separated from one another by virtue of their varying specific gravity. By having the said chambers so united as to permit a free flow of the ore from one to another, the process of separation is greatly facilitated, and the separation carried on with greater certainty than in the jig machines now in use.

PEGGING JACK.—John G. Ziegler, Salt River, Mich.—This invention consists of a circular ring or table mounted on a standard by being pivoted to the top of it at one edge, and resting at the opposite edge on braces to which it is pivoted. Said braces are swiveled to the standard so as to swing around it horizontally and be adjusted vertically by controlling nuts screwing up and down on the standard, whereby the said ring or table, whereon the blocks to which the last is clamped are mounted, can be readily adjusted to any required angle to the horizontal plane. The invention also consists of the attachment of the last-supporting blocks to this ring or table by a long slotted plate, which is secured through the table, so that it can turn freely thereon, the said slotted plate being capable of shifting endwise along the bolt by which it is secured, which passes through the slot, so that the last can be oscillated horizontally on the table, and shifted transversely thereof to facilitate the adjustment of the work to any position.

IRON STRUCTURE.—Joseph D. Duclos, New York city.—This invention has for its object to simplify the construction of iron buildings by dispensing with the "backing up" or covering of the walls on the inner sides thereof. The invention consists in finishing the cast metal walls of such structures on both sides with panels, ornaments, or otherwise, and in thereby making the inner backing up, by means of plaster or other devices, entirely unnecessary. The cost of putting up iron buildings is thus greatly reduced.

DENTIST'S AND BARBER'S CHAIR.—Francis J. Coates, Cincinnati, Ohio.—This invention consists of certain arrangements of apparatus for supporting the seat and shifting it on a horizontal pivot laterally, also forward and back, and raising and lowering the seat. It also consists in the construction of such chairs with perforated covers to the seats and backs for ventilation. Thus constructed, the seat and back will be kept moderately cool instead of becoming and remaining unpleasantly heated when in use.

WASHING MACHINE.—William W. Grant, Bloomington, Ill.—This invention has for its object to furnish an improved washing machine. It consists of a rectangular suds box, made with a concave bottom and concave vibratory back, so arranged as to swing down to allow the water to flow back into the suds box when a wringer is being used. It contains a corrugated beater board, actuated by a standard and lever passing through notches in the cover.

BUGGY REACH.—John W. Reeder, West Manchester, Ohio.—This invention has for its object to furnish an improved reach for buggies and other vehicles, which shall be so constructed that one of the wheels may rise in passing over obstructions without twisting the reach, splitting the headblock, breaking the braces, or straining or otherwise injuring the reach or its connections.

BOOK HOLDER.—David Moritz, Carmansville, and Robert White, Mott Haven, N. Y.—This invention relates to a new strap or holder for books, being intended for children's use while carrying their books to and from school, and for similar purposes. The invention consists in the combination of a spring slide with a perforated guide and with the fastening string, all operating in such manner that the string drawn through slide and guide will be clasped and held secured by the action of the spring.

MODE OF PROPELLING CANAL BOATS.—Joseph Hough, of Buckingham, Pa.—This invention relates to a new apparatus for propelling ships and boats and for preventing, to the greatest practicable extent, the lateral disturbance of the water. The invention consists, first, in the use of a double propeller, composed of two wheels, that revolve in opposite directions but effect the same results by having their wings inclined in opposite directions. The invention consists, also, in the use, at the sides of the vessel, of laterally adjustable plates, which serve to absorb the lateral disturbance of water and thereby prevent all injury to the banks or shores of any water course in which the vessel may be used.

PAINT MILL.—Robert J. McGrew, Evansville, Ind., assignor to himself and George W. Shanklin, of same place.—This invention consists in an arrangement of the furrows or grooves of stationary or movable conical grinders, calculated to be efficient in performing work and to be self-sharpening. Second, it consists in a construction and arrangement of both the grinders, so that they can be readily taken off when worn out and new ones applied without any unnecessary waste of parts not worn out. Third, it consists in an arrangement of the connecting devices by which the bridge or top frame is connected to the hopper to facilitate the removal of the rotating grinder. Fourth, it consists of an arrangement of devices for suspending and adjusting the rotary grinder. Fifth, it consists of an arrangement of grooves in the shell to answer the purpose of an ordinary scrape for the discharge of the ground paint.

BORING MACHINE.—William C. Freeman, Louisiana, Mo.—This invention consists of one or more gangs of boring tools arranged on a vertically adjustable support and provided with driving belts for the tools and apparatus for raising and lowering the tools while in operation, with automatic feeding gear, a hopper, guides, and holder for the stuff to be bored, all arranged so that the feeder pushes a board from the bottom of the hopper along the guides to the holder over the gangs of boring tools, which then come up and bore the board along one or both edges at the same time that the feeder goes back for another board, and then go down before the feeder comes forward again with the next board and ejects the first by the next, and so on. The hopper, guides, holder, and the tools are adjustable to boards of different sizes.

LEATHER BOARDING AND GRAINING MACHINE.—Louis Townsend, Terre Haute, Ind.—This invention has for its object to furnish an improved machine for boarding and graining leather, doing its work quicker and better than it can be done by hand, and with substantially the effect of hand boarding upon the leather. By suitable construction the upper boarding and graining roller can be raised for the convenient insertion of the leather without disarranging the gearing. The frame is held down to hold the upper roller down upon the lower roller by a spring. Levers are provided, the outer ends of which are connected by a cross bar which serves as a foot lever or treadle for operating said levers. The inner ends of the levers are pivoted to the lower parts of the sliding bars or frame and also to the frame of the machine. A roller is attached, made somewhat smaller than the boarding and graining rollers, so as to enter the space between the forward sides, and hold the leather firmly against them. In using the machine the outer ends of the levers are pressed down, which raises the frame and upper roller and operates another lever to throw back the small roller and blade. The leather is then passed between the rollers and the blade, and as the levers are released the spring forces the frame and roller down, which operates the second levers to throw the blade and roller forward, the blade folding or doubling the leather, and the small roller holding it firmly against the graining rollers. If, now, the machine is started, certain rollers will draw the leather inward and other rollers will draw it outward, while the blade will keep it doubled or folded and pressed in between the graining rollers, the fold of the leather constantly changing its place, and the same effect being produced as is produced by hand boarding and graining, and doing it quicker and better.

SASH BALANCE.—Herman Gross, Hoboken, N. J.—The invention consists in a screw passing through a nut at the meeting rail and spring at one end, all arranged on the inside of window frame, and so adjusted that the tension of the spring tends to turn the screw in the direction to raise the sash with just sufficient power to balance or hold the sash wherever it may be, so that the latter can be moved up or down with but a slight application of force, the same as when balanced by a cord and weight or other balancing contrivance.

BUGGY, FARM AND LUMBER WAGON.—Chesley Jarnagin, Beans Station, Tenn.—The invention consists in a peculiar mode of arranging the seat so that it will be out of the way of any load that may be carried, and so that the driver may never be inconvenienced by the load, and thereby incapacitated from a faithful attention to his business; also in a stone body of peculiar construction and adaptation; and also in a new mode of graduating the load upon a stone body.

HAY OR GRAIN RACK.—Chesley Jarnagin, Beans Station, Tenn.—The invention consists in a lower frame for hay racks, which projects forward and rests upon a platform of the running gear; in a shield or fender by which all forward movement of the load in going down hill, and all inconvenience from the same to the driver, is entirely prevented; and also in a folding curtain fastened to said shield and attached to an end pivoted to a bow, to shelter the driver from the effects of the direct rays of the sun.

MANUFACTURE OF BROMINE.—Herman Lerner, Mason City, and Elijah C. Harpold, Hartford City, W. Va.—The invention consists in making the bitter water pan with a close cover so as to form a boiler, and in connecting its steam space with the stills, whereby the vaporized bitter water may be utilized for the agitation of the liquid therein. It also consists in connecting this boiler with a primary reservoir, which is thereby kept at a proper temperature, and a large proportion of the salt precipitated. It also consists in connecting the furnace with a secondary reservoir, whereby the latter may be always maintained at the desired temperature, and thereby precipitate nearly all the residue of salt.

COTTON CULTIVATOR.—William Brooks, Lexington, Ga.—This invention relates to a cultivator for cotton and other crops, etc., and it consists in the combination, with an ordinary single shovel plow, of a pair of horizontal curved wings, which are attached loosely to the heel of the shovel standard by means of a single fulcrum bolt, to enable said wings to adjust themselves to the surface of the ground.

BLIND SLAT ADJUSTER.—Oliver L. Houghton, Holden, Mo.—This invention consists of a coiled spring connected to one of the slats for turning them up all the slats being connected together with a ratchet disk on the lower slat, and a catch pivoted on the lower cross piece of the blind to hold the slats open; or, instead of the disk and catch, it is proposed in some cases to have a hasp with a knob hinged to the lower slat, and a catch plate attached to the cross piece below, for pulling the slats down, and fastening them by a pin on the hasp.

EARTH AUGER.—Joseph Wilson, Cameron, Mo., assignor to himself and Lewis A. Bing, of same place.—This invention relates to augers for boring wells, and consists of two semicircular tapering pods, each with a cutting lip and opening, securely riveted or fastened to arms. Securely fastened, by brazing or otherwise, to the sides of the shank, are two pairs of cross plates. To the upper pair the ends of the arms are jointed, so that the parts of the pod may be separated when the auger is raised and the inclosed earth may be released. The pods are held together in close contact with each other, so that they form a round hollow cylinder sufficiently tapering to allow it to be revolved in the earth with but little friction. When the auger is full it is withdrawn, the pods are separated, and the earth discharged.

AWNING SLIDE.—John Boyle, New York city.—This invention has for its object to furnish an improved awning slide, retaining its position securely and not being liable to get out of order; and it consists in a grooved slide, sliding block, and the tubular socket to receive the rod.

DRAWER SUPPORT.—John Baggs, Easton, Md.—The invention relates to drawers generally, and consists in providing them with a support, susceptible of easy adjustment to take up wear, prevent sticking, and render the relative position of a drawer to the frame always readily maintainable. It consists, secondly, in beveling the front division piece between drawers, so that the drawer will not rub the veneering and cause it to peel off, but will cease to have a bearing on said division as soon as it is started outwardly, and will not contact with it until the drawer is entirely closed.

ADJUSTABLE CHIMNEY CAP.—Patrick H. Carlin, Brooklyn, assignor to himself and George H. McLaughlin, New York city.—This invention has for its object to produce a metallic chimney cap or covering for the tops of chimneys in place of the blue stone or other stone or brick caps heretofore used, and thereby to increase the strength and durability of chimneys, and reduce the possibility of their crumbling to pieces. The invention consists in the use of a metallic top having adjustable ledges to fit any thickness of walls, and adjustable cross pieces to fit any position of flues.

COOKING VESSEL OR BOILER.—William Y. Thomson, Oyster Bay, N. Y.—This invention has for its object to furnish an improved cover for kettles and other cooking vessels, which shall be so constructed that the liquid contents can be conveniently poured off without danger of spilling the solid contents of the vessel or scalding the hands of the operator. Upon the upper part of the opposite sides of the inner surface of the vessel, and directly opposite the lugs, are attached shoulders or flanges upon which the cover rests. To the inner side of the vessel are attached lugs or pins to keep the cover in place upon the shoulders. The cover is made in the form of two semicircular disks, hinged to each other at their straight edges. To the middle part of one of the semicircular disks is attached the handle by which the cover is handled. In the other semicircular part of the cover are formed a number of perforations, through which the water flows out when the kettle is inclined. The perforated part of the cover is covered with a flap, hinged to the said semicircular disk, so that it may be pushed out by the outflowing liquid. Suitable means are provided so that, by turning the cover one quarter around, it will be locked into place. In pouring off the liquid contents of the vessel, the said vessel is inclined by means of the handle, upon the lower ends of the arms of which are formed straight hooks which enter slots in the lugs formed upon the lower part of the said kettle. This construction enables the handle to be kept from dropping down upon the stove or range and being burned or heated.

CORN PLOW AND MARKER.—George W. Meixell, Hecktown, Pa.—This invention has for its object to furnish an improved machine for furrowing the ground for planting and cultivating. The two beams, to which the standards of the plows are attached, are connected and held in their proper relative positions by the cross bars, which are secured to the upper sides of the beams so that the plows may be conveniently adjusted wider apart or closer together, as circumstances may require. The rear end of the tongue, which is loosely bolted to the center of the central cross bar, passes through a keeper, which is so formed as to allow the said tongue to have a vertical but no lateral movement. This construction relieves the horses' necks from having to support any weight, and at the same time leaves the plows free to follow the surface of the ground. The depth at which the plows work in the ground is regulated by the gage wheels, which may be readily adjusted. The handles may be inclined, to allow the plowman, while guiding the plows, to walk at the side of the row of plants being cultivated. By suitable construction, the marker may be turned from one side to the other as the machine passes back and forth across the field, working equally well at either side.

MACHINE FOR POLISHING MARBLE AND WOOD.—John C. Mateer, Kankakee, Ill.—This invention has for its object to furnish an improved machine for polishing marble and wood, and which may also be used for operating a bit or drill for boring purposes, doing its work well and thoroughly, and adjusting itself to the surface to be operated upon; and it consists in a vertical shaft, revolving in bearings attached to suitable supports. Upon the upper part of the shaft are placed a fast pulley and a loose pulley to receive the driving belt. A frame is arranged, to the rear ends of the top and bottom bars of which are attached bearings in which the shaft revolves, so that the said frame may be supported by the said shaft. This shaft, by means of a belt, imparts motion to a second shaft attached to the frame. From the second shaft extends another frame, at the end of which is a third shaft, to the lower extremity of which the rubber is fastened and so arranged as to adjust itself to the surface to be operated upon. The swinging frames can be conveniently raised and lowered to adjust them to the thickness of the material to be operated upon.

STEAM ROAD ROLLER.—Thomas Aveling, Rochester, England.—The object of this invention is to construct a light and efficient steam road roller with horizontal boiler. To this end, the construction of the roller is so modified as to avoid the necessity for the heavy framing heretofore employed. In carrying out the invention, the general arrangement of the ordinary traction engine is adopted, converting the driving wheels into rollers, and the space left by these rollers is covered by a pair of front rollers, which serve also as steering wheels. These rollers are made conical or "dished," in order that, on the ground line, they may be close together, while at and above their axle there is space for a vertical shaft standing up from their axle, and which serves as a front support for the boiler. This support is so connected to the shell of the horizontal boiler as to allow of its receiving a slight lateral (as well as an axial) motion, which lateral motion is required to permit of the rollers adjusting themselves to their work. The front rollers are mounted loosely on a dead axle to which is bolted the lower end of the vertical shaft or support. To the extremities of this axle a horizontal forked or saddle piece is attached to receive and act as a guide for the steering chain. The chain passes rearward to a chain wheel, by turning which the steering of the rollers will be effected, their axle being free to swivel and oscillate with the vertical support attached thereto. Mr. Aveling has done more towards developing improvements in this line of invention than any other person. Aveling & Porter manufacture the machines in England, and Mr. W. C. Oastler, 43 Exchange Place, New York city, is the agent for this country.

BRIDGE.—George E. Harding, New York city.—The invention consists in a stiff upper chord of metal or wood, preferably arranged in the form of a double ribbed arch, braced and counterbraced in suitable panels, and rigidly connected at each end with a double lower catenary chord, also braced and counterbraced with vertical tension rods connecting the upper and lower chords.

[OFFICIAL.]

Index of Inventions

For which Letters Patent of the United States were granted.

FOR THE WEEK ENDING NOVEMBER 5, 1872, AND EACH BEARING THAT DATE.

SCHEDULE OF PATENT FEES:

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APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter named.

22,880.—CARPET SWEEPER.—N. B. Pratt. January 22, 1873.
22,900.—MOP HEAD.—L. Taylor. January 29, 1873.
23,034.—FIRE PLUG.—J. L. Lowry. February 5, 1873.

EXTENSIONS GRANTED.

2,036.—FRUIT PRESERVING HOUSES.—B. M. Nyce.
2,038.—PRESERVING FRUIT, ETC.—B. M. Nyce.
4,784.—PRESERVING FRUITS, ETC.—B. M. Nyce.
7,813.—HORSE RAKE.—H. W. Sabins.
21,924.—PATCHING RIFLE BALLS.—L. H. Gibbs.
21,926.—LOCOMOTIVE ENGINE TRUCK.—L. Bissell.
21,952.—CAR SPRING.—P. G. Gardiner.
21,991.—SAFETY STEAM BOILER.—F. Stebbins.
22,049.—RAILROAD CAR WHEEL.—T. C. Ball.

DESIGNS PATENTED.

6,225.—TEA CAN.—J. Britton, Greenpoint, N. Y.
6,226 & 6,227.—FURNITURE.—D. Denyven, Cambridgeport, Mass.
6,228.—COOKING STOVE.—A. J. Gilbert, New York city.
6,229.—PERFUMERY BOTTLE.—F. Storm, Philadelphia, Pa.
6,240.—COOKING STOVE.—I. J. Vincent, Pittston, Pa.
6,241.—COOKING STOVE.—I. J. Vincent, Pittston, Pa.
6,242.—COOKING STOVE.—A. C. Williams, Albany, N. Y.
6,243.—FIRE SET HOLDER.—A. Wunder, New Haven, Conn.

TRADEMARKS REGISTERED.

48.—MEDICINE.—T. Boyce, F. McKenzie, San Francisco, Cal.
1,049.—WHISKY.—F. Chevalier & Co., San Francisco, Cal.
,050.—MUSTARD.—H. C. Hudson & Co., San Francisco, Cal.
,051.—CHAMPAGNE WINE.—Benauld, Francois & Co., New York city.
,05 BRANDY.—Benauld, Francois & Co., New York city.

Value of Patents,

AND HOW TO OBTAIN THEM.

Practical Hints to Inventors.

PROBABLY no investment of a small sum of money brings a greater return than the expense incurred in obtaining a patent even when the invention is but a small one. Larger inventions are found to pay correspondingly well. The names of Blanchard, Morse, Bigelow, Colt, Ericsson, Howe, McCormick, Hoe, and others, who have amassed immense fortunes from their inventions, are well known. And there are thousands of others who have realized large sums from their patents.

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

How Can I Best Secure My Invention?

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

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

Preliminary Examination.

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

To Make an Application for a Patent.

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The patent may be taken out either for five years (government fee or $20) for ten years (government fee $40) or for fifteen years (government fee $60). The five and ten year patents may be extended to the term of fifteen years. The formalities for extension are simple and not expensive.

American inventions, even if already patented in this country, can be patented in Canada provided the American patent is not more than one year old.

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

Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing MUNN & Co., 37 Park Row.

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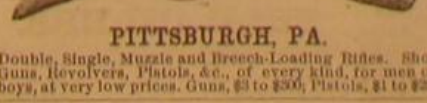

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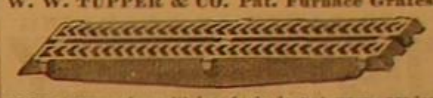

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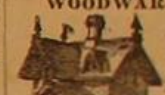

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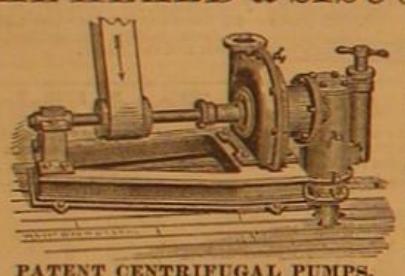

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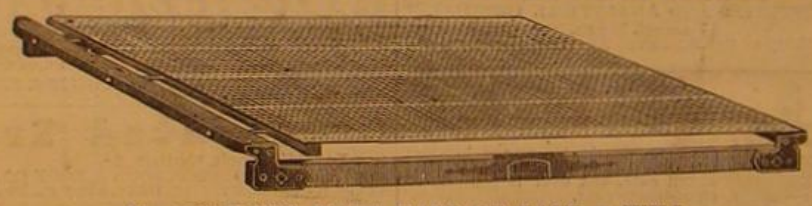

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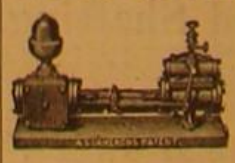

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SCIENTIFIC AMERICAN

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

Vol. XXVII.--No. 24. [NEW SERIES.] NEW YORK, DECEMBER 14, 1872. [$3 per Annum, IN ADVANCE.

TWENTY INCH SMOOTH BORE GUN FOR THE RUSSIAN GOVERNMENT.

The weight of this weapon in a finished state is 44⅝ tuns. The weight of the projectile to be employed—a cast iron spherical one—is 900 lbs. In trying the gun, in all 313 rounds were fired, the normal charge of prismatic gunpowder being about 117 lbs. The experiments of firing were conducted on the river Rama, the high bank across the stream serving as a butt, which was at a distance of about 1,400 yards from the the gun. The weapon was placed under an iron plated covering of a peculiar construction. On the discharge of the piece the concussion of the air was so great that in the village of Matoriloro, situated at a distance of one third of a mile, the chimney stacks fell in when the wind was blowing in that direction. The sound itself, although loud, was not deafening, and persons standing even under the iron-plated covering were able to support both the noise and concussion of the air. The iron gun carriage weighs 6½ tuns. The breech of the gun is elevated and depressed by means of a screw ratchet key. For facilitating the running forward of the gun a system of cogwheels is introduced, and for the diminution of the recoil, and the hoisting of the charge and projectiles, special appliances are provided. The moving of this enormous mass of iron can be effected easily by three men.

After the introduction into the military art of rifled cannon, the conviction became established of their unconditional superiority over the smooth bores. As regards guns of small caliber this opinion may very likely be correct; but with respect to naval guns of the largest calibers, it would be difficult to give the preference either to the one or the other system. Without going into particulars of the merits or demerits of the one or the other description of weapon, we will point to one important difference in the effect of the spherical projectiles of the smooth bores and the oblong ones of the rifled guns; the latter will hit an iron-plated target at a greater distance than the former, and, so to say, pierce it through; on the other hand, the former will produce a far greater amount of concussion, shaking loose the rivets of the plates and bolts of the target, and bounding on the plates and cracking them. Besides the difference in the destructive action of these weapons, there is an enormous difference in the cost of production. Thus, for instance, according to a statement of Mr. Grasshof, the price of a 20 inch smooth bore gun will cost, when produced in quantities, about $8,000, where as an 11 inch steel rifled piece corresponding to the same could not be produced under $30,000.

MARINE CASUALTIES.

The report of Supervising Inspector General Nimmo, recently made public, furnishes the following interesting details relative to late casualties in river and ocean steamers. Full statistics are given for the year 1871, from which we find that sixty-five disasters by fire, explosion and wreck took place during that period, involving a loss of $3,600,661 and 363 lives. The average number of casualties above given is thirty-one per cent less than the average for the preceding three years; the average loss of property is nineteen per cent and of life four per cent less. Various modifications are suggested to the present laws, and more specific provisions are asked for regarding methods of investigation. The different catastrophes which have happened during the past year are recapitulated. The first case is that of the steamer Oceanus, which exploded on the Missouri river, killing forty-one persons. Then follows the Bristol casualty in Newport harbor; the burning of the Bienville and loss of forty-one lives; the sinking of the Metis, twenty-three lives lost; the bursting of the flue on the Dean Richmond, the fault in this case being ascribed to the failure of the manager of the line to have the boiler inspected after the steamer had been laid up for several months; lastly, the burning of the Missouri and the sacrifice of eighty persons closes the list.

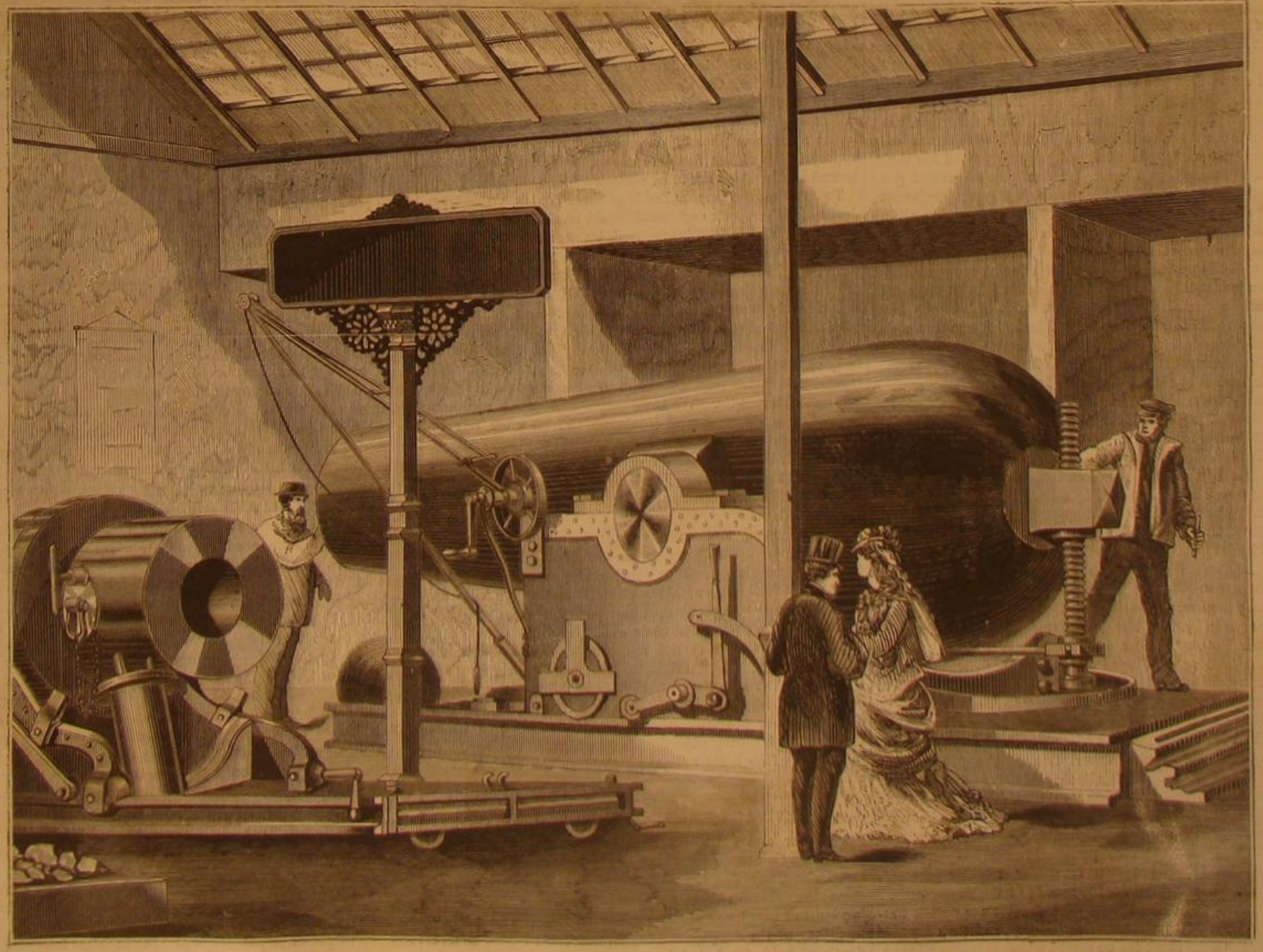
Strict discipline and repeated drilling of the officers and crews of sea-going vessels is earnestly recommended. A uniform system of tests for boiler plates is suggested, and the principal manufacturers have been called upon to present plans of testing machines. A series of general experiments upon safety valves is also recommended, which shall be of the most exhaustive character. Further tests of steam boilers, similar to those made at Sandy Hook, are called for, and especially upon boilers of the various forms used on vessels of the seaboard, of the lakes, and of the Western rivers. It is suggested that passenger steamers be allowed to carry petroleum which, in the opinion of experts, shall be perfectly safe, and amendments to the law are recommended which will authorize the immediate seizure of explosive or dangerous articles shipped contrary to the law.

The steamboat inspectors' service consists of a supervising inspector general, 10 supervising inspectors, 36 inspectors of hulls, 36 inspectors of boilers, 3 assistant inspectors of hulls, 3 assistant inspectors of boilers and 8 clerks of inspectors.

The report concludes with the expression of the hope that in the future there may be a free and friendly interchange of views between this service and all the interests of the country affected by our laws for the preservation of life and property on steam vessels, and that such intercourse may result in the best attainable security for human life and the highest degree of prosperity for our commercial interests.

A PLANET BETWEEN MERCURY AND THE SUN.—Mr. J. R. Hind, the astronomer, shows that there is a high probability that a planet circulates between Mercury and the sun, having a period of revolution of about nineteen days. Mr. Hind suggests that, on March 24 next, the sun's disk should be watched, as a conjunction of this hypothetical planet with the sun will occur about 10 A. M. on that day.

A CORRESPONDENT writes us that, while visiting the Library of the British Patent Office, in London, he noticed that the SCIENTIFIC AMERICAN attracted a larger number of readers than any other scientific publication there taken. This is an interesting fact, and holds good wherever our paper is taken. The regular weekly edition of the SCIENTIFIC AMERICAN is nearly equal to the combined number of all other scientific papers in the world.



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VOL. XXVII., No. 24. [NEW SERIES.] *Twenty-eighth Year.*

NEW YORK, SATURDAY, DECEMBER 14, 1872.

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THE PROPOSED HALF MILLION GRAB.

As Congress has now assembled, and in view of the extraordinary influence which will be brought to bear upon that body to obtain a large appropriation in order to cover the expenses of American Commissioners and exhibitors to the Vienna Exposition, we deem it advisable to present a recapitulation of the various objections which we have urged against such proceeding, and also a brief review of the facts regarding the Austrian patent laws and similar enactments of other European countries, the condition of which forms the basis of our opposition. The reader will therefore find in the following a succinct *resumé* of the various arguments which we have from time to time advanced, and from which, in connection with the published and opposite views of the United States Commissioner, General Van Buren, an intelligent idea of the controversy may be obtained.

According to the rulings of the Austrian patent law, patents in that country must be worked within one year of their date of issue; working before application for a patent, or between the dates of application and issue, is not a compliance with the law. Not only the device but all its parts must be made in Austria and sworn to be in exact conformity with the drawings and specifications filed. There is no provision whereby a suit may be terminated. The infringer, after the case is completed and he finds himself beaten, has only to assert that the inventor has not properly proved his working. The suit is then re-opened, and the same ground gone over, and this can be done as often as the infringer chooses, during the whole life of the patent. If an inventor allows two years to pass after working his patent the first year, without manufacturing it again, his letters become void. As regards the practical working of the above regulations, we have presented sundry communications from American inventors in Austria tending to show that Americans have never succeeded in getting a favorable decision in that country, and detailing individual experience, proving that so far from the government supporting the injured party, it actually seeks means to aid the infringer in his piracy.

Not only are the Austrian laws thus oppressive, but the regulations of adjacent European countries are equally unjust. We note in English journals repeated complaints of the unlawful seizure of patented articles displayed in the Paris Exposition of 1867, and we find it stated that inventions supposed to be protected by a special certificate, in that Exhibition, have been patented by Continental people. That the facts of the case are fully appreciated in England is proved both by the warnings of the press and the appropriation by Parliament of but £6,000 ($30,000) to assist English representation. The practice under the Prussian law—the Austrian practice is little better—is strongly condemned in evidence given by Mr. Henry Bessemer, the great English steel manufacturer, before a Parliamentary committee. He states that, after disposing of the use of his process to Krupp, the German founder, the latter, according to law, applied to the Prussian Patent Office for a patent on the same. The authorities first declared the invention to be not new, then temporized for a long period and finally denied the application on the ground that a description of the process was published in the English Blue Book, which volume circulated in Prussia. Mr. Bessemer adds "that is universally the way in Prussia, unless it is some paltry thing, merely to keep up the appearance of granting patents, they give an occasional patent in that way, but they receive always the drawings, the fees and the description from the English patentee, which is published there for the benefit of the Prussians. . . Having obtained all the information from an English patentee, they make it public in their country, and then say it is not new." Other cases are on record where patents on inventions have been refused, and after the denial the government has quietly proceeded to manufacture the articles. Especially is this true of military goods.

Under the existing patent law of Austria, a valid patent cannot be had if the invention is exhibited in Austria prior to the application for a patent. By a recent modification, the Director of the Exposition is empowered to except from the operation of the above clause such inventions as may be exhibited at the Exposition, and to grant a certificate to that effect in such cases as he chooses.

It is hardly necessary to say that, as a protective patent measure, this certificate is worthless. There is, therefore, plainly no ground for the assertions of the United States Commissioner that it is a patent or in any way operates as such. The most that it does is to fix a time during which an invention may be exhibited in Austria before being patented, and it then leaves the inventor to the tender mercies of the old and unaltered law. We therefore strongly deprecate any appropriation of the public funds in support of this great show business until Austria modifies its laws and consents to grant to our inventors the same enjoyment of their inventions in Austria as the subjects of that empire enjoy in the United States. In this country the Austrian inventor may obtain a patent even if his invention has been exhibited and manufactured for two years prior to his application for a patent; and our courts will defend and protect him from infringement, the same as if he were one of our own citizens.

From the consideration of this branch of the subject, we desire to direct attention to subordinate though cogent reasons why legislative assistance should be denied. We consider that an inventor or manufacturer in sending his goods for exhibition to Vienna does so in accordance with the views expressed by President Barnard in a late oration: that it will be a grand advertisement and ensure him a large profit. Unless it is to his direct advantage to make such a display, no inducement in the shape of partial assistance will cause him to expend the necessary time and trouble. Surely, then, it is manifestly unjust to devote the national money to the ends of private gain. For the relief of needy inventors having meritorious products to exhibit and being without funds to forward their desires, just exception might be made and discriminating enactments, private or otherwise, passed. But to manufacturers of our own products and of long known and tried devices, who incur no danger of infringement, pecuniary assistance should be denied, and they ought to be ashamed to ask it. Such refusal will not militate against a fair display of American products, as the same are largely manufactured abroad and will in any event be contributed by foreign exhibitors.

We have yet to refer to the especial labor of the United States Commissioner. This gentleman some time since voluntarily accepted the office, well knowing, as he himself states, the duties pertaining thereto, and that it was merely honorary, no salary being attached. After working "zealously" alone for several months, he has suddenly, under what authority we know not, appointed an advisory committee of thirty, who in turn appoint a series of assistants, making the total number of officials one hundred and forty-three. Forgetting his voluntary acceptance and also that of his subordinates, the Commissioner now concludes that he and they will labor no longer at his or their private expense, and consequently devotes his entire energies in securing, or, to use a common phrase, the lobbying through Congress, an appropriation of *five hundred thousand dollars* from which he and his deputies are to be compensated.

To say that the personal ends of these gentry do not underlie their patriotic endeavors would be absurdity; the fact is evident, and indeed is admitted by some, though, at the same time, defended by specious arguments of scientific reports, etc. It is well known that living expenses in Vienna are extremely high, and therefore half a million dollars would barely cover a year's expenditure for the number of officials above mentioned, leaving either a very small sum or nothing for the benefit of the exhibitors. We hold that this body of office holders are totally unnecessary, and that for Congress to lavish public money upon them would be both unjust and impolitic. We have ample diplomatic representation in Austria, with paid employees to look after our interests. We need no one at home to point out to our citizens where their best interests do or do not lie. Our business men are sufficiently shrewd and amply capable of managing their own affairs without any assistance from General Van Buren or his staff.

In conclusion, and on the grounds above related, we strongly urge upon Congress the denial of all applications for this appropriation. If a considerable sum is necessary, let General Van Buren, his assistants, and others who are interested in the Exposition, subscribe to the extent of their abilities, and thus further their own profit with their own funds. The country cannot and should not lavish half a million dollars, which might be far more advantageously applied to the reduction of our national debt, to the support of our own Exposition., the Centennial of 1876, and to hundreds of other purposes, than to any enterprise to which there are such strong objections, and which, at the best, bids fair to be of so little national benefit as the Vienna Exposition.

REVIVAL OF AMERICAN SHIPBUILDING.

Two new and splendid steamships, for the Pacific Mail Steamship Company, have lately been launched at Wilmington, Del. They are the Colon and the Acapulco, both of same size. Three others, for the same company, are also being built at Chester, Pa. The following are the general dimensions of the Acapulco: Length, 300 feet; beam, 40 feet; depth of hold, 30 feet 6 inches. She is a four decker of 2,324 tuns measurement, with a carrying capacity of upward of 4,500 tuns. Her model is handsome, and combines speed stability, and large stowage capacity. She is to be brig rigged, like the other vessels of the line. Her interior will be supplied with all modern improvements. The machinery is first class, of the compound type, with cylinders 51 and 88 inches in diameter, and with 42 inches of stroke; she has four boilers, 9 feet 9 inches in length and 13 feet in diameter, connected to one smoke stack; each boiler is made of 13-16 inch boiler iron, double riveted, and capable of carrying a working pressure of 70 pounds of steam. The line shafting is 13½ inches in diameter, the propeller being 16 feet 3 inches, with a varying pitch of 22 to 26 feet.

We alluded the other day to the remarkable stupidity exhibited by certain prominent shipping merchants, in requesting the American Institute, of this city, to examine and report whether the compound marine engines, now so extensively used, were really meritorious; as if the success and economy of this form of machinery, now employed on all the finest foreign vessels trading to this port, had not settled the question. Among the signers was the Vice President of the Pacific Mail Steamship Company. The engineers of that corporation seem to understand the subject, whether the Vice President does or not, for they are putting in the compound engines; and their new fleet of steamers will doubtless be enabled to make the same speed on half the coal burned in their present vessels, besides carrying more cargo. It would not be a bad idea for shipping merchants, who pay for the building of steamers, to become readers of the SCIENTIFIC AMERICAN, and thus keep themselves posted in the mechanical and scientific progress of the day.

THE CALIFORNIA DIAMOND BUBBLE.

For several weeks past the papers have been filled with accounts of the discovery of diamonds, rubies, sapphires, and other precious stones, in Arizona and other parts of the Western wildernesses. The wonderful region, where the gems were to be found almost as thick as blackberries, was alleged to be quite circumscribed, and very inaccessible. The fortunate discoverers brought to San Francisco a large number of specimens, which excited the astonishment and interest of everybody. It was then announced that they had arranged, by purchase and preëmption, to secure the whole of the valuable area, which embraced these untold treasures. The aim of the proprietors, as they now allege, was to make arrangements for the supply of a large amount of funds, so that a body of workers might be sent to the grounds and subsisted for a length of time sufficient to collect all the jewels that were accessible. To effect this, they determined to form a joint stock company. A corporation, styled the San Francisco and New York Commercial and Mining Company, was accordingly organized, a large amount of the stock sold, and the money transferred to the pockets of the original projectors. The purchasers of the stock, in order to ascertain the approximate value of their astonishing possessions, decided to institute a careful survey of the diamond regions and, for this purpose, a scientific party, headed by the well known geologists, Clarence King, D. D. Colton, Mr. Bost, and Mr. Frey. These gentlemen, after a toilsome march, reached the alleged diamond regions, and found, surely enough, diamonds and rubies on the surface of the ground and in the crevices of the rocks. But, strange to say, in every instance of a "find," it was evident that the gems had been deposited there by the hand of man, and that none existed where, if their occurrence had been genuine, the inevitable laws of Nature would have placed them. The explorers were forced to the conclusion that the ground in certain places had been salted, or scattered over with the gems for the purpose of deceiving honest or unskilled searchers, and they denounced the whole thing as a swindle of the most barefaced description.

When the report of the surveyors reached San Francisco, the trustees of the corporation met and adopted a resolution to the effect that the fraud be at once and fully exposed, in order that the public might be protected; also that no more stock be issued or transferred, and that the corporation be dissolved as soon as practicable.

Thus ends the romance of the Arizona diamonds. It is to be hoped that the originators of this daring outrage upon innocent purchasers of the stock may be brought to justice.

OFFICIAL PUBLICATION OF THE AMERICAN PATENTS—A NEW AND IMPORTANT WORK.

No better evidence of the energy and ability which the present Commissioner of Patents, General M. D. Leggett, has brought to the discharge of his onerous duties, and no more satisfactory proof of the rapid improvements which are being effected in the department under his charge, can, we think, be asked than that afforded by the recently published volume which forms the first of a series hereafter to be issued by the Patent Office, entitled "Specifications and Drawings of Patents." It consists of a large quarto of 668 pages of letter press and 226 pages of plates, containing not the mere claims, but the entire specifications and reduced *fac similes* of the drawings of all patents issued for nearly one month. It is intended to publish this work monthly, so that the record of devices patented, instead of being obtainable only in the Patent Office, will be broadly disseminated throughout the country and made generally accessible.

The importance of this undertaking, both as an encouragement to the useful arts and as a valuable aid to the inventor, can hardly be over estimated. An immense amount of time is constantly wasted by people seeking to develop what to them are new ideas, which are in the end perfected only to be rejected, after official examination, as old and covered by previous patents, while the luckless inventor discovers too late that he might have saved all his toil and expense, had he posted himself in what others had done before

him. With the aid of the present work, which—for a small yearly sum, no more than sufficient to cover the actual cost—may be added to every one's library, the most accurate information may be obtained, not only regarding the latest improvements and discoveries, but also all that has hitherto been accomplished in any special branch of industry or mechanism. So that within a few years the accumulated volumes will form the most elaborate encyclopædia of the useful arts ever published.

Each monthly edition will contain at the least estimate one thousand patents, while the aggregate of the latter, published in the twelve volumes, will reach nearly fourteen thousand per annum. If we compare the above large total with that corresponding in other countries, we find that the sum of all the patents granted in the United States in a single year exceeds the entire number issued by many nations during the past century or since the establishment of their patent offices. This fact alone shows that the work will be of still wider value as furnishing, not only to Americans but to the world, a complete record of the majority of all the useful inventions produced.

Great Britain approaches us most nearly in the number of novel ideas yearly devised by its inhabitants and placed under the protection of its patent laws. The statistics of this nation show that 3,000 patents are annually granted, but little over one fifth of the average taken out in the United States. The English specifications and drawings have, however, been regularly published for a considerable period back, so that we are enabled to draw the contrast between the British and American modes of transmitting this valuable information to the public.

The specifications of the English patents are issued in volumes measuring 7¼x10x2½ inches, each weighing some 4½ pounds. Each year's publication occupies about fifty books of specifications alone, the drawings being bound separately in fifty additional volumes—16x22x3 inches in dimensions, and weighing about fifteen pounds each. The aggregate dead weight of a year's issue reaches 975 pounds or *nearly half a ton* of printed matter, all of which, it seems, is required for the description of 3,000 patents in a manner not a whit clearer or fuller than our compact yet elaborate volumes. On the above English plan of publication, it would require about five hundred volumes a year, weighing in the aggregate over two hundred tuns, to produce the same number of patents as are yearly issued by this country, and which Commissioner Leggett expects to print in thirteen comparatively small volumes. As to the comparative expense of the two systems, no comment is necessary. As a matter of course the English publications might as well remain unprinted, for they are virtually out of almost every one's reach.

We can confidently predict a world-wide circulation for our new work. It will prove a trusty guide to the inventor and a useful and convenient means of reference for the Patent Office Examiners, as well as a valuable repository of knowledge for all interested in or desirous of obtaining information regarding our industrial progress. As an addition to our mechanical and scientific literature, it enures greatly to the credit of Commissioner Leggett, to whom its inception is due, while, as a monument of the national inventive genius, it is a production of which the country may justly be proud.

IMPROVED SHIP'S COMPASS.

The Earl of Caithness, at present visiting New York city, has recently exhibited to us a new form of gravitating ship's compass, invented by himself. Seamen are well aware that during heavy weather the rolling and pitching of a vessel cause the compass to oscillate, and that the consequent side movement of the points often renders proper steering a matter of difficulty, and at times results in throwing the ship far off her course. Lord Caithness' invention overcomes this difficulty by abolishing the gimballs in which the compass box is supported in the binnacle, and substituting therefor a ball and socket joint.

The arrangement of this device is simply a ball of metal fastened directly under and to the center of the bottom of the compass box, resting on a ring formed in the top of a hollow conical support, which is firmly attached to the binnacle. Just within the ring is a small metal point, and in the ball is a slot, fitting over it, so that sidewise rotary motion of the parts is prevented, and the compass, when adjusted to the ship, is held in proper position.

Attached to the ball, and counterbalancing the box and its contents, is a vertical rod, on which slides a weight. Within the binnacle, this pendulum has free play, and, by its gravity remaining always vertical, will necessarily retain the instrument in a horizontal position, no matter how deeply the ship may roll or pitch.

The variety of compass employed, whether liquid or ordinary card, is of course immaterial. In port, when it is desired to hold the compass steady, it is only necessary to slip the weight on the vibratory rod an inch or so down, so as to embrace the end and also the top of a small fixed upright at the bottom of the binnacle, securing it in place by a set screw.

His Lordship's invention is one of practical utility, and is both inexpensive and a decided simplification and improvement on devices now in use. We have before us many testimonials received from the British Admiralty, and officers of the navy and merchant service, giving records of its performances, all of which unite in its commendation. We note that in one instance a compass remained free from oscillation when the vessel was rolling to an angle of 30° and at times 35°. As Lord Caithness is desirous of introducing his device in the United States, we take pleasure in thus presenting an invention, evidently meritorious, efficient, and well worthy the careful attention of all seamen.

THE NOVEMBER ATMOSPHERIC WAVE.

Recent reports from the Signal Service Bureau indicated the discovery that the great meteorological phenomenon, known in Western Europe and the British Isles as the November atmospheric wave, has appeared on this continent. That this aerial billow has been hitherto believed to exist only within circumscribed limits, is shown by the following, written by Sir John Herschel in 1863, in which he speaks of "that great periodical phenomenon whose recurrence is beginning to be recognized as one of the features of our European weather table—a vast and considerably well defined disturbance, peculiar, it would seem, to this portion of the globe." The views of the distinguished astronomer are, however, now clearly shown to be erroneous. On November 12 last, says the report, a similar atmospheric wave began to break over the shores of Oregon and British Columbia, as shown by the weather telegrams. By the evening of the 13th, it had spread over nearly all the Pacific States and Territories, Utah and Nevada, and at midnight was pouring through the passes of the Rocky Mountains. On Thursday, the 14th, it descended upon Colorado, Nebraska, Kansas, and the Indian Territory. On Friday morning, it extended in unbroken magnitude and magnificence from Oregon and Washington Territory eastward through the great trough or depression of the Rocky Mountain back bone in Idaho and Montana, and stretched thence to the Lower Missouri and Lower Mississippi Valleys and over the western shores of the Mexican Gulf. Through this discovery the approach of winter may be accurately predicted, as it advances from the Pacific coast eastward in the great current of westerly winds. By showing that the warm air from the Pacific Ocean laden with vapor breaks over the icy summits of the Rocky Mountains, it explains the cause of the vast falls of snow which so effectually blocked the Central and Union Pacific Railroads last year. The air robbed of its vapor, and besides deflected upwards, is, it is believed, further chilled, and large quantities of latent heat are liberated. The warmer strata being then borne eastward explains the existence of the mild winter belt lying northeast of the mountains of Idaho and Montana and extending to the Athabasca and Saskatchewan rivers.

Whether or not this vast motion in the atmosphere has any connection beyond that of coincidence of time with the November meteoric belt, through which we have recently passed, is an open question. It undoubtedly has had some influence in the severe storms recently experienced. The telegraph informs us that, on the night of the 12th of November, the polar bands of cloud, said by Humboldt to presage tempests, appeared; while on the same evening a prediction of the Signal Bureau was verified by the rising of a heavy storm which visited the lakes with great severity and swept over the whole face of the country. The more immediate effects of the present wave are said to be drier and more wintry weather.

The Signal Bureau deserves the greatest credit for the valuable addition to scientific information elicited by its researches, and we trust that the Government will appropriate ample funds to promote the prosecution of such important labors.

DEATH OF HORACE GREELEY.

This distinguished editor, so widely known in connection with the New York *Tribune*, died on November 30, at the age of 61 years, at Chappaqua, N. Y. His demise has deprived the world of industry, progress, and science, of one of its stanchest and most zealous friends. The son of a New Hampshire farmer, he was apprenticed to a newspaper printer in Vermont, and came to New York in 1831, with very little money, and no friends He obtained work as an ordinary type setter in a printing office, and soon showed his intelligence and ability. In partnership with a friend, he undertook the printing of a one cent daily paper, which soon failed; and Mr. Greeley then found another partner, with whom he started the *New Yorker*, a journal which had for seven years and a half a high reputation for its literary and critical ability. Mr. Greeley was subsequently the editor of *The Jeffersonian*, and then of the *Log Cabin;* but his great work was the establishment of the New York *Tribune*, the first number of which was issued in April, 1841. In this work he was ably assisted by Thomas McElrath, his partner, without whose business abilities it is not likely that the *Tribune* would ever have attained its present success.

Although Mr. Greeley's talents were chiefly literary and controversial, he had a most enlightened sympathy for all the branches of science and the progressive spirit of the age in which he lived. He was notably the friend of the industrious, the ingenious, and the intelligent among the people; and his journal owes much of its popularity to this trait in the character of its principal editor. His influence as a journalist has been acknowledged by all parties, and although much of his life had been passed in weathering political storms, he has left few personal enemies behind him. He was the recent candidate for the Presidency, of the Democratic party, and to over exertions made during the late campaign is due, it is believed, the illness which has so fatally resulted Horace Greeley was a remarkable man, and his name will occupy an eminent place in the annals of American history.

J. E. T. has tried a recipe published in our paper for a cement composed of glue and rubber in spirits of niter, and says the thing wont work. The rubber dissolves but the glue remains solid. In dissolving and combining many substances, it is oftentimes necessary to observe a certain order. In the present case, if our correspondent will dissolve the glue in a little water and then add it to the solution of rubber in spirits of niter, we think he will succeed.

[Reported for the Scientific American.]

ELECTRICITY AT THE STEVENS INSTITUTE.--NOVEL RESEARCHES BY PROFESSOR MORTON CONCERNING THE INDUCED CURRENT.

The first of a course of public lectures on electricity was recently delivered by Professor Morton, at the Stevens Institute of Technology, Hoboken, N. J., before a large and intelligent audience.

The lecturer introduced his subject with a few simple, but suggestive, experiments, showing the attraction and repulsion of pith balls and gold leaf very plainly, by throwing their magnified image on the screen. He mentioned that although glass was the substance generally used as an insulator, it was not by any means perfect for the purpose, and pointed to a series of Leyden jars which were entirely useless as a reservoir of electricity, owing to the poor insulating power of the glass.

Vacuum tubes were passed among the audience, each tube having sealed within it a smaller tube, with bulbs blown along each inch of its length; in the space between the smooth outside and the balbed inside tube, was placed an ounce of mercury; on suddenly inverting the instrument, the mercury, in its descent, would strike against the bulbs of the inner tube, producing friction, and consequently electricity, of which the effect could be seen as a violet or purple colored light following the mercury.

The subject of electrical induction was next introduced, with a simple instrument called the electrophorus, and a Holtz machine; then followed a series of experiments with induction coils. A Giessler tube was caused to revolve rapidly by means of a small magnetic engine. When the induced current was transmitted through the revolving tube, it produced the effect of a handsome piece of fireworks. A wire, with strips of paper fastened at one end, was connected with the inner coating of a Leyden jar. On charging the jar with the long sparks of induced electricity from the induction coil, the strips of paper would be repelled and stand out from each other, but on discharging the jar they would instantly drop. A chime of bells was rung on the same principle, and would continue to ring for twenty minutes with one charging of the jar.

Professor Morton mentioned that he believed he was the first to discover that the induced or secondary current of the Rhumkorff coil was capable of producing attraction and repulsion, similarly to frictional electricity.

An electrical orrery was set in motion by the induced current escaping from points, and reacting on the air; a lighted candle, held near one of the points, was almost blown out.

The speaker closed the lecture with some brilliant experiments with the large coil of the Institute. Wood was torn up, and gunpowder was only scattered with one electric flash, which lasted the six billionth of a second, but ignited by another of longer duration, about the six or eight hundredth of a second. The last experiment, that of causing the induced electricity to penetrate blocks of glass, was received with well deserved applause; the assistants brought in two heavy columns of glass, each having a metal rod running through its middle; thick varnish was poured on the top face of one column, and the block of glass to be penetrated placed on the varnish. More varnish was then poured on the block, and the other column placed on top. The principle was simply to bring two very well insulated electrodes together, with the block of glass between them; the object of the varnish was to render the path through the glass the easiest course for the electricity. The terminal wires of the secondary coil were connected with the rods in the columns of glass. It was very interesting to observe the effect of the strange force struggling through the glass; the electricity would penetrate perhaps an eighth of an inch, and then, as if the resistance were too great, it would dart back and run around the outside of the block, turning the corners and scattering the layers of varnish; then again the current would make a new attack, penetrate deeper and deeper, until at last the bright streams of light passing entirely through the glass announced the electrical success.

The Professor exhibited a block of glass three inches thick (penetrated in this manner), by throwing the light through it and on the screen; two plainly marked cleavage lines showed the electric path through three inches of solid glass.

L. L. D.

THE CHRISTIAN LEADER.

The *Christian Leader*, the organ of that body of religionists known as the Universalists, has just made its appearance in a new and improved form, to wit, the large quarto shape. Its readers are now presented with twenty pages of matter, handsomely printed. The new publisher is Mr. M. K. Pelletreau, and his name alone is a sufficient guarantee for the elegance of the typography. Office No. 8 Church street, New York; subscription $2.50 per annum, chromo included. The new editor is E. H. Chapin, D. D., who, as everybody knows, is not only an able and popular writer but he is also a most eloquent speaker. Under this new editorship and management, the *Leader* will undoubtedly take the place in the ranks of religious journalism which its name so appropriately implies. The editor in his address says: "In our day, the human mind is much engaged with problems that involve the highest interests of our being. It may be an age of religious doubt and dislocation, it is not an age of religious indifference. These things appear, not because men are apathetic, but because they are in earnest. Trained by the scientific culture of the times to face the facts of nature, they demand facts and not assertions in every department of human faith and teaching."

In education, science is invaluable as the sole means of training and invigorating the intellect.

NEW ICE HARVESTING INVENTION.

Mr. Louis Townsend, of Terre Haute, Indiana, has devised and patented a number of useful and ingenious inventions, destined to cause much saving of labor in the cutting, transporting and housing of ice. Not only this but an ice increasing machine is introduced by which the thickness of the ice in rivers, lakes, etc., can be materially augmented. This device consists in a number of sections made of two planks each, nailed together at right angles and braced by an end piece. As soon as the ice has acquired a sufficient thickness to bear the workmen, a sufficient number of these sections to enclose the desired space are placed end to end and secured to one another. The lower edges of the sections are wet so that they become frozen to the ice. Water is then pumped into the enclosed space to a shallow depth, which readily freezes. Another supply of water is added, and so on until ice of the desired thickness is formed. This invention was patented April 23, 1872.

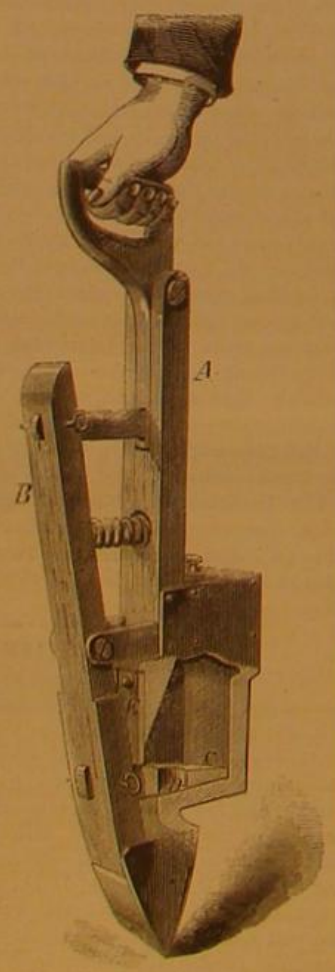
Having made his ice, Mr. Townsend invents an ice cutter which consists of a T shaped frame work carrying a set of circular saws which mark the ice similarly to an ice plow but do not cut through. Then driven by suitable mechanism are vertical saws destined to cut the blocks, power being transmitted by means of a horse walking on an endless belt. The power may move forward automatically as the saws cut their way through the ice, and may be placed at a considerable distance in advance so that being far from the edge of the ice there is no danger of its support breaking through. When it is desirable to have the saws work in advance of the power, they are reversed and the latter is mounted on a boat or raft. The date of this patent is Oct. 8, 1872.

The blocks being cut, in order to float them to the elevator or flume where they are to be stored, a device is presented formed in three sections hinged to each other. Each section consists of a top bar, bottom bar and a series of rounds, so that the apparatus resembles an ordinary ladder. It is placed around a block of ice, a rope is attached and the whole floated to the desired point. Patented April 23, 1872.

The blocks having been brought to the store house, Mr. Townsend supplies an invention for carrying or moving them about. It consists of a carrier the bottom of which is a metal plate made somewhat in the form of an earth scraper, but with its forward edge turned up. Metallic straps pass around the lower side of the plate and serve as runners, also as guides to hold the ice, and their ends fasten the plate to the long bars or handles. The carrier is made of such a width as to receive two blocks of ice placed side by side, and is designed to secure the ice as it falls from the chute, carry it to the place where the packing is going on, and there be easily slipped from under its load. This invention was patented April 23, 1872.

IMPROVED SEED PLANTER.

The accompanying illustration represents a convenient and ingenious form of hand planter which may be readily adapted to various kinds and different sizes of seeds.

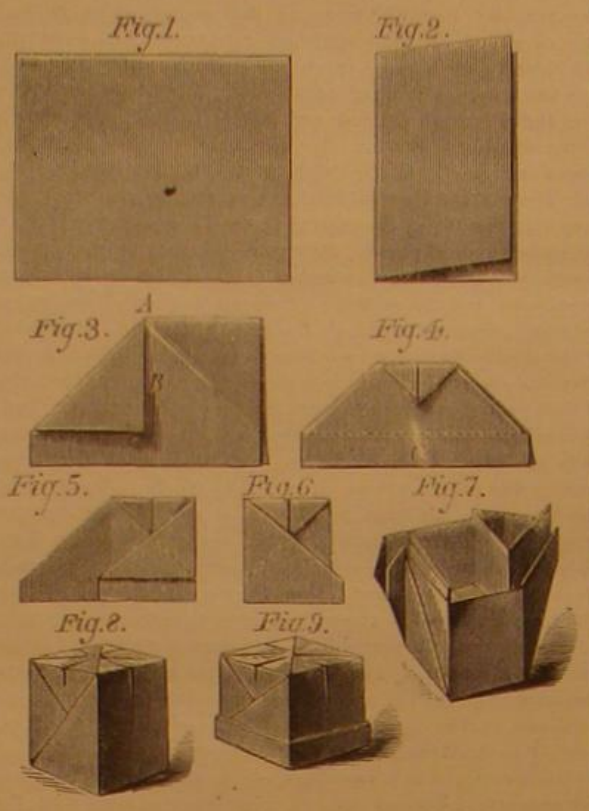


A and B are two blades meeting at their lower extremities and there protected by a metal sheath, as shown. Attached to the blade, A, is a seed receptacle, a part of which is exhibited as broken away in order to show the interior arrangements. At the bottom, and passing through an opening in the receiver, is a wedge-shaped valve, C, which is secured by being pinned in a slot in the blade, B. This valve has a circular orifice at D, and immediately above it, and resting upon its upper side, is a sliding piece, E, countersunk in the blade, A. The two blades are held apart by the spring, and are connected by the bearing, F, on which the moving blade, B, works, and also by the arm, G, to which is attached a hand lever, the fulcrum of which is at the upper extremity of the blade, A.

In operation, the receiver being filled with seed, the apparatus is thrust into the ground. A downward and backward motion of the hand lever, to the left in the engraving, causes the blades to separate at their lower extremities. The valve, C, is thus withdrawn through the opening in the receiver, as far as to permit the seeds which have settled in the orifice, D, to drop therefrom, fall down into the point of the planter, and thence pass through an opening into the ground. The slide, E, descends by its own weight as the beveled upper side of the valve is drawn under it, thus preventing the seeds, beyond what are contained in the orifice of the latter, from escaping, and then ascends as the valve is pushed back. Different valves, with various sized orifices, may be used to suit the varieties of seed employed. Patented June 11, 1872. For further particulars address Mr. Henrick Lage, glass box 1,055, Omaha city, Nebraska.

HOW TO MAKE PAPER CAPS.

It is a noticeable fact that, in workshops and factories where numbers of men are employed, a large percentage of the operatives will be found to be prematurely bald. If the cause of this affliction be sought, it will be traced to the pernicious habit of continually wearing the close cap or hat, thus keeping the scalp at an unnatural heat, and cutting off

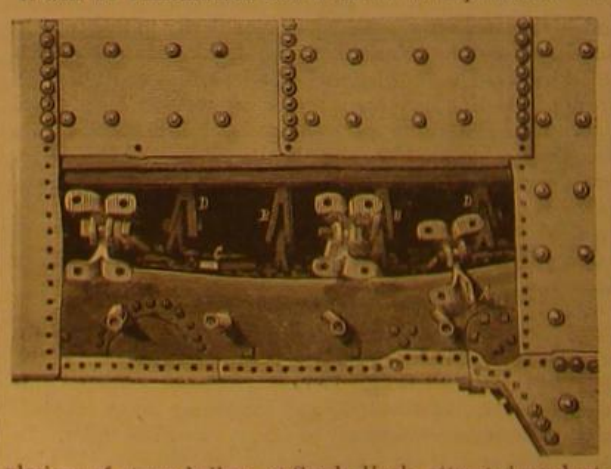


from it all ventilation. The hair under such treatment is, as a matter of course, weakened, and, decaying at the roots, falls out in large quantities. In defence of the practice, it is urged that the head and its covering must be protected from the dirt and dust that fills the air of the work rooms, and that an old hat is about as good as anything that can be used. We think that all will concede that a light paper cap that costs nothing, or at best a penny for a sheet of brown paper, will answer every requirement of protection, while at the same time being both light and cool. Besides, it is much more cleanly to renew one's head gear with a fresh sheet of paper every once in a while, than to continue wearing a grimy, greasy, thick piece of felt or cloth for months at a time. In order, therefore, that all may be able to make their own caps, we have prepared the accompanying engravings which, with the following few words of explanation, will show how they are folded:

First, provide a sheet of moderately thick brown paper, size from eighteen inches to two feet, shape as in Fig. 1. Smooth it out perfectly flat and double over as in Fig. 2. Turn it round with the fold from you, and mark the exact middle of the piece at A, Fig. 3. Then bring down both corners and measure off on the edge, B, from the point, A, Fig. 3, a distance equal to one quarter the circumference of your head. Mark the point. Now, turn the paper over so that the under side will be uppermost, and bend the apex of the triangle back from the point just marked, as in Fig. 4. Fold over the sides, Figs. 5 and 6, and with scissors cut off the lower portion, C, below the dotted line and also the points of the two lower corners of the pieces just bent over. Next unfold the paper; spread it out flat. You will find a square marked in the middle, and creases leading therefrom to the corners of the paper. Double up the material on these creases, so as to bring up the paper as sides of a box, of which the middle square is the bottom, as in Fig. 7. Smooth the folds flat, and your work will appear as in Fig. 8. Lastly, turn up the edges of the box all around, twice, folding the paper on itself. Your cap is then complete, and, if the measurement directed above was correctly made, it will exactly fit your head.

STEAM BOILER EXPLOSIONS.

It will be remembered that a series of experimental explosions of steam boilers, at Sandy Hook, attracted much attention some months ago. The boiler tested were, before



being submitted to excessive steam pressure, several times subjected to hydrostatic pressure until ruptured at their weakest points. After one of these boilers, No. 3,* had given way at the crown sheet under this treatment, Mr. F. B. Stevens, who planned and conducted the experiments, had a sheet cut away opposite the crown sheet, and the interior photographed. We now have the pleasure of presenting a copy of this photograph in the accompanying carefully made engraving.

The boiler was built by the well known firm of T. F. Secor & Co., in 1846, and was 25 years old at the time of its removal from the boat.

The excellent proportions of its bracing are shown by the fact that no one detail seems to have shown special liability to fracture. The ear of a crow-foot brace, at A, the pins at B B, and the body of a brace at C, have all given under about the same pressure. The crown sheet seems to have gone down considerably under B B, and is much distorted elsewhere. Far back, at D D, we can see, in spite of the lack of light, braces that still held. The picture is an interesting study.

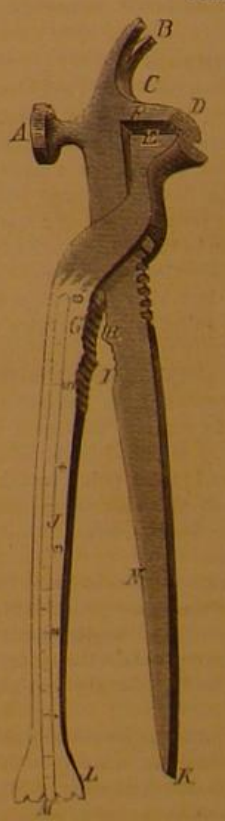
Brain Work.

One thing I would like to impress upon those who are exceptionally excitable. The very slightest stimulants, which others may use with impunity, are bad for them. I have known cases of chronic neuralgia, from which torture had been endured for years, cured by ceasing to drink tea and coffee regularly, or by leaving off smoking. The nerves are such delicate affairs that they often make us a great deal of trouble with very little cause, seemingly. Excessive brain work renders them much more susceptible. This susceptibility must be counteracted by the avoidance of those things which tend to excite. What a steady brain worker wants is to replace (not stimulate) his vitality as fast as he uses it up. To this end he wants everything that is nourishing and soothing. A stimulant crowds out some part of the requisite nourishment, since the system can only receive a certain proportion of matter into it at a time and appropriate it harmoniously. If you set it to work on a stimulant, or set a stimulant to work on it, the action is mutual. It will not assimilate fully the nourishment which may come immediately afterward.

All the diseases to which we are constitutionally liable are aggravated by the use of stimulants. They assist the development of chronic complaints, and make all sickness harder to cure. It is not necessary to speak of their bad effects on ailments of the brain. But most of these, I believe, are to be traced originally to their use. A healthy brain naturally seeks relief in sleep when it is tired. But one that is spurred and driven on by stimulants loses that inclination. From the inability to rest springs the whole train of nervous and cerebral diseases.

I believe that one, working the brain at proper hours and giving it the requisite rest, relaxation and nourishment, and never stimulating it into unhealthy action, might go on doing the very hardest mental work from youth to extreme old age and never suffer an atom from it—on the contrary, be benefitted.—*Howard Glyndon.*

COMBINED TOOL.



The ingenuity of some of our inventors has often been exercised upon the combination, in one instrument, of the tools in daily use by some classes of mechanics, and especially by housekeepers; and we here illustrate a successful arrangement of many of the useful implements most commonly needed. It is not necessary that we should give a lengthy description, as our engraving will show the numerous and varied uses for which the appliance is available; and its simplicity of form is such that it can be sold at an economical price.

The invention consists in combining the following named useful tools, in convenient form for general purposes, namely, hammer, A, tack and nail puller, B, stove cover lifter, C, scraper, D, pincers, E, adjustable wrench, F, gas burner tongs, G, nut cracker, H, cork presser, I, six inch rule, J, screwdriver, K, box opener, L, carpet stretcher, M, door fastener, N.

It was patented May 9, 1871, by Mr. J. Gorrick

THE school ship Mercury, owned by the city of New York and used as a reformatory for unruly boys, recently sailed on her third cruise. The vessel will proceed to the Volcano Islands, south of the equator, taking soundings and deep sea temperatures as often as may be practicable; thence to Rio and Barbadoes, and then back to New York. All necessary instruments for determining velocity of currents, sounding and collecting deep sea plants are provided. The information obtained will doubtless be of much scientific value, inasmuch as no correct charts of tropical ocean currents have as yet been published.

*Experimental Steam Boiler Explosions, by Professor R. H. Thurston: Van Nostrand, 1872.

[From Journal of the Franklin Institute.]

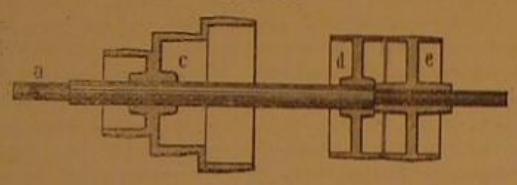
TRANSMISSION OF MOTION.

A Lecture delivered by Coleman Sellers, at the Stevens Institute of Technology, Hoboken, N. J., February 19th, 1872.

NUMBER V.

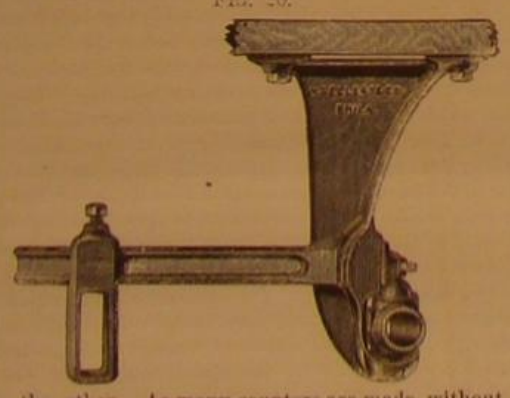
Pulleys are sometimes made loose on the shaft, and are used mainly on what are called countershafts, for the purpose of starting and stopping machines. Countershafts are usually short shafts placed over or under the machines to be driven, and, receiving the power from a main line, transmit it to the machine. Thus, I have here an example of a counter shaft for driving a lathe (see Fig. 19). You will observe that this shaft is necked down at its ends (a and b), to a smaller size; these smaller ends are the journals. It has upon it a cone pulley, c, corresponding with the cone pulley on the lathe head to be driven, the various sizes giving different belt speeds, and it has also a pair of fast and loose pulleys, d, e. Now this may be taken as an example of a countershaft; but all countershafts are not made in this manner. The term countershaft is applied to all shafts driven from the main line when placed at or near the machines to be driven, and sometimes in cotton and woolen factories some really long lines, driven from the main line in the same room, are called counters or counter lines. Such lines, differing in no respect from main lines except in name, need not be especially considered. Countershafts such as I here show you, Fig. 14, are peculiar in themselves, and must be considered by themselves. In this example there are fast and loose pulleys d, e. When the belt is on to the fast pulley, d, it will, in causing it to revolve, rotate the shaft also, and thus drive the machine connected with it; but when shifted on the loose pulley, e, that pulley can turn without turning the shaft. Now, you will observe that the shaft in the loose pulley is of the same size as the journal part, and the hub of the loose pulley is longer than its face is wide; this is an important feature, as it insures stability and durability. It makes the pulley run steady, and its extended bearing makes it wear well. It is advisable to so ar-

FIG. 19.



range countershafts of this character as to admit of the loose pulley being near the hanger, so as to admit of the shaft being turned down to the journal size where the loose pulley is. Thus, for a double purpose, the box of the hanger holds the pulley in place between it and the shoulder of the shaft, and the lubrication of the bearing helps to oil the loose pulley, as much of the oil will find its way along the shaft. The hangers for that counter need not be made with a vertical adjustment. They should be provided with the swivelling principle in the box, and as the boxes can be slid on from the end, they may with advantage be made solid, not in halves, as are the boxes of line hangers. I have here two examples of hangers to countershafts, called counter hangers. One of these (Fig. 15) is for use on a countershaft where there are fast and loose pulleys; the arm is to carry a belt shifting rod, which slides in the adjustable guide, and by suitable belt forks is used to push the belt from one pul-

FIG. 20.



ley to the other. As many counters are made without fast and loose pulleys, there are hangers made without the shifter arm, and this form of hanger is extensively used in factories for the counters of machines having the fast and loose pulley on the machine itself, as is the case with the looms.

I have already mentioned that there is a distinctive difference between the shafting system of this and other countries; let me explain this more fully, taking for example the practice that holds in England at the present day. Theoretically, motion can be transmitted more economically by means of gear wheels than by means of belt. Gear wheels transmit motion without loss by slipping, as might be the case with belts. Gear wheels are used in England to transmit the power of the engine to what is usually called the jack shaft; from this shaft, by means of bevel wheels and upright shafts, the power is conveyed to the various stories and thence by bevel wheels to the line shafts. This system insures the transmission without slip to the lines, but it is costly and very cumbersome, inasmuch as very high speeds are not possible with gearing. With a very rapid motion the teeth are broken by the back lash. Sometimes wooden teeth or cogs are inserted in the driving wheels, and the driven wheels are made of iron with the teeth carefully planed to proper shape. Wood and iron teethed wheels can run rather faster than iron on iron, but still not up to the speed now common in this country. Let us suppose, for instance, that it is found expedient to use no higher velocity to the geared shafts than 100 revolutions per minute, and the machine driven necessitates the use of pulleys 3 feet in diameter to drive them. The first cost of the line would certainly be less if the line could be run at 200 revolutions, and pulleys only 18 inches in diameter used to drive the machines. Well, the practice here is to obtain a speed of say 400 revolutions for lines in spinning rooms, and to use pulleys not more than 9 inches in diameter. These high speeds are not attainable with gearing, so belts from the engine to the line have come to take the place of gearing in all well constructed American mills, and this with a manifest gain in diminished first cost, in economical use and in steadiness and smoothness of motion.

Not very long ago, an enterprising firm imported from England some peculiar spinning machines, and some, to us, novel machines for preparing the wool with the intention of making fine yarns. They also brought out a boss spinner to put up the machines and organize the factory. They consulted me in relation to the shafting to drive the new machinery, and I asked for speeds of machines, etc., to enable me to arrange the proper speed of shafts, power, etc. They referred the matter to this spinner, who said that he did not know what speed the machines were to run, but if I would make the shafts 3 inches in diameter and run them at 100 revolutions per minute, the pulleys should be 36 inches in diameter. This was, of course, information enough to guide me, but, instead of making all the shafts 3 inches diameter, I made some only 2¼ inches and giving a speed of two hundred and forty. I could use pulleys only 15 inches in diameter. When the plan was shown to the spinner, he condemned it *in toto*. These machines could not be driven from any less pulleys than 36 inches; that he knew, and no argument could convince him that the same speed was being obtained at a less cost. The mill owner, a good business man, but not much of a mechanic, was in doubt as to what to do, but was convinced when he saw the estimate of the two systems, one at so much less cost than the other, and when he was shown that the pulleys on the machine were only 12 inches in diameter, hence would require no larger pulley on the line, so far as power was concerned. I could relate many other examples of converts to the American system of mill shafting, whose conversion was brought about through their pockets, but who are now enthusiastic in praise of the entire principle of light shafts, small pulleys and transmission by means of belts in place of gearing.

It is in America only that the production of all that pertains to mill gearing and shafting has been reduced to a systematic manufacture. To make a machine is one thing; to manufacture machines is quite another thing. Thus one sewing machine may be made by itself at a cost more or less in proportion to the labor expended upon it. But the same machine, by means of organized labor, can be produced in quantities for a tenth of the cost of one machine. Hence systematized manufacture is needed to insure cheap productions. The hanger which Mr. Bancroft showed to the New England machinists would indeed have been an expensive luxury if simply made one at a time, with no special tools fitted to its production; but with most special tools, thorough organization of the labor employed, and the production of immense numbers of them, with all parts made to gages and interchangeable, the cost is less now than what the commonest, rigid bearing hangers were made for formerly, and their adoption is now universal. Apart from systematized labor, an important item in first cost is weight of material. Not very many years ago all shafting, and all pulleys, and everything relating to the machine for transmitting motion, were made and sold by the pound. Purchasers were attracted to the makers who charged the least per pound, and no very great care was taken to see that too many pounds did not go into the various parts of the machine. Shafts of a given size could not be made to weigh more or less by different makers; but much needless weight might be put into hangers, into couplings, and into pulleys, so that the price per pound really came to have no meaning so far as total cost was concerned. Some dozen years or so ago, the house of William Sellers & Co., feeling that this system of selling hangers, pulleys, couplings, etc., by the pound was not the proper way to dispose of such things, determined on a radical change. They instituted an extensive series of experiments to demonstrate just how strong and consequently how heavy each article comprised under this head should be. They found that pulleys might be reduced in weight, and, by the employment of suitable machinery, be more perfectly made. So of hangers, and all that pertains to shafting, except the shafts. They then published a price list, offering to sell each item at some certain fixed price, dependent upon its own cost. This price list enabled the purchaser to know beforehand just how much money would be required to obtain what he wanted, and for strength and durability he took the guarantee of the makers. There was great opposition to this system from those who were still anxious to sell by the pound; but in time the manifest advantages of the plan caused its adoption by other makers.

Various establishments have been fitted up at great cost for the production of "shafting," and the same attention is now paid to its construction as is given to any other branch of the machine business. All conceivable wants of the trade are met by specially contrived devices, which can be made in quantities and kept in stock ready for sale. Hangers varying in size and "drop" (that is, in distance from center of shaft to the foot), are made from carefully designed patterns. Pulleys fitted for double or single belts, for wide or narrow belts, and made high or straight on the face, are all from patterns nicely adapted to the work each has to do. Last, but not least, all these things are made to standard gages, so as to have their parts interchangeable. A nomenclature, too, has come into use, and all the technical terms used are in a degree uniform through the trade. In regard to the sizes mentioned, in speaking of shafts, they are called always from the size of the bar iron from which they are made, and the term "shafting size" has come to have a significant meaning. All turned shafts are made from merchantable sizes of round bar iron, and in turning, one sixteenth is taken off in diameter, so that what is called a two inch shaft is really only one and fifteen sixteenths in diameter, and so of other sizes; they are all one sixteenth less than their names imply; and the couplings, hangers, etc., are made to conform to these sizes.

The adoption of high speeds for shafts has, as I have said, rendered it almost impossible to employ gearing for the purpose of transmission. Belts have become the recognized means of transmission, and mills formerly driven by gearing are now being altered so as to use belts only. When two shafts are placed parallel, the transmission by belts is a very simple matter; but sometimes shafts are required to be driven at right angles to the axis of the source of motion. This can be done by belts, provided the belts be carried over guide pulleys, so set in relation to the driving and receiving pulleys as will enable the band to lead properly from one to the other. Various devices have been arranged to effect this with readiness, and it is not an unusual thing to carry belts as wide as twenty inches over such guide pulleys, and in all imaginable positions. But this subject is one that would require more than the time allotted to one lecture to fully explain. I must therefore pass it by with this brief allusion to it, trusting that I may have an opportunity at some future time to explain it more fully to you.

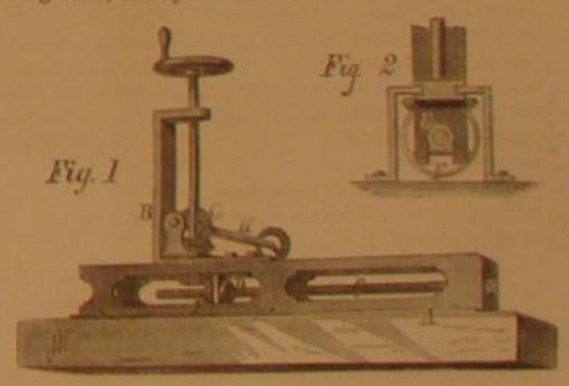
The subject of the transmission of motion from the motor to the machine, is, as I have shown, a very important one, and I cannot omit mentioning that I had an opportunity recently to note the comparative tests of power employed in driving two large manufacturing establishments. The amount of shafting, reduced to the same basis in each, showed in one case a consumption of ten horse power to run the empty shafting, and in the other thirty horse power only. The first was of the improved self-adjusting kind. The last was an example of shafts in rigid bearings. This will show you clearly how needful it is to study economy in transmission of power; and I trust what I have said to you this evening may at least furnish food for thought, and lead you to inquire into the subject further.

New Electrical Battery.

M. Lionel Weber has invented a new battery composed of a porous diaphragm filled with plumbago. This vessel is placed in a glass or porcelain vase containing a saturated solution of ammoniacal chlorhydrate. Into the plumbago is introduced a plate of charcoal which constitutes the positive pole; and into the solution which surrounds the diaphragm is plunged a plate of amalgamated zinc, forming the negative pole. This battery has been found to have great force, to be constant in the support of regular and continued work, to be economical and to need but little attention.

HEAD BLOCK FOR SAW MILLS.

The invention herewith illustrated is designed to facilitate the operation of setting logs to the saw in the process of sawing lumber, so that the thickness of the piece to be cut may be determined with accuracy. In Fig. 1, A is one of he head blocks of the carriage. B is the knee against whichl the log rests, and by which it is moved. C is a horizontal



screw immovably affixed to the head block. D is a sleeve nut traversing said screw, and connected with the knee by means of the stirrup, E, as more clearly shown in the sectional view, Fig. 2. The same engraving represents how the edges of the horizontal portion of the knee, B, are grooved to slide in a slot in the upper portion of the head block.

Connected with the sleeve nut, D, is the bevel gear, F, which is actuated by the rod and hand wheel, as shown. By turning the latter, the sleeve nut on the screw, C, is caused to rotate, and consequently to move forward or back, carrying with it the stirrup, E, and also the knee. By this means the sawyer can reach the setting apparatus from the side of the log, and also set the latter with great precision. At G is shown another bevel gear which is also actuated by the hand wheel. This rotates the shaft, H, which ends in a miter wheel that forms the portion of a similar mechanical device on another head block, so that both blocks may be connected together and actuated by a single hand wheel or crank. By having three blocks, those on the ends communicating, as shown, with the one on the center of the log, it is claimed that the stiffness of the log will obviate the tension or twisting in the extension rod, a common defect in other devices.

Patented through the Scientific American Patent Agency, April 16, 1872. For further information address the inventor, Mr. H. C. McEwen, Oakdale Station, Alleghany Co., Pa.

Correspondence.

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

Self-Propelling Fire Engines.

To the Editor of the Scientific American:

The terrible fire in Boston and the world-wide horse disease, occurring so closely together, have naturally turned our thoughts to the subject of steam power *versus* horses.

The fire department of Cincinnati has had several self-propellers in use for many years, and has tested them very thoroughly for this special purpose; and I am informed by Mr. Fatta, one of their engineers, that the self-propellers have not as yet been sufficiently successful as to exclude horses. It requires several minutes to get steam up to a propelling point, and in that time horses can be hitched to the engine, and will often reach the point of action by the time the steam is up to the needed pressure. When the fire is at a considerable distance, however, and the steam gets to its working pressure before the engines arrive there, the surplus steam may be used very efficiently to assist the horses over difficult ground. As it does not add much to their cost or weight, or in the least impair the efficiency of the fire engines, it seems to me that the propelling device should be attached to every engine for use in cases of emergency.

One wheel is sufficient to propel an engine, and a steering device is not needed, the steering being performed by horses, or if necessary, by men. I saw a self-propeller in use at the late fire in Boston; one of the hind wheels was driven by an endless chain from a small chain pulley or "sprotchet" wheel on the end of the crank shaft of the engine, which could be released by a clutch when the propelling device was not in use. The ratio was about one turn of the traction wheel to six or eight of the crank shaft. The only extra parts used in this case are the chain, two simple chain wheels, one eccentric, and a reversing link.

Engine houses should be on high ground, for the reason that it is easier to hurry these heavy fire engines down hill than it is up, and everything possible should be done to facilitate their movement to the fire. F. G. WOODWARD.

Worcester, Mass.

Freezing Water in Bottles.

To the Editor of the Scientific American:

In the winter of 1865–66, I succeeded in freezing water solid in glass bottles, filled to the corks, without breaking them, by the following method: Several bottles were filled with water, and perforated corks were inserted into their necks, rather tightly. A glass tube, open at both ends, and drawn to a narrow conical point, was then inserted, point downwards, through the corks, to a little below the middle of each bottle. The tubes were of rather thick glass, having about a 3-16 inch bore, and projected about an inch above the corks. The bottles, thus prepared, were set in an exposed place, in extremely cold weather, and left over night. On the following morning they were found to be unbroken, yet each bottle was filled with solid ice. The covers and tubes, having been forced out, were lying beside them on the shelf. A portion of the water had frozen in the tubes, and this ice was forced up and partly projected out at their tops, to the hight of an inch or more, and was more or less bent to one side and downwards. This must have taken place before the tubes themselves began to be forced up, by the expansion consequent upon freezing. Thus the tube at first served as a vent, while the water was freezing at the top and bottom and all around its own circumference; but at length, the ice beginning to form about the conical point of the tube, this was gradually forced up, the space which was gradually relinquished in the center of the bottle being sufficient to compensate for the further expansion of the water. COE F. AUSTIN.

Gloster, N. S.

Juice vs. Cider.

To the Editor of the Scientific American:

I agree with the writers of two articles, lately published in the SCIENTIFIC AMERICAN, that there is a difference between cider and juice, but I prefer the juice: and I think any person who is very fond of apples would do the same.

Not long since I read that a physician—I have forgotten who—had never known a person who was very fond of fruit to become a drunkard. He regarded the two tastes as antagonistic. If this be so, we ought to cultivate a taste for fruit by drinking juice rather than cider. As sulphite of lime is used to keep cider sweet, I would like to inquire what the action of the drug is when taken into the stomach? As its office is to absorb oxygen and prevent the cider becoming oxidized, I do not see why it would not, like phosphorus, interfere with the oxidation of the blood by absorbing a part of the oxygen taken in by the lungs. If it would have such an effect, to drink it would be equivalent to breathing a poorer quality of air.

I presume if cider could be kept sweet as long as desired, and then exposed to the air until the sulphite was changed to sulphate, there could be no objection to its use.

Those who know will please inform us who make cider, so we shall know whether to use the drug or not.

Charlotte, Me. H. A. SPRAGUE.

Scientific School at Princeton.

To the Editor of the Scientific American:

Knowing that the readers of your journal feel interested in the establishment of scientific schools, I feel sure that they will be glad to hear of a new one.

Last June $200,000 was subscribed by Mr. John C. Green, for the purpose of founding a scientific school in connection with Princeton College, and already a large building is in course of erection. The building will probably be completed and the scientific school in operation by September next. This school will necessarily be of great advantage to the college, as students in the academic department can take advantage of the scientific school, and *vice versâ*.

The want of the age has been an ideal education, an education not exclusively scientific, not entirely classical; but an education embracing, with its practicality and science, a fair degree of literary culture.

We seem to be progressing toward this education. Already Harvard and Yale have declared in favor of it, and now Princeton comes to the front. The day is not far distant when all our larger colleges will have scientific schools, and science will enter largely into their courses. M.

Princeton, N. J.

Inventions Wanted.

To the Editor of the Scientific American:

I would respectfully call the attention of inventors to the fact that three articles need to be invented, either of which will be a fortune to the successful inventor:

A spring to close doors slowly, without slamming.

A detachable metal or other tip for children's shoes.

A sewing machine chair attachment, to be attached to any chair to support the back of the operator.

AN INVENTOR.

THE STURTEVANT BLOWER AND ITS USES.

The air blast, as many are aware, was but a short time ago applied to but few uses; indeed, its whole employment was confined to furnaces and forges for working metals and in connection with steam boilers. Coarse fans or, in cases where an especially strong blast was required, ordinary pumps constituted the mechanical device. To supply this manifest deficiency, Mr. B. F. Sturtevant, of Boston, invented what is now known as the Sturtevant blower, and in 1867 obtained his first patent, which was subsequently illustrated with engravings in these columns. Since this date thirty patents upon the original form have been granted, and so widely has the manufacture become extended that it is now stated that no less than nine thousand blowers are in use. We have obtained from the above gentleman the following facts, regarding the various operations, etc., to which the different styles of the Sturtevant blower may be advantageously applied, and we believe that the information thus for the first time collected will prove an excellent means of reference for manufacturers and others, besides exhibiting the many uses to which this ingenious machine may be adapted:

The pressure blower may be used for supplying blast for forges, all kinds of furnaces for smelting, melting, heating and converting all kinds of metals and ores, ranging from the jeweler's blowpipe through the long catalogue of silversmiths', coppersmiths', and blacksmiths' forges. For forges and furnaces for manufacturing agricultural implements, hardware and cutlery, from the plow to the penknife. For blowing the furnaces in railroad and steamship building and repair shops, iron and brass founderies, Bessemer steel works, cast steel works, rolling mills for the manufacture of iron and steel rails, sheet iron and boiler plate and merchant iron. For making blasts for steam forges for forging shafts for steamships, anchors, etc.; and also for affording a blast for furnaces for smelting and packing gold, silver, copper and lead ores.

Exhaust fans are employed for removing shavings from planing and molding machines, sawdust and dust from sand wheels such as are used for polishing lasts, carriage spokes, shoe bottoms, felt hats, etc. and emery wheels for polishing all kinds of hardware, smoke and gas from smoky smith shops and manufacturing establishments and chemical works. Steam and vapor arising from paper machines and all drying cylinders and dry rooms; also sweat from millstones, offensive odors from try kettles and dyeing establishments, dust from rag and cotton pickers, flax and rope machinery, ventilation of coal mines and all underground apartments or cellars; also for exhausting impure air from public buildings of all kinds. Two of these fans are already in use in the United States Senate Chamber, and two in the House of Representatives, being driven by very powerful engines and capable of removing 1,800,000 cubic feet of foul air per hour.

Pneumatic despatch blowers are arranged for conveying and elevating packages and freight of all descriptions weighing from one pound up to two tuns.

Hot blast blowers are used for taking the hot volatile product of combustion from large boiler chimneys and forcing it into kilns for drying non-combustible materials such as fertilizers, brick, etc.

The hot blast machine (tubular steam heater and blower combined) is employed for heating the air with either live or exhaust steam and blowing it under beds of wet wool and cotton, and also cotton waste and wadding, into machines for drying wet cloth and hosiery, into kilns for drying lumber of all kinds such as are used in finishing. Also for doors, sash blind and carriage manufactories, piano and organ factories, staves for barrels, tubs, pails and clothes pins, brick, grain, tobacco, sliced fruit and vegetables of all kinds, chemicals, glue and gunpowder, and for drying leather and skins in tanneries. These machines not only supply the necessary heat for evaporating the water from the substance to be dried, but the great energy of the blast expels the moisture from the dry kilns, keeping them thoroughly ventilated and filled with dry hot air.

Erie Canal Navigation.

Navigation on the Erie Canal, New York, has closed for the season, and with it ceases the limit of competition for the State reward of one hundred thousand dollars, offered for the best form of canal boat motor, in lieu of horses. By the terms of the law passed in 1871, a reward of one hundred thousand dollars was offered for the device best suited, in the opinion of the Commissioners, as a substitute for horse towage. Competitors were to exhibit their improvements at their own expense, in working order, in boats carrying not less than 200 tuns of freight in addition to fuel and machinery; and they were allowed until the close of navigation of the present year to make their trials. Quite a number of boats have been tried upon the canal, some of which proved highly successful. The award of the Commissioners has not yet been made.

The closing of canal navigation compels about forty thousand men to seek employment during the winter at other occupations. Probably half a million more, who have worked on the rivers and lakes of the State, must soon look to something else for support, for the icy season is at hand.

In the aggregate, the canals of the State of New York are are eight hundred and thirty-four miles in length. The Erie extends from Buffalo to Albany, three hundred and fifty miles; the Chenango, from Binghamton to Utica, ninety-seven miles; the Genesee Valley from Olean to Rochester, ninety-five miles; a branch of the same, from Conesus to Danville, twenty miles; the Black River, from Rome to Carthage, including a distance of forty-two miles by river, seventy-seven miles; the Chemung, from Elmira to Montezuma, including a distance of thirty-five miles through Seneca Lake, eighty miles; the St. Paul's, a branch of the Erie, from Montezuma to Seneca Falls, thirty miles; and the Delaware and Hudson, from Honesdale, Pa., to a point on the Hudson River opposite Rhinebeck, about eighty-five miles of which are in the State of New York. These, in the season, are navigated by nearly 7,000 different boats, or an average of eight boats to each mile of canal. Of these boats the largest have each a carrying capacity for 225 tuns of assorted cargo, or 2,000 barrels of flour, or 9,000 bushels of grain. The smaller boats have a carrying capacity of 125 tuns, in proportion as indicated above. The average cost for the construction of the boats used is, for the larger, $5,000, and for the smaller, about $2,000. The average monthly cost of running, including tolls and towing, is about $800 per boat, which, it will be seen, involves a very large capital for simply the running expenses of a season. The men nearly all complain of the manner in which the canals have been managed by the State authorities, and express the hope, earnestly, that the next Legislature will inaugurate a reform. They charge the great falling off in the canal trade upon the failure to keep the canals in proper order, and the heavy tolls, by which, they declare, a vast business, which now seeks railway and other conveyances, has been driven away.

A London Fire.

On the day when Boston was burning down, a great fire was consuming the largest and what was supposed to be the most thoroughly fireproof building in London. This was the gigantic City Flour Mills, in Upper Thames street, near Blackfriars bridge.

From its extraordinary hight, it towered above all the other wharves and buildings in the neighborhood, and it had no less than 400 windows in and around it There were seven stories to it, each of them being divided into warehouses and machine rooms, and the quantity of grain that was continually kept in it was extremely large. The building was 65 feet wide and 250 feet long, one end fronting on the Thames and one side on a creek from the Thames, from which barges might be laden. The fire was discovered shortly before seven o'clock in the morning. Very soon thirty engines and upwards of 200 firemen, under the direction of four superintendents, were in attendance. The floating fire engines also appeared in due time and got as near to the burning premises as the condition of the tide at the time would allow. A capital supply of water was obtained, but the fire, in spite of every effort that the skill of the firemen enabled them to make, spread gradually through out the entire upper part of the building. The floors one by one gave way with a tremendous crash, throwing the entire weight of the contents on those beneath. Although, being daylight, no reflections of the flames were visible, yet as the fire became known the bridges and all the streets in the neighborhood were densely crowded. On the river also the floating engines were surrounded by skiffs and other small craft, all filled with spectators. The land engines played from every conceivable point round the building. Firemen stood on the roofs of high premises abutting upon the mills, and thence managed to pour, into the windows and apertures of the building, tuns upon tuns of water. Very little impression seemed, however, to be made, and the fire was likely to continue in that state for a day or two, owing to the immense bulk of the smouldering contents.

Preserving Charred Papers.

Mr. E. H. Hoskins, of Lowell, Mass., has suggested a very useful and practical way of preserving and giving toughness and flexibility to charred paper, which has proved to be of much importance in the identification and copying of valuable documents, charred by conflagrations such as the recent Boston and Chicago calamities. We have seen specimens of charred papers and bank notes, thus treated, that can be handled with impunity. The printing upon the charred bank notes can be readily discerned. The preserving process consists, we believe, in pouring collodion upon the surface of the charred paper. The collodion forms a thin transparent film, dries in a few minutes, when the process is complete.

PATENTS.

The present system of conferring patents upon inventions of public advantage, says Mr. W. R. Hooper, in *Appleton's Journal*, comes down to us from a transatlantic custom of very doubtful parentage. The English monarchs of the sixteenth and seventeenth centuries were wont to bestow on some royal favorite the privilege of the tanning of leather, the sale of salt, or other desirable monopoly. And when freedom, "slowly broadening down from precedent to precedent," had taken away this regal prestige, the same privilege might be acquired by him who could prove that his newly discovered invention would benefit the community. This wild graft of royal patronage, transplanted across the ocean, has burgeoned into one of the most beautiful branches of the tree of liberty. The Patent Office stands side by side with the common school as the ripened development of a distinctively American civilization. In literature, in commerce, in the arts of war, and in many such things, different nations may be our superiors; in a widely diffused education and in inventive genius for labor-saving machines, America leads the world.

As at present systematized, the grant of a patent is in the nature of a contract. Government says to every man of inventive skill that, if he will apply his mind and his capital to invention, and shall develop an improvement upon any existing "art, machine, manufacture, or composition of matter," he shall enjoy the benefit of his invention for the next seventeen years; at the expiration of that time the invention is to become the property of the public. So well is this contract appreciated that, short as has been our national existence, one hundred and ten thousand persons have already entered into it, and fifty thousand more applied and were rejected. The number of applications for patents steadily increases, as well as the objects of invention. These applications now arrive at the capital at the rate of twenty thousand a year.

It is the general opinion of those who study our patent system as a science that we are just on the verge of new discoveries that shall benefit the world more than any past invention. We have bridled the lightning and taught it to carry messages: but suppose the awful force of electricity, that can crush the hardest rock and bring a more tremendous power to bear instantaneously on a given point than any other known motor, should be as subject to our control as steam is! In that instant the motive power of the world is more than doubled. Within twenty years the burden of sewing has been taken off the mother and sister and put on the machine. Suppose the flying wind that hovers over our roofs should be imprisoned and so used that it should perform all our domestic labor before the airy captive should escape! There is no power on earth so great, so steady, so massive, as the tide. Twice each recurring day it lifts the whole body of sea water a number of feet into the air. It penetrates up every creek and stream and river, forcing the water to rise and overwhelm the solid land. Should this immense amount of tidal power, that envelops the whole world, become subject to the will of man and forced to do his bidding, we should have an instrumentality to bear the burdens of mankind infinitely more powerful and more general than anything now in use. We travel to-day on solid earth; should some of the numerous applicants for patents for the use of balloons or flying machines happen to succeed, and we should all take to travelling upon the wings of the wind, what would become of railroads and turnpikes and steamboats? Nor are these idle speculations. The employment of lightning, of wind, of tide, of air, will not seem so strange to our enlightened children as the telegraph, the sewing machine, the railroad, and the steamboat, seemed to their grandparents. The child may now be living who will yet see them all the willing slaves of man, joyous to do his bidding in the service of humanity.

The vast majority of patents contain no remarkable invention; they merely make some slight progress upon existing facts. Not in one great tide of invention does improvement come, but rather in small, gentle waves, each advancing almost imperceptibly further than its predecessor. And it is that slight difference that gives success to patents. The inventive mind is so constantly on the stretch that similar claims are constantly made by rival inventors. When petroleum first began to enlighten our darkness, there were twenty-five claimants at one time before the office, all asking for substantially the same mode of raising oil out of the solid earth. And when velocipedes so suddenly leaped into fashion a few years ago, four hundred and thirty-two applications for velocipede patents were filed within four months, and of these thirty-three were contemporary claims for the same idea. Every spring brings forth a crop of stove patents, each manufacturer preparing for the coming winter by striving to surpass his rivals in the prettiest pattern and the greatest warmth-giving power. Few persons think much of the form of the lamp they buy; yet lamp patents are renewed every year. At one time the student lamp, with an argand burner, yields its manufacturer a small fortune; the next year some fortunate genius notices that two wicks give an imperceptibly larger light than the argand; and the patent he obtains brings him prominence in all the lamp markets in the country. One of the most essential elements in patents is novelty; yet applications are continually made for patents based on ideas as old as the Christian era. Pliny, writing in the first century, describes harvesters for heading grain as then in existence on the plains of Gaul; and Paladius mentions them again in the fourth century; but both of these lacked some idea that would adapt them to general use. Tailors' machines were in smooth running order in Paris long before Hunt and Howe perfected the present invention. It remained for the Americans to lighten the domestic cares of the female sex throughout the world.

Most patent rights are limited in their application, and never attain a general circulation. But a patent of wide use, however small the royalty it pays, benefits the happy inventor with a large profit. Inventions for sewing machines, of which one company makes about three thousand a week, inventions for the use of India rubber, for agricultural implements, fire arms, and modifications of leather and paper, have accumulated fortunes. Nor is it possible to tell the extent of the ramifications of a patent. A few years since, all the dentists of the country combined to break an India rubbia patent; every one of them had to pay a royalty whenever he inserted a set of teeth in vulcanized rubber. Their combination failed, and the royalty still is paid. One of the most profitable patents ever issued in this country was for the manufacture of horseshoes. In England one of the most lucrative has been the Bessemer manufacture of steel. Most patents concern themselves with agricultural or domestic labor. In one year two hundred and twenty patents were granted for cultivators, two hundred and ten for plows, one hundred and eighty for churns, one hundred and seventy five for washing machines, one hundred and fifty-one for sewing machines, one hundred and forty for stoves, and another hundred and forty for gates. Nearly eighteen hundred patents have been issued for sewing machines and their attachments; and the applications for newer inventions come in daily.

For these applications for patent rights increase much faster than the population. In 1851 there were two thousand of them; in 1870 nineteen thousand one hundred and seventy one, of which thirteen thousand three hundred and twenty-one were granted. Inventive skill does not depend upon education. Prussia is as well educated as this country; but in 1867 only one hundred and three patents were issued in Prussia, as against thirteen thousand in this country. Vermont has as good schools as Massachusetts; but the Bay State secures ten per cent of all the patents granted to the nation, while the Green Mountain State has less than one per cent. To quicken the inventive mind demands a large amount of capital engaged in manufacture, a skilled body of workmen, and a profit in the improvement of manufactures. Where these coexist, patents are in demand.

As a general rule, valuable inventions are the results of long years of close thought and much expenditure of time and money. Capital never offers itself to the inventor without the promise of an enlarged and speedy return. Nor do valuable ideas often enter the mind of the outsider on any subject. Abraham Lincoln was a very able lawyer of Illinois when in May, 1849, he obtained a patent for lifting steamboats over river bars; but it may be doubted if that patent has ever been used, or would have been applied for by a marine engineer.

Curiosities of Natural History.

We cull the following from a recent lecture in London by Mr. F. Buckland: He began by declaring that he was utterly opposed to the Darwinian theory of "development," and then explained the grounds on which his opposition rested. Man, he said, is unarmed, and his position of supremacy over all created beings taught him to invent what Nature had not given him, that is, weapons of offence and defence. The first instrument found by man is a common stone; this he cuts and adapts to his use till he makes knives, arrowheads, and hatchets, which afford him the means of securing his prey, making war on his enemies, and manufacturing other implements, such as wooden clubs, which could not be wrought without the aid of harder substances. He showed a massive club from New Zealand, which he recommended to the Chief of the Police as a preferable weapon to the "staff" used by the policemen: though he believed that such an unwieldly affair was used rather as a sign of authority—by the Lord Mayor of New Zealand perhaps—than as a weapon of warfare. In contrast to this large club, Mr. Buckland exhibited some small South American arrows, or puff darts, only a few inches long, and poisoned with some mysterious matter called wourali, which he believed might be snake poison. These arrows are blown through a small tube, and are so deadly that the moment anything is struck by the arrow it dies. The *virus*, however, is only fatal when mixed with the blood externally, and an animal thus killed has no ill effects on the person eating it. Thus from flints—a fine specimen of which, found among fossil elephant bones at Hoxne, in Suffolk, was exhibited—through clubs and arrows, man has gone on inventing weapons till he has now the deadly Snider, with which we civilized people are as ready to kill one another before we have ever seen each other, as the savages of Africa or of the South Seas with their less refined weapons.

Animals, on the other hand, have their arms found for them. Witness the lion, with his teeth and claws; the viper with its poison fangs; the elephant with his tusks; the torpedo with its electric battery. Man is not descended from a monkey. What monkey ever invented a weapon? Mr. Darwin has mistaken the law for the by law. It is true that from the sponge, the lowest in the scale of created organisms to man, there is a certain similarity of structure. Mr. Buckland showed by a simple diagram the ascending scale of creation, from a sponge—a simple stomach—upwards through the various classes to the head of all, man; but, he added, between man and beast, between man and monkey, there is a hard line drawn—a great gulf fixed. When a monkey walks as upright as he can, he is in a stooping position; his hands hang down, and he never raises his arms except to seize some support. When a man in the circus, or in the street, tries to imitate a monkey, he throws his arms up in the air—which a monkey never does. *Os homini sublime dedit.* The similarities in structure exist, but they exist through design, through a special adaptation of them to the various conditions of the animals possessing them, and are no more caused by "development" than a hungry man's appetite is satisfied by wishing for something to eat.

The cast of an immense hand of a gorilla was passed round, and Mr. Buckland asked if any young lady would like to honor her "poor relations" by accepting such a hand. It measures nearly six inches across and eleven inches long.

Speaking of poisoned arrows leads us to poisonous snakes. Mr. Buckland said he could not understand the antipathy that existed in man's mind against snakes. Some years ago he was entertaining some natives of New Zealand at his house—not that he could speak New Zealand to them, or they English—but, after conversing with them by means of roast beef and plum pudding, he produced a dead snake. Such things as snakes do not exist in New Zealand, and probably none of his guests had ever seen one before; but immediately it was produced they drew back, and raised a loud shout of fear, thinking that some harm would befall them. We might be allowed here to suggest that we have, in this dread that man has of snakes, another indirect proof of the truth of Holy Writ—that the "enmity between the seed of woman and the seed of the serpent" exists in reality, and will exist as long as the curse lasts.

But to return to the lecture. Mr. Buckland explained the controversy which has been raging, and which has been recorded in *Land and Water*, about "vipers swallowing their young," and showed a box containing a family of the father and mother and seven little vipers, which he excited great laughter by stating he was doing all in his power to induce to swallow, or be swallowed, though he doubted if they would do it to oblige him, any more than he would swallow his young to oblige any one else. He then exhibited casts of various species of venomous and non-venomous snakes, and a large skin of a boa constrictor, 16 feet long, showing the beautiful markings of the animal. He then passed round a preparation showing the poison glands and fangs of a viper *in situ*, explaining that when a snake attacks its prey it does not bite, but pricks it, allowing the *virus* to run down the fang or tooth, which is hollow, into the puncture. A short time since a rattlesnake died at the Zoological Gardens, and Mr. Buckland took the rare opportunity thus offered of making experiments to test the nature of the poison. The appearance presented by the *virus* when examined through the microscope was very peculiar, the liquid crystallizing very rapidly and throwing out *spiculæ* or radiating lines, similar to the coruscations of the aurora borealis and representing most probably the darting action of the poison when injected into a wound. The snake who was the object of this unique discovery was in its death a warning against greediness; it had had two guinea pigs given it one day for its dinner, and instead of eating one at a time, as a good rattlesnake would have done, it swallowed both at once and died, and so fell a victim to gluttony and guineapigism." Apropos of the food of snakes, the lecturer explained why they are fed with white mice instead of brown ones at the Zoo. He had often heard ladies exclaim: "How cruel to feed the horrid snakes on the pretty white mice," while the common brown mice in such a case would have received no pity. A brown mouse, if the snake does not eat him, will eat his way out of the cage, and thus show his gratitude to the snake for not devouring him by making an aperture through which Mr. Snake can also make his exit, while a white mouse will not attempt such a burglarious mode of escape. But why should the white mouse be pitied in such a death more than a brown mouse?

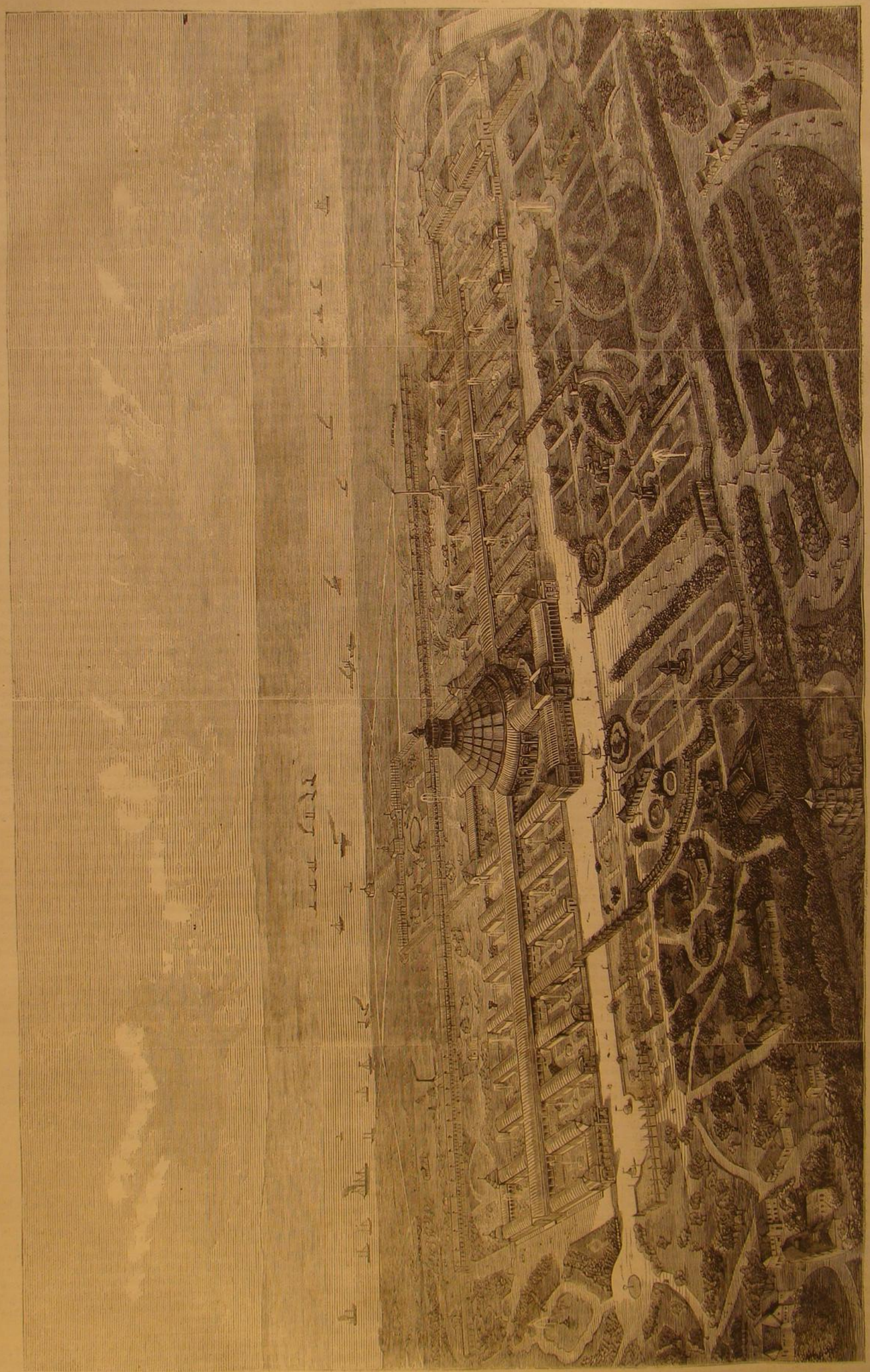
The Man of Long Life.

He has a proper and well proportioned stature, without, however, being too tall. He is rather of the middle size, and somewhat thick set. His complexion is not too florid; at any rate, too much ruddiness in youth is seldom a sign of longevity. His hair approaches rather to the fair than the black; his skin is strong, but not too rough. His head is not too big; he has large veins at the extremities, and his shoulders are rather round than flat. His neck is not too long; his abdomen does not project; and his hands are large, but not too deeply cleft. His foot is rather thick than long; and his legs are firm and round. He has also a broad, arched chest, a strong voice, and the faculty of retaining his breath for a long time without difficulty. In general, there is a complete harmony in all his parts. His senses are good, but not too delicate; his pulse is slow and regular.

His stomach is excellent, his appetite good, and his digestion easy. The joys of the table are to him of importance; they tune his mind to serenity, and his soul partakes in the pleasure which they communicate. He does not eat merely for the pleasure of eating, but each meal is an hour of daily festivity; a kind of delight, attended with this advantage, in regard to others, that it does not make him poorer, but richer. He eats slowly, and has not too much thirst. Too great thirst is always a sign of rapid self-consumption.

In general, he is serene, loquacious, active, susceptible of joy, love and hope; but insensible to the impressions of hatred, anger and avarice. His passions never become too violent or destructive. If he ever gives way to anger, he experiences rather a useful glow of warmth, an artificial and gentle fever without an overflow of the bile. He is fond also of employment, particularly calm meditation and agreeable speculations, is an optimist, a friend to Nature and domestic felicity, has no thirst after honors or riches, and banishes all thoughts of to-morrow.

AT the Zoölogical Gardens, London, a recent event of some interest is the birth of a hippopotamus. The babe is three feet six inches long, weighs one hundred pounds, and is of the color of a polished mahogany dining room table. It suckles continuously, and enjoys life very much.



THE BUILDINGS OF THE VIENNA EXPOSITION.—(See page 376.)

IMPROVED HOT BLAST OVEN.

The invention herewith illustrated is an oven for heating the air supplied to blast furnaces. The various portions are constructed with a small weight of metal, and in such a manner as to provide against lateral and vertical deflection under a high degree of heat. By suitable means the gases which do not support combustion are allowed to escape, so that the oven may be heated by stone coal or similar fuel.

Fig. 1 shows the device, with parts broken away to exhibit the interior arrangements. Fig. 2 is a vertical, and Fig. 3 a horizontal section of a heating tube. The base of the oven is divided transversely by the partition, A, and longitudinally by the partition, B, into compartments. In the two chambers in front of partition A are the fire grates and ash pits, as shown through the broken away wall, immediately above which are perforated metal arches, one of which is represented at C. In the partition, A, are two openings, as at D, provided with dampers and regulated by a lever, E, outside of the side wall. The object of these orifices is to furnish a means of escape for the gases into the empty compartments in rear of the base.

The upper portion of the oven consists of four metal columns at the corners, which rest upon frame plates. On these columns are cleats, which support the ends of the bars or shelves, F, on which the heating pipes rest. The other extremities of the bars are held up by similar cleats on the middle column, G. Each heating pipe is divided into two narrow branches, which connect at the ends in single chambers, I. This arrangement is shown in the pipes lying beside the oven, Fig. 1, and also in the sectional views, Figs. 2 and 3. A vertical bar or stay is placed at the middle and between the two branches, so as to keep them firmly in position. The ribs, J, on adjoining tubes, fit closely together so that one pipe affords lateral support to the other. At K, on the upper side of the pipe, are fastened cleats which form a groove or recess running across the top of each tier of pipes when placed in position on the bars. In this groove is shoved a T shaped rail, the upper edge of which comes in contact with the lower sides of the next tier of pipes above, thus affording a firm support and preventing vertical deflection.

The inner surfaces of the pipes are corrugated, as in Fig. 3, thus giving a greater heating space and increasing the lateral strength. At the upper side of one end of each pipe is placed a vertical tube, L, which connects with the under side of the similar end of the pipe next above. The pipes in position are shown at H, Fig. 1, and are contained in the two chambers formed by the extension of the partition, A, to the top of the oven.

M and N are cast iron chests secured under the frame plate. The opening in M serves to admit the air which passes from the chest up through one set of heating pipes and thence to one of the metal boxes, O. Passing through the connecting tube, P, the blast descends through the other system of pipes, and thence into the box, N, through the opening, in which it

Fig. 2

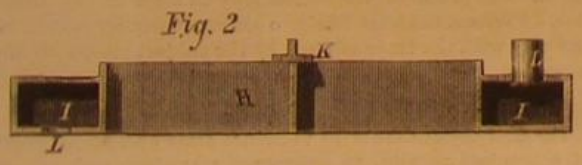
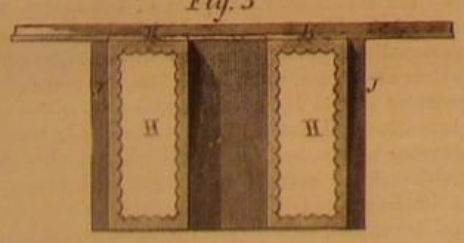


Fig. 3

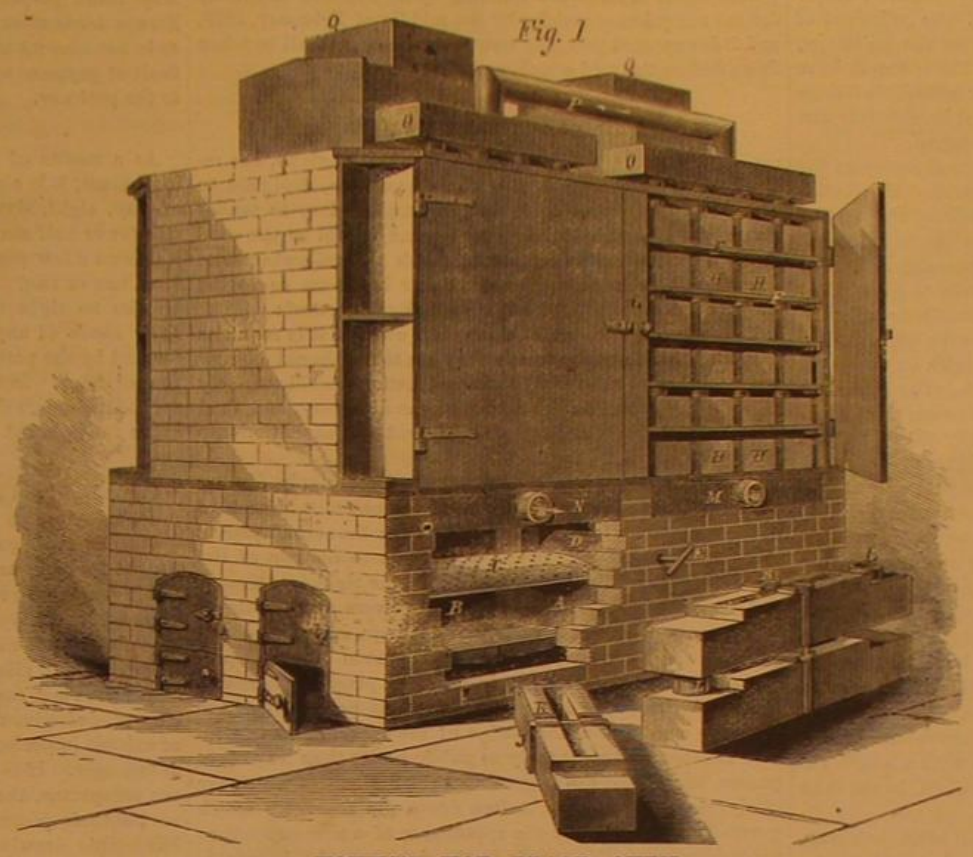


is discharged in a heated condition to the tweer. The arch of the oven is of fire brick with openings in the center, to allow the passage of smoke, etc., out of the chimney, Q Q.

The advantages claimed for this device may be briefly stated as follows: The peculiar shape of the heating metal which affords a large area of heating surface in proportion to the number of joints and weight of iron; the construction of the interior of the heating pipes so that some portion of every cubic inch of air within them is in contact with the heated metal; the facility with which a change of pipes may be effected without stopping the furnace and cooling down; the arrangement for carrying away impure gases and supplying the furnace with pure air, so that the latter can at all times be kept at regular work without change of burden; corrugating the surface of the heating metal, thereby increasing its facility for absorbing heat; the shape of the heating pipes as insuring durability at a high temperature.

Patented Sept. 3, 1872. For further information address the inventor, Mr. Jesse Young, Trigg Furnace, Trigg County, Ky.

Fig. 1



YOUNG'S HOT BLAST OVEN.

Drawing as an Educator.

In a recent address before the Teacher's Institute, Connecticut Mr. Northrop gave many interesting particulars concerning the comparative progress and condition of education in Europe and this country. He considered that we surpassed Europeans in school architecture; no city in Europe, he said, equaling Hartford in this respect, and in arithmetic, in which our methods of computation are more quick and accurate. Yet they may be regarded as in advance of us in the following particulars: 1. More thorough supervision of schools; 2. Plan of gradation; 3. Culture of the expressive faculties (Americans have a few set words and phrases which are made to do duty on all occasions, without reference to propriety or congruity); 4. Independence of text books. They teach the subject rather than the book, the matter rather than a letter, and their teaching is more conversational; 5. More thorough teaching of history; 6. Mode of teaching modern languages; 7. Drawing. The swiss are in advance of all other countries in this art. To this their general prosperity was owing. Hemmed in among the mountains, they own their own houses and are more prosperous than many other countries with better advantages.

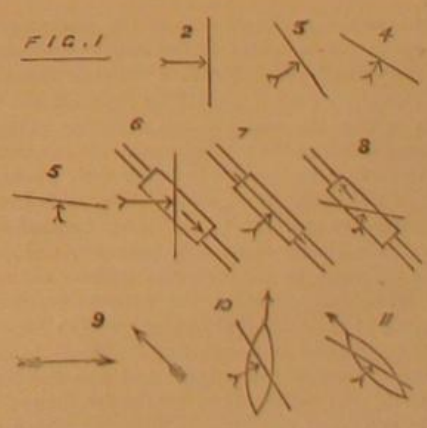
England pays five times as much for pauperism as for education, while Swizerland pays seven times as much for education as for crime. Drawing has chiefly made this difference. Mr. Northrop urgently counselled all the teachers to teach every one of his or her scholars drawing, even if they had to neglect other studies.

HOW A VESSEL SAILS AGAINST THE WIND.

We have been asked by a naval officer of high standing in her Majesty's service, who is well known as a sailor and a writer on seamanship, says *Naval Science*, to explain in a popular manner, and for the benefit of unscientific seamen, why it is that a ship is able to sail close to the wind and thus travel in a direction which is apparently opposed to the action of the force which is moving her. He says that, although most persons accustomed to the sea are aware of the fact, they are perfectly unable to comprehend it; and the scientific explanation by means of the resolution of forces does not help them out of their difficulty at all. This phenomenon is repeated many times in the day within the experience of numbers of seamen and people who live near the sea, and to some minds the observation of a constant repetition of this unaccountable circumstance becomes positively irritating. After such good reason being shown, we cannot refuse what little assistance we may be able to give towards clearing up this mystery, and shall proceed to give an illustration that we think may enable the action of the wind upon a ship when she is sailing to windward to be understood. In considering this subject in the simplest manner, let us separate the action of the wind upon the sail from the action of the sail upon the ship, and treat of each independently. Let us first consider the action of the wind upon the sail, and let us suppose that the wind always blows across the page from left to right, as in the direction of the horizontal arrow in Fig. 9. And let us, for the sake of simplicity, consider the case of a single sail upon a mast. Now, we shall take it for granted that every seafaring man will admit three things: 1st, that the wind, blowing steadily in one direction, will not press upon the sail at all if the sail is set with the edge to the wind; 2d, that if the sail is set in any other position, the wind will press more or less upon it; 3rd, that the wind will press most upon the sail when it is set across the wind, and that it will press less and less upon it as the sail is turned away from this position. For instance, with the wind blowing steadily as arranged (across the page from left to right), if we set the sail as in Fig. 1, the wind will not press on it at all; if we set it as in Fig. 2, the wind will press upon it with its full force; if we set the sail as in Fig. 3, the wind will still press upon it, but will press with very little force indeed. Let us draw thick arrows to represent the pressures of the wind on the sail in these different positions; that in Fig. 2 shall represent the full force of the wind on our little sail when set right across the wind, and the others shall get shorter and shorter as the sail is turned more and more away from the wind, and as the force consequently decreases. In Fig. 1 there is no arrow at all, because the wind does not press on the sail at all.

Now, let the reader carefully bear in mind that these little arrows represent the total effect of the wind upon the sail. There is no other effect upon it worth considering here. In Fig. 2, all the wind is effective upon the sail; in Fig 3, part of the wind's force is lost by slipping past the sail, so to speak; in Fig. 4, more of its force is lost in this way, but there is still a considerable pressure exerted against the sail; but in Fig. 5, nearly all the force, and in Fig. 1, quite all the force, is lost. But what we wish to impress is that the sail in Fig. 4, for example, is acted upon just as if a lighter wind than that actually blowing across the page were blowing in the direction of the arrow; and similarly in all cases, and under all circumstances, a wind blowing in one direction will act upon a sail which is inclined to it, just as a lighter wind blowing directly against it would act.

Let us now hoist our little sail upon a light railway truck, and place this truck upon a railway lying diagonally across the wind's path, as shown in Fig. 6. Here the sail is set in the same position as it is in Fig. 2, and the effect of the wind upon it will obviously be to propel the truck down the railway in the direction of the small arrow. It is also clear that if we set the sail in the truck in the position shown in Fig. 3, the effect of the wind would still be to drive the truck in the same direction (down the rails), but it would go more slowly, because, as we have seen, the force acting on the sail in Fig. 3 is less than that acting in Fig. 2. But supposing we now set the sail on the truck so that the sail stands along the truck, parallel to the line of rails, as in Fig. 7, we shall get no motion of the truck, because the pressure of the wind upon the sail will now be exactly across the railway, and the sail will be pressing the truck in that direction. The truck will not be forced either up the rails or down the rails, but across them only, and therefore no motion will ensue. Let us now turn the sail still more away from the wind, and set it upon the truck in the position shown in Fig. 5. The wind as we have seen, will press upon the sail, but with very reduced force. This case is represented in Fig. 8. Now we here see (Fig. 8) that although the wind is still blowing across the page, the effect of it is to press the sail almost directly up the page, and it is easy to see that the effect of the sail will be to propel the truck up the railway in the direction of the small arrow. Here, then, we have a railway truck literally sailing up to windward, because while the wind is blowing in the direction of the one arrow the truck is moving in the direction of the other; see Fig. 9.



Now this railway truck illustrates very fairly the case of a ship, with this exception, namely, that the truck can make no leeway; the rails prevent this. But a ship can and does make leeway, and therefore cannot sail so near to the wind as the truck. It is obvious, however, that the same general principles apply to the ship as to the truck. For example, let us take the case of the sail shown in Fig. 3, and set it upon a ship, as in Fig. 10; it is clear that the ship will sail away easily enough in the direction of the small arrow, which is at right angles, or square, to the direction of the wind, which we still suppose to blow across the page, but which takes effect upon the sail in the direction of the other arrow. Or, let us take the case of the sail set as in Fig. 4, and set it similarly upon our little ship, the wind taking effect as in Fig. 11. Is it not obvious that, just in the same way, and for the same reason, as the railway truck in Fig. 8 was driven up the line, so in the present case, Fig. 11, the ship will be driven in the direction of the small arrow, which is manifestly to windward? The only difference between this case and that of the railway truck is that, while the ship is

driven ahead, it will also be driven somewhat to leeward, which the truck was not; but this consideration only affects the amount of the ship's progress to windward.

THE BUILDINGS OF THE VIENNA EXPOSITION.

The bird's eye view herewith presented, of the vast building now in process of erection in Vienna, will convey as good an idea of the magnitude and splendor of the preparations for the World's Fair of 1873 as is possible in so small a space. The site chosen is the Imperial Park or Prater, along one side of which extends the new channel of the Danube, while on the other runs the Danube canal—a portion of which is seen at the right of our illustration—which separates the Park from the city, so that the Exhibition will lie in convenient propinquity. Great avenues, to permit of ample access and circulation, have been made, the principal of which, the Haupt-Allée, extends in front of the buildings, and through the Park from end to end. The grounds have been beautifully laid out, sheets of water added, buildings removed, and every resource of ornamental architecture and landscape gardening lavished in their decoration.

The central rotunda, with its conical roof, occupies the most prominent position in the view presented. This building will be filled with the choicest objects of the trophy character that the exhibiting nationalities can supply, and will doubtless present a *coup d'œil* of surpassing grandeur. It springs from the ground, a circular façade of piers of no less than 426¼ feet in diameter, with Roman-Doric columns at either side, and connecting arches filled with glass. Within this is a gallery fifty feet wide, covered with its own roof, while above rises the great arcaded circuit. The large lantern seen above the roof is 105 feet in diameter, and is surmounted by a second lantern and cupola fully 300 feet above the ground. The rotunda stands in the middle of the grand quadrangle, which is 755 feet square. The vast central gallery or spine is 2,985 feet long, and the vista from end to end will probably be as much as even the condition of a Viennese summer atmosphere will enable the unassisted eye to discern objects clearly through. The width of this great hall is 82 feet, and its hight from floor to wall plate 52¼ feet. The cross galleries are 250 feet in clear length by 49 feet in width; the open spaces between them will be laid out as gardens, in accordance with the taste and styles of the various nationalities to which they will appertain. The great picture gallery occupying a position to the southwest of the main building, and quite detached from it, with a length exceeding 700 feet, will probably, while it consists, be the most magnificent fine art collection in the world.

The machinery annexe is a substantial brick building, shown in our illustration to the rear of and parallel to the central gallery. It is intended to be permanent, and after the Exposition will be used for mercantile purposes in relation to the adjoining Danube quay. The extreme length is 2,614 feet, and the width nearly 155 feet in the clear. The side walls consist of brick piers, running up to the roof, with segment arching between, at a level to suit the side buildings. Ample means of lighting and ventilation are provided. Boiler houses are constructed at various points along the length of the building, and steam and water introduced from end to end. Down the gangways, at the sides of the central span, are to be laid lines of rails of the ordinary gage, so that exhibits can be brought right into the building on the railway trucks, lifted from the latter by traveling cranes, and deposited in their places. Altogether the arrangements of this portion of the Exposition are admirably planned, and the view which will be presented from the gallery—a range of machinery in motion extending for nearly half a mile—will be something which has never been previously witnessed.

Directly on the northeast side of the machinery building will come in the terminus of the North Austrian railway, and by proper sidings, etc., with a complete system of turntables, immediate connection will be obtained, not only with the rails within the building, but with nine other lines of way, each extending the whole length of the exhibition. Exhibitors will thus be enabled to bring their goods, without the risk of unloading, right up to the specified localities.

The thirty-two transverse galleries are destined for the reception of the lighter articles of industry, and the assignment of divisions to the different nations corresponds to their geographical situation, the extreme eastern division being given to India and that furthest west to America. Opposite the south end is a series of buildings for the use of the Sultan. West of this a large and fine building, in the Egyptian style of architecture, for the dwelling of the Viceroy, is in process of erection. In different places about the grounds are small buildings for fire apparatus, and barracks are being erected for the quarters of the troops stationed as guards.

The work on the buildings and grounds began last February, and has progressed as fast as the labor of six thousand hands could make it. The Austrian method of working is exceedingly slow and, from the description of the correspondent of the Boston *Globe*, according to our ideas, rather comical. It is stated, as an example, that a number of piles had to be driven, on account of the bad quality of the ground; instead of putting on an engine and driving the pile, a tripod is rigged with pulleys at the top, from which some thirty ropes radiate. These thirty ropes are grasped by thirty men, and the weight pulled up a little way; then all hands let go. The weight falls, and they begin again, so that thirty men take three hours to do what Yankees would do in ten minutes. Labor, however, in Austria is so cheap that money is actually saved by the adoption of this shiftless method.

Each gallery will have, on the outside, the arms of its nationality, and Austria's sections are already decorated. There still remains very much to be done in the interior, but in the eastern half of the Haupt gallery the flooring is already laid, and in the Austrian section the interior decoration is well under way, and is very pretty. Columns, a few feet apart, throughout the entire distance of the small galleries, extend from the bottom to the top. The base is square, of the color of oxidized silver, and upon this a round column, of a red color, with gilt figures terminating in a scroll work and capping of silver. Upon each of these columns is a staff bearing the Austrian Eagles all very heavily gilded, while in the center is a bronze wreath, in which are the letters W. A. (*Welt-Austellung*, the German for World's Fair). Most of the windows have been put in, and the east wing glazed, and several of the rotunda supports raised and fastened in position.

It is hoped to have the building quite finished and ready for the reception of articles by the middle of February, 1873, and it is expected that the outside staging will all be taken down before the cold weather sets in.

HOW TO MAKE MONEY BY PATENTS.

Charles Barlow, patent solicitor, London, England, has recently issued a pamphlet with the above title, designed to give patentees useful hints and suggestions how to render inventions profitable to the patentee and useful to the community. The writer commences with the following trite remark, which is as applicable to our inventors as to the English patentees to whom it is specially addressed:

To render patents profitable to their owners, it is requisite that the inventions for which they are taken should be new and useful, that the patent and specification should correctly describe and ascertain the nature of the discovery, and then that the patentee should judiciously put the invention into practical operation.

There may be said to be four ways of commonly dealing with a patent. The first mode is for the patentee himself to put the invention into practical operation; the second plan is to grant licenses for its use; the third is to dispose of the whole right; and the fourth is to divide the right into shares, and dispose of part of them; but the powers and privileges of the grant permit of a variety of dealings, including mortgages. Unquestionably, the preferable mode is for the patentee himself, if possible, to initiate the practical introduction of the invention into the market. If he possesses the requisite capital and knowledge of the trade, he can introduce it more advantageously to public notice than any other person, because he can best combat the difficulties which are likely to spring up, and soften down the asperities which generally are excited by the appearance of a new competitor for public favor. Fortunate is the patentee who is able to manufacture his patented articles without extraneous assistance,—who can appeal to the public at large, who, in the long run, adopt whatever is practically useful. Not a few novices in patents fall into the error of demanding exorbitant prices for their merchandise: they assert that there would be little advantage in a patent did it not enable the owner to gain high profits. Certainly a higher profit than is usually made in trade is due to the patentee who is taxed for his privilege, and who has to incur heavy expenses in experiments, models, and trials. But sound policy will dictate moderation, and the patentee will find it to his real interest to cultivate an extensive trade at fair and reasonable prices. The effect of placing too high a price upon the articles is to prevent trial of them, and it should be the object of the patentee to promote by all means in his power a speedy demand.

NOVEL MODE OF EXCITING A DEMAND.

In general it will be necessary for the patentee to stimulate demand. When Day and Martin first introduced liquid blacking, they hired a number of men, and equipped them in the garb of livery servants. These men were continually asking the apathetic shopkeepers for the celebrated liquid blacking, and would purchase no substitute. When tradesmen found, as they thought, that the nobility and gentry required the article, they gave orders for it, and when they kept it in stock, they recommended its use, and so the compound came at last into general use.

The more feasible, and certainly more commendable plan now, is to gain publicity by advertising. At the time when Day & Martin commenced, advertising was considered disreputable: tradesmen were not then accustomed to expend two or three thousand pounds in placards, or five or six thousand per annum in advertising in newspapers; neither did billstickers keep their carriages as they do now.

ADVERTISING.

In these times advertising is all powerful, and the patentee must not fail in this respect.

In addition to direct advertising, which, to be permanently beneficial, must be systematically and constantly adopted, the author then proceeds to name the different journals devoted to mechanics, mining, engineering, building, etc., published in London, in which he recommends patentees to advertise and have their inventions illustrated, selecting such papers as relate most intimately to his invention.

PUBLIC EXHIBITION.

A favorable opportunity of obtaining wide publicity occurs when a patentee is enabled to inaugurate the commencement of his operations by a public exhibition or experimental trial, to which he invites the reporters of the press. After showing them over his works, and exhibiting to them specimens of his new manufacture, he should supply the reporters with a printed statement of the nature of the matter, and then conduct them to a suitable entertainment. He will be assuredly repaid by the notices which will follow.

LICENSES.

There is a large class, however, who cannot themselves bring out their inventions, and who, consequently, sell the whole or a portion of their rights, or seek for purchasers of licences. In most of the staple manufactures, such as iron smelting, steel making, sugar refining, cotton, wool, and flax spinning and weaving, larger returns will be obtained by granting licenses than by a sale to any one firm. Licenses under letters patent may be exclusive, perpetual, limited, and general. An exclusive license amounts almost to a cession of the patent, and ought only to be granted under terms nearly equivalent to its purchase. Where a royalty is covenanted to be paid, a stipulation should be made for a fixed minimum amount per annum, otherwise the licensee can only be held liable to pay on the actual manufacture, and he may think proper to cease manufacturing. Probably all license deeds reserving royalties should contain a stipulation as to net amount of royalty to be paid annually, and in default of payment of that sum that the license should revert to the patentee.

STOCK COMPANIES.

As a means of obtaining capital for the development of inventions, it is a good plan to divide the patent into shares of, say, eight, sixteen, or thirty-two; the owner retains a quarter or half share and finds less difficulty in raising capital from a few persons in small sums, than a large amount from one or two. These shareholders, or joint proprietors, acquire no right to work the patent; they simply receive their share of any profit which may arise from its being worked by the patentee, or from licenses, or from the sale of the privilege. In this manner those much envied and sought for individuals, called capitalists, are induced to invest their spare funds in aid of poor inventors, to mutual advantage.

SEARCH FOR CAPITAL.

Capital will not in general go in search of the inventor; he must therefore go in search of capital.

Whatever is good, or valuable, or excellent, must be sought for early and late, in season and out of season, and the inventor who seeks capital must gird up his loins and vigorously set out on his search. Before doing so, he should provide himself with the best made model or specimen which his means will allow. Inventors often fall into error in this respect. They content themselves with an ill constructed, clumsy, defective model, of the most crude and paltry order, or exhibit imperfect samples which show defects rather than advantages. If to this be added a dirty drawing and a written prospectus, the picture of the equipment of many inventors for their journey in search of capital will be complete. With this drawing under the arm, and a unique model or specimen in the pocket, they journey on sometimes for months, and sometimes for years, and seldom without accomplishing their object in the long run, although by better management they might considerably shorten the term of their pilgrimage. They seem to have but one idea, and that is to benefit the world by the introduction of their invention, until which event occurs mankind, in their opinion, will remain in a state of semi-barbarism. They would, however, greatly facilitate the acquisition of their desires by devoting more attention to the preparation of whatever may be necessary to induce men to form a favorable opinion of the invention.

A pleasing model, correct in detail, made to scale, and well finished, serves to persuade and to silence objection; and if drawings are shown, they should be neat, and the prospectus or description always printed. When it is sought to interest some person with capital at command to take a share with a view to putting the invention into operation, or to enable a patent to be procured, the search may be made in any direction. Perhaps the least likely to aid are those connected in any way with the trade affected by the subject matter of the invention.

GETTING IN THE FIRST WEDGE.

The first object should be to induce some one, on payment of a nominal royalty, to commence manufacturing, and if the results are satisfactory, the area of operations may be readily extended. The trade should be addressed and canvassed personally if possible, or by a fitting representative; and this time after time, until some tangible result follows.

The patentee who is intent upon and determines to carry out his invention will not fail to visit personally the largest manufacturing houses, and in general will not visit them in vain. Although he may be a stranger and unacquainted with the details of the trade, if he possesses a clear head and a practical invention, he will meet with courteous attention, and carry his point.

HOW AMERICANS DO IT.

The author has frequently witnessed the successful manner in which American patentees dispose of their inventions in this country. They literally come, and see, and conquer all difficulties. They usually come well primed. They bring with them machines that will work, or a dozen rifles which will shoot with accuracy. They proceed to visit the center of the trade they wish to deal with, and by perseverance, energy, and tact, they succeed in accomplishing their object. Cannot Englishmen follow their example? How few do!

PHILANTHROPIC ASSOCIATIONS.

At any time within the last twenty years there has been in existence some society or association professing to be animatmated by the most philanthropic sentiments towards inventors. It is true such societies have sprung up like mushrooms, and have generally as quickly withered; but, generally speaking, some such affair is before the public, making a great parade of its efforts to aid inventors and to amelior-

ate their hardships. Under the guise of philanthropy, the object of most of these associations has been to carry on the business of patent agency with a view to their own individual benefit. Of fair competition no one has a right to complain; but that species of hypocrisy which masks itself under the name of philanthropy, while it seeks only self-aggrandizement, ought to be denounced and exposed; and inventors may rest assured that no society ever existed, or does exist, which was or is capable of benefitting them in the slightest degree. And inventors will best consult their interests by avoiding dealings with philanthropic patriots who would fain use inventors in the same manner that the monkey used the cat.

The author discusses in his pamphlet the English system of granting patents, and thinks that all patents should be granted for a longer period.

Lastly: All patents should in future be granted for the term of 17 years. This is the term which Congress a few years ago enacted that United States patents should enjoy. However good and valuable an invention may be, there is, and generally speaking almost always must be, considerable difficulty in introducing it. Its initiatory stage is seldom profitable; and in the remaining years of the 14, there is oftentimes not time enough to permit the owner to recoup his expenses, to say nothing of remunerating himself for years of labor and anxiety. One of the first patents taken in this country for sewing machines remained dormant for seven years, because there was no demand for the article; it was in advance of the times, and numberless instances might be quoted where similar delay has occurred. The copyright of a book or a play or a piece of music extends during the lifetime of the author, and for some years after his decease; does it seem too much to ask for 17 years copyright of a new locomotive, or loom, or propeller, or electric telegraph? If any country in the world can afford to be generous as well as just to inventors, it surely is this, which enjoys unparalleled prosperity, due in a great measure to the efforts of inventive genius.

NEW FIREPROOF CONSTRUCTION.

The *Building News* publishes the following description of an invention in which iron or steel, hollow earthenware and concrete or cement are the materials employed in combination. The walls, partitions, floors and roofs are constructed of cells of metal in which are placed earthenware pipes, the sides of which are splayed outward at the base to form a skewback. The pipes and iron flitches are bolted together so as to constitute composite girders. Between each skewback, an earthenware hollow pipe with oval shaped head and flat soffit, channeled and indented to receive the plaster of ceiling, is placed, with sufficient room left between the composite girders to receive a charge of cement concrete. The upper surface of the floor is leveled and covered with strong cement grout. Holes are left in the soffits of the hollow pipes for ventilation, and the pipes themselves may be utilized to convey warm air through the building. In walls and partitions, the iron and steel lengths are placed in a vertical, in floors, in a horizontal, and in roofs in an angular position.

In partitions, wire is used instead of lath to receive the concrete and plaster. The proportions of the concrete are six parts of broken brick, slag and sand, and one of cement, well mixed. The floors are made in one body and not in layers. This method is said to be cheap, to require no skilled labor to construct, to furnish thorough ventilation, and to require comparatively no repairs.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections in the month of September, 1872:

During the month, there were 988 visits of inspection, by which 1,990 boilers were inspected—1,929 externally, and 500 internally—157 were tested by hydraulic pressure. The defects in all discovered were 1,020, of which 292 were regarded as dangerous. These defects were as follows:

Furnaces out of shape, 42—9 dangerous; fractures in all, 110—53 dangerous; burned plates, 61—25 dangerous; blistered plates, 103—15 dangerous; cases of sediment and deposit, 196—9 dangerous; incrustation and scale, 191—10 dangerous; external corrosion, 70—29 dangerous; internal corrosion, 25—6 dangerous; internal grooving, 7—3 dangerous; water gages defective, 60—18 dangerous; blow-out defective, 26—24 dangerous; safety valves overloaded, 34—19 dangerous; pressure gages defective, 119—22 dangerous, varying from —5 to+20. Boilers without gages, 13—all dangerous, as they were being used at high pressure; deficiency of water, 3—2 dangerous; broken braces and stays, 40—29 of these cases left the boilers in unsafe condition; boilers condemned, 12.

The Force of Nitro-Glycerin.

The torpedoes of *Roberts & Co.*, used in the oil regions for enlarging and opening the bottoms of oil wells, are charged with nitro-glycerin, and the works for the manufacture of the explosive are at Scrub Grass, Pa., on the Allegheny Valley Railroad. The works were recently destroyed by an explosion, resulting in the instant death of H. F. Wolf, a telegraph operator, and D. V. Wright, the torpedo agent. The explosion was fearful, shaking the earth in the neighborhood like an earthquake, and hurling stones and pieces of timber in all directions. The works were shattered as if they had been a target for artillery exercise. The ground on which the building stood was excavated to an astonishing depth. This excavation is directly underneath where the magazine was located. Not a piece of flesh bigger than a visiting card could be found of either of the unfortunate men, and limbs of trees in the vicinity held shreds of clothing and little bits of flesh. They were actually blown to atoms, and not a piece of flesh an inch long could be discovered. On the hillside a watch belonging to Mr. Wright was found battered up and red with blood.

An almost similar occurrence took place on November 25, near Yonkers, N. Y., in which two young men, it is not too much to say, wantonly destroyed themselves. With two companions, they were out walking and came upon a fenced inclosure, inscribed "Danger," "Nitro-Glycerin," etc. They scaled the fence, leaving the other two behind, and threw large stones at the cans, the necks of which stood out from the lids of the boxes in which they were enclosed. The inevitable explosion blew the two perpetrators of the mischief to atoms, the two other boys, who got behind trees, being severely injured. Some of the inhabitants of Yonkers are said to have loudly condemned the owner for leaving the dangerous substance in a place where a catastrophe could possibly occur!

The Origin of Man.

Dr. Ludwig Buechner, the German naturalist, lately delivered a lecture in this city on the Origin of Man, in connection with the theory of the origin and development of life. After explaining the Darwinian theory of the origin of life, the lecturer characterized the hypothesis that man is a descendant of the monkey and the ape as absurd. The higher classes of monkeydom—the gorilla, the chimpanzee and orang-outang—were, he said, only our cousins, and there was some satisfaction that these ugly animals were not our ancestors. But there was no doubt that they descended from the same ancestor who was the forefather of man. The origin of man must be looked for in a tropical region, probably Southern Asia or Africa, during the tertiary period. There is a theory that between Southern Asia and Africa there existed a now sunken continent, called Lamuria, of which there are traces in the numerous islands, where, according to some authors, the origin of man was placed. The ancestor of man was described as a hairy, long headed animal, with long arms and short legs, which, by the development of the brain and its moral attributes, resulted in the development of man. If the origin of man is placed in the tertiary period, the time of the origin of man must be traced back hundreds of thousands of years.

PATENT OFFICE DECISIONS.

The Cigar Ship Patent Extended.

In the matter of the application of Ross and Thomas Winans for extension of patent No. 21,917, for improvement in hulls of steam vessels, granted October 26, 1868, the Acting Commissioner Thacher has granted the extension. The Examiner gives the following interesting particulars:

This application relates to a novelty in ship building, the announcement of which was a sensation, and the development of which has excited a widely-extended public interest. It has been generally known as the "cigar ship," and the experiments testing its practicability, which have been made from time to time in this country and Europe, have been attentively watched by great numbers on both continents.

The report of the Examiner in the case is as follows:

This invention consists in a hull for vessels complete in itself, whose cross-section at any point shall be a perfect circle, and whose longitudinal section is formed of segments of a circle, making the form of the hull that of an elongated spindle, for the purpose of diminishing the usual variation of resistance common to vessels of irregular configuration, by which the same are caused to roll, and also to diminish the resistance of a vessel of given tonnage in passing or being propelled through the water, while at the same time increased strength is obtained.

The invention appears upon careful examination to have been new at the time the patent was granted, and the testimony of eminent experts indicates that it is valuable and important to the public.

In any case the applicants have shown their own faith in the ultimate success of their attempt to promote the efficiency of ocean steam navigation by continuous and persistent efforts extending through the life of their patent, and by an expenditure during that time of over a million dollars in money.

The importance and value to the public—although the amount in money is not calculated or approximately estimated—may, without doubt, be considered established, to what extent, however, is left entirely to conjecture; but the enormous outlay and uniform testimony of the experts as to the results obtained indicate that the value is very great, and will be commensurate with the difficulties and expenses already incurred.

The applicants show an expenditure of more than a million of dollars without any returns whatever. They, therefore, have not been adequately remunerated notwithstanding they have been unusually diligent, having been almost constantly engaged in the construction of vessels upon their plan during the past fourteen years.

The granting of this application will doubtless have a beneficial effect upon the public interests, as no existing interest whatever can, by any possibility, be prejudiced, as, if the averments of the applicants and the testimony of their experts can be relied on, the success of the invention is assured, and its general adoption by the public is only a matter of time.

If, however, the plan shall hereafter prove a failure, the applicants will be the only losers, while the public interests will have been subserved by the demonstration that more than a million dollars in money will have afforded.

DECISIONS OF THE COURTS.

United States Circuit Court, District of Connecticut.

MORRISON *et al. vs.* CASE *et al.*

A suit in equity under section 77 of the act of Congress of July 8, 1870, relating to patents, trade marks, and copyrights, brought by Thomas A. Morrison and others against Julius A. Case and others, to restrain defendants from the alleged infringement of complainants' trade mark.

SHIPMAN, Judge:

This is a bill in equity, praying for an injunction to restrain the defendants from using a certain trade mark upon men's and boys' shirts. The parties are both of them shirt manufacturers, selling their goods in the general market. The plaintiffs and their immediate predecessors have been engaged in the manufacture and sale of this class of goods for many years, during which the business has grown to considerable magnitude. For twenty years they have used the trade mark in question, by stamping or labeling the same upon the shirts manufactured and sold by them, and upon their packages and advertisements. In March, 1871, the plaintiffs caused this trade mark to be registered in the Patent Office at Washington, under the act of Congress approved July 8, 1870 (16 U. S. Statutes at Large, 210, &c., section 77, &c).

The trade mark in question, as appears by the certificate of the Commissioner of Patents, and the facsimiles filed in his Office in conformity to the act of Congress, consists of the words "The Star Shirt;" also, the words "The Star Shirt" with the device of a six pointed star used in connection therewith; and, also, the device and words "The * Shirt"—either one or all being used as convenience requires.

Though this device or mark is in part arbitrary, and, to that extent, would have no natural or necessary significance in connection with the article manufactured, apart from its use in that connection, yet, by such use of the plaintiffs, in connection with their manufacture and sale of these articles, it has become well known to the trade, and has come to be taken by dealers as a peculiar designation by which the plaintiffs' goods are distinguished in the market. It is, therefore, both in its character and use, when taken together, a lawful trade mark. It has long been employed by the plaintiffs, and well understood by dealers and the public, as designating such articles of their manufacture. They have complied with the requirements of the act of Congress, and are entitled to protection. Their exclusive right to the use of this trade mark is coextensive with the limits of the United States.

The defendants have clearly infringed this right by using the words and device of the plaintiffs, both in the exact form, and in such near resemblance as is calculated to deceive. They have done this by so marking the shirts made by them, and by the labels used on their packages and packing boxes.

A perpetual injunction must, therefore, issue, restraining them from any use of this trade mark, either in the identical form in which it is registered in the Patent Office, or in any form in which it may be calculated to deceive by confounding the goods manufactured and sold by the plaintiffs with shirts made and sold by the defendants.

C. G. Child, for complainants.
C. E. Perkins, for defendants.

United States Circuit Court, Southern District of New York.

MEISSNER *et al. vs.* THE DEVOE MANUFACTURING COMPANY.

This was a suit in equity on the patent granted to Albin Warth, April 17, 1870, for an improvement in stop valves for petroleum packages. The complainants were Frederick and Charles F. L. Meissner and Charles F. Ackermann, constituting the firm of Meissner, Ackermann & Co., and Albin Warth, the inventor; and the defendant was the Devoe Manufacturing Company.

The claims of the patent were as follows:

1. The cup-shaped disk suspended within the package A, receiving the screw *b*, and forming a valve seat in combination with the valve *g* suspended from the screw between guides *h*, substantially as and for the purpose described.

2. The vent hole *c* and discharge opening *d*, in the cup-shaped disk, in combination with the central screw and with the valve and the guide arms, all constructed and operating substantially as described.

I deem it highly probable that the stop valve made by the defendant, when considered in reference to its construction and its office and function of a mere stop valve, is substantially like that described in complainants' patent, and that if the latter had been described and claimed by the patentee independently of the precise form and location of the parts and of the material office or function which such precise form and location performs in the combination described, the stop valve of the defendant must have been declared an infringement.

But the patentee has seen fit by his specification and claim to confine the right secured to him within much narrower limits. He does not in his specification claim that either part used in the construction of his stop valve is new, nor that any number of the parts, not including a cup-shaped disk by means of which the whole apparatus is sunk below the outer surface of the oil can, are new in their combination with each other.

The defendant does not use the parts in the same form or in an equivalent form, and does not produce the same result. The change he has made in the form of the disk constituting the valve seat is such as necessarily defeats the purpose for which the complainants' device was intended and which it accomplishes. The defendant's disk is, therefore, not an equivalent to that used by the plaintiffs—it has not the same effective operation. Instead of suspending the stop valve below the surface of the can or vessel by its convex form, it rises, necessarily, above that surface, and carries still higher the parts with which it is connected, thus doing the very thing which the complainants, by the peculiar form of their disk or valve seat, profess to avoid and do avoid. The conclusion cannot be escaped by saying that the difference is not in the material or essential characteristics of the device, but only in the degree of utility, that the defendant's device is the same in principle and in substantial structure, but by a change in the form of the valve seat, by inverting it, the device is rendered less perfect and less useful.

Under a specification and claim which might readily be suggested, this reasoning might be entirely just and true, and might render it necessary to pronounce the defendants' device an infringement. But the actual claim cannot be rejected. The complainants must stand or fall by the claim as made; and that, not only in terms, but when read and construed with reference to the whole specification, makes the form of the disk a part of the complainants' structure, material to its location in connection with the can, and especially material to the function or effect designed to be produced, and, in fact, produced thereby. I think, therefore, that under this patent, the complainants cannot reject the form of the valve seat and the location of the structure within the can, and allege that any form of valve seat and any location of the stop valve, however projecting above the surface of the can, is an infringement of their claim, provided in other respects it is substantially like theirs.

I think that in all other respects the defendant's stop valve does include the complainants' and all of its parts, in substantially the same form and manner of combination, and operating in substantially the same way and producing the same result. The differences in the nut and screw, in the guide, and in the contrivance for preventing the turning of the

valve are not changes in the principle or in the manner of operation which would relieve their stop valve from condemnation as an infringement; they are a mere substitution of equivalents. For this reason it seems not improbable that the conclusion to which I am compelled is not because the actual invention of the complainants has not been infringed or copied by the defendant, but because the specification and claim upon which the patent is granted has so narrowed the ground on which they stand that they fail to realize all the monopoly to which, in virtue of the actual invention, the patentee may have been entitled. If this be so, the Court is nevertheless unable to relieve them. We can only deal with the rights of the complainants as they are defined in and secured by the letters patent; and, as thus defined, my conclusion is that the defendant's stop valve is not an infringement.

The bill of complaint must, therefore be dismissed with costs.

J. Van Santvoord, for complainants.
G. Gifford, for defendants.

THE NOVEMBER METEORS.—Between seven and eight hundred meteors were observed in the course of five hours, on the evening of November 27, at the Observatory of Vassar College, Poughkeepsie, N. Y.

Facts for the Ladies.—Mrs. Paschol, New Middleton, Tenn., has a Wheeler & Wilson Lock-Stitch Machine in use since 1858; it has run constantly without repairs; has 10 of the original 12 needles. Other kinds of machines wear out in a few years; she has never seen a Wheeler & Wilson worn out. In 1867, she earned $317.75, besides doing the sewing for her family and six negro work hands and considerable for her neighbors. See the new Improvements and Woods' Lock-Stitch Ripper.

Business and Personal.

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

Ross Bro's Paint and Grain Mills, Williamsburgh, N. Y.

Wanted—Nail Keg Heading Turner. Manufacturers, send illustrated circulars and prices to William Brown, "Pioneer Steam Keg Works," St. Louis, Mo.

Male and Female Agents Wanted—100 per Cent. Profit. Address, with Stamp, for particulars, P. O. Drawer 217, Buffalo, N. Y.

For Steel and Iron Set Screws, send to Reynolds & Co. for Price List, New Haven, Ct.

For Sale, two Patents. Address H. S. Ball, Spartanburg, S.C.

Dobson's Patent Scroll Saws make 1100 strokes per minute. Satisfaction guaranteed. John B. Schenck's Sons, 118 Liberty St., N. Y.

Permanent Photograph Printing, just what is wanted by Manufacturers. Send for Circular and specimens to Amer. Photo Relief Printing Co., 1002 Arch St. Philadelphia, Pa. John Carbutt, Sup't.

Millstone Dressing Diamond Machine—Simple, effective, durable. For description of the above, see Scientific American, Nov. 27th, 1869. Also, Glazier's Diamonds. John Dickinson, 64 Nassau St., New York.

Agricultural Implements and Machines for Fall and Winter use. R. H. Allen & Co., 189 & 191 Water Street, New York.

Valuable Patent Right for Sale. The amusing Toy Attachment for Pianos, illustrated in SCIENTIFIC AMERICAN, October 28th, 1871. Address G. L. Wild & Bro., 420 11th St., Washington, D. C.

Boston Fire! Goodnow & Wightman, 23 Cornhill, were not burned out, and are ready to fill all orders for Tools and Materials. Catalogues were all burned, but will have more in about two weeks.

First Class Steam and Vacuum Gauges, Engine Registers, Davis' Recording Gauges. New York Steam Gauge Co., 46 Cortlandt St., N.Y.

Kahnweiler's Cotton Seed Huller, $175. Is warranted perfect in its operation. Send stamp for circular to R. H. Allen & Co., New York, manufacturers and dealers in Agricultural Machinery of every kind.

Four Brick Machines, Combined with Steam Power (Winn' patent), makes 40 M. per day, for sale at a bargain. Address the manufacturers, John Cooper and Co., Mount Vernon, Ohio.

Absolutely the best protection against Fire—Babcock Extinguisher. F. W. Farwell, Secretary, 407 Broadway, New York.

Hydraulic Jacks and Presses—Second Hand Plug Tobacco Machinery. Address E. Lyon, 470 Grand St., New York.

Steam Boiler and Pipe Covering—Economy, Safety, and Durability. Saves from ten to twenty per cent. Chalmers Spence Company, foot East 9th Street, New York—1202 N. 3d Street, St. Louis.

Steel Castings "To Pattern," from ten pounds upward, can be forged and tempered. Address Collins & Co., No. 212 Water St., N. Y.

Heydrick's Traction Engine and Steam Plow, capable of ascending grades of 1 foot in 8 with perfect ease. The Patent Right for the Southern States for sale. Address W.H.H.Heydrick, Chestnut Hill, Phila.

The Berryman Steam Trap excels all others. The best is always the cheapest. Address I. B. Davis & Co., Hartford, Conn.

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

Wanted—Copper, Brass, Tea Lead, and Turnings from all parts of the United States and Canada. Duplaine & Reeves, 760 South Broad Street, Philadelphia, Pa.

The Berryman Heater and Regulator for Steam Boilers—No one using Steam Boilers can afford to be without them. I. B. Davis & Co.

T. R. Bailey & Vail, Lockport, N. Y., Manf. Gauge Lathes.

For 2, 4, 6 & 8 H.P. Engines, address Twiss Bro., New Haven, Ct.

The Berryman Manuf. Co. make a specialty of the economy and safety in working Steam Boilers. I. B. Davis & Co., Hartford, Conn.

Williamson's Road Steamer and Steam Plow, with Rubber Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1509.

Belting as is Belting—Best Philadelphia Oak Tanned. C. W Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

Boynton's Lightning Saws. The genuine $500 challenge Will cut five times as fast as an ax. A six foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

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

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

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

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

Presses, Dies & all can tools. Ferracute Mch. Wks, Bridgeton, N.J.

Gear Wheels for Models. Illustrated Price List free. Also Materials of all kinds. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

Machinists; Illustrated Catalogue of all kinds of small Tools and Materials sent free. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

Gatling guns, that fire 400 shots per minute, with a range of over 1,000 yards, and which weigh only 125 pounds, are now being made at Colt's Armory, Hartford, Conn.

A New Machine for boring Pulleys, Gears, Spiders, etc. etc. No limit to capacity. T. R. Bailey & Vail, Lockport, N. Y.

Winans' Boiler Powder, 11 Wall St., New York. Certain cure for Incrustations—17 years best in the market.

Notes & Queries

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

1.—Is there any good fastening for rubber belts? All the iron fastenings that I have tried are only failures; and in common lacings, the oil used in dressing the leather spoils the belts.—J. E. S.

2.—Will some one inform me of a good and quick method of hardening hydraulic cement pipes, or concrete, which will not kill the natural petrifying process?—A. H. B.

3.—I have noticed that trees, struck by lightning, were never split if the bark was torn off, but have found them to subsequently split. Why are lightning rods twisted when struck? Why does lightning that coils round an object never do any damage?—J. C. S.

4.—Have there ever been scales constructed which will weigh correctly, pounds and ounces, at any temperature, through other means than the changeable weight at a fixed point, or the sliding weight and beam? If so, how are they constructed and what is the reason they are not in general use? Scales with springs seem to be unreliable; besides they answer the purpose only to a certain extent, as they do not weigh more than thirty or forty pounds.—A. B.

5.—H. A. S., of Hiogo, Japan, says:—I am an habitual smoker, and have often noticed, when enjoying a pipe or a cigar, that the smoke which tobacco produces changes its color during inhalation, that which escapes from the bowl of the pipe or end of cigar being of a bluer color than that which is puffed out of the mouth. I attribute this to the condensation of some one of the component parts of the smoke. I should be much obliged if some one would kindly inform me if I am correct, and if so, what is it that is condensed, and what condenses it?

6.—How can I get the hardest edge on a plate of cast iron or steel, or even wrought iron? What I want is a plate of strong metal, say half an inch thick, with one side say 1-16 deep, of the hardest metal to be got for an edge, to work in the ground or gravel, and still strong enough to stand some concussion. Will case hardening do? Can cast steel be case hardened to it? Also, can you tell me who is the original inventor of the vacuum steam pump?—H. B.

Answers to Correspondents

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at $1·50 a line, under the head of "Business and Personal."

ALL references to back numbers must be by volume and page.

E. T. N., of Pa.—The mineral you send is iron pyrites—sulphur and iron.

B. J. K., of Ga., will find methods for curing his gun of its propensity to scatter fully described on pp. 42, 58, 74, 107 of our volume XXVI.

F. H. J. asks for practical directions for making bibulous paper for drying crystals, and for making salts of copper, cobalt, and silver. The paper can only be made in a paper mill, and common blotting paper will answer the purpose. The salts of metals can be purchased for very much less than they can be made. Consult any good chemistry for the processes.

C. Y. asks:—Will you please tell me through your paper what the difference is between a salinometer and a hydrometer? Answer: In principle, none. The salinometer is a glass tube graded specially for salt water, to indicate different degrees of saltness. A hydrometer is a similar instrument graded to indicate the specific gravity of any liquid in which it is placed.

J. A. S., of Ohio, says:—Will you please inform me how brass fitters obtain the beautiful finish for brass work usually seen on gas fixtures? I believe it is called dip lacquer finish. Please give the ingredients and proportion, and, if possible, the mixture of brass which produces the best results. Answer: The finish is obtained by dipping the article in nitric acid, a special quality called dipping acid being sold for the purpose. After dipping, the article is varnished. As to the metal, any brass founder will give you that. It varies with the intended use of the casting. Fine yellow brass is composed of 66 parts of copper and 34 parts of zinc.

F. R. says:—Will you please tell me whether the diamonds used in the diamond drill are a manufactured article? A friend tells me they are so, but I think they are the true black diamond. Answer: The diamonds used in drills and stone saws are not manufactured. By no process at present known can the qualities of the diamond be imitated. The diamonds used in drills are known here as black diamonds, and have the appearance of close grained coal. This substance is termed by dealers *carbonado*, and appears to occupy a place between anthracite coal and the real diamond, having the hardness of the latter. The carbonado is found in Siberia and Brazil.

J. M. says:—I saw a reply to a correspondent concerning the old wheel question, and send this to say that, if you have no objection, after having expressed an unwillingness to admit discussion on that subject at this time, I will say to D. W. S., not only what I think, but exactly how it can be proved that, as per construction of the question, the wheel makes only one revolution; and this I will do with an article no longer than your reply to D. W. S., on page 330 in your last issue, with a few rings for a diagram. Please therefore to say to J. M. how you like my proposition. Should a discussion follow you are not required, you know, to take sides, if not so disposed. Answer: We should be very glad to re-open the wheel discussion if we were not fully satisfied that it could lead to no good result. The very same diagrams by which our correspondent thinks he can conclusively prove the one revolution, can be used by the two revolution people to establish the correctness of their ideas. In the course of the former discussion, we frequently received similar models and similar diagrams from opponents for the purpose of proving their views.

C. C., of Michigan, says:—I want to know if an air pump will take suction from the exhaust of a steam engine and force the steam into a rotary boiler for paper manufacture, creating a pressure of one hundred pounds to the square inch? Also, would such a pressure have the ordinary heat that one hundred pounds pressure has in an ordinary steam generator? Answer: An air pump would accomplish the object intended but, to condense by compression to the extent indicated, would require it to be made very strong, would absorb very great power, and we should be inclined to expect it to prove an unprofitable experiment. Were the experiment made and the full pressure attained, the temperature of th steam would be the same as in the steam boiler at the same pressure, viz 327·8° Fahrenheit, with steam per gage at one hundred pounds per square inch. We should anticipate that it would be found far less expensive to take prime steam from the boiler at the desired pressure and temperature than to compress the exhaust steam as proposed.

In reply to H. E. C., query 2, page 345, I would say that faded writing can be restored by rubbing over with tincture of galls.—F H. J., of N. Y.

To W. G. Blish, page 340.—A belt can be shifted with the loose pulley on the driving shaft if the driven shaft has a momentum that will keep it in motion until the belt is completely shifted, not otherwise. Also, crossed belts never run so well as straight ones. Better obtain more pulley surface by increasing the size of both pulleys, giving greater belt speed—a double gain. It is difficult to make a belt leave a tight for a loose pulley if the latter is much the smaller, but a slight difference is good practice.—J. E. S.

To B.S.P., query 3, page 345.—Make a solution of gutta percha in bisulphide of carbon, apply a coat or two around the leak in your gas bag; put also a coat or two on a thin piece of leather. Now warm the two coated surfaces, and at once press firmly together.—E. H. H., of Mass.

To H. E. C., query 2, page 345.—Faded ink can usually be restored. Try brushing over the writing a dilute solution of sulphuric acid to which a few drops of nitric acid have been added. When dry, brush over a dilute solution of prussiate of potash; the faded writing will exhibit a blue color, which will deepen on exposure. Or brush over the writing some solution of hydrosulphuret of ammonium, which by age and exposure has become yellow, and the writing will become black. Don't be astonished at the pleasant smell of this last plan.—E. H. H., of Mass.

To B. S., query 3, page 345.—Air slaked lime will not do for making lime cylinders. Take lumps of nice soft chalk, and cut out or turn your cylinders; place in a crucible together with some powdered chalk, submit to a bright red heat for an hour or two, and you will have as nice lime as you can wish.—E. H. H., of Mass.

To I. W. C., query 4, page 345.—To a solution of nitrate of silver, add solution of cyanide of potassium until no further precipitate is formed; allow it to settle and pour off the clear liquor. Dissolve the sediment in enough solution of cyanide of potassium and form into a paste with prepared chalk. Rub some of this paste on your brass, or copper, or German silver, etc., and you will have a nice thin deposit of silver, of course not so thick or durable as if deposited by a battery. Be careful of the cyanide, as it is deadly poison, and do not let it get near a scratch.—E. H. H., of Mass.

Recent American and Foreign Patents.

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

ROTARY STOOL.—George H. Spencer, Fitchburg, Mass.—This invention has for its object to improve the construction of rotary office stools, chairs, etc., and it consists in the cylindrical nut or spider made with radial arms, having longitudinal sockets formed in their outer ends, and in the legs or posts with their upper ends bent inward to enter the longitudinal sockets of the spider.

SLEEPING CAR.—William E. Gowdy, Waldron, N. Y.—This invention has for its object to improve the construction of sleeping cars in such a way that each berth may be closed as securely as a state room. When the panels are turned down upon the bottoms of the seats, and the cushions replaced upon said seats, the panels will be entirely out of the way. By this construction, also, all the parts that require to be detached and removed are certain partitions. This construction makes the berths or compartments of a sleeping car become as secure as a state room, and the occupant, when he has bolted the panels upon the inside, can sleep in safety,

DUMPING CAR.—John R. Dubois, Virginia City, Nevada.—This invention relates to improvements in the class of dumping cars in which the box is hinged and pivoted so as to be turned horizontally and also be tilted toward either side or end of the track; and it consists in the peculiar arrangement of locking devices for preventing the box from swinging around on the turn table at the same time that it is held from tilting.

FIREPROOF FLOOR AND CEILING.—George H. Johnson and Edwin R. Hall, Chicago, Ill.—The invention relates to a mode of forming a fireproof floor and ceiling by means of slabs and hollow tiles of burnt clay, plaster of Paris, or other incombustible material, applied to the upper and under side, respectively, of timber joists, the slab being of rectangular form and secured by the same devices as the floor boards which are laid thereon, and the tiles being of prismoidal shape and provided with flanges to adapt them to cover and also be supported by strips attached to the sides of the joists.

CAR COUPLING.—Perry Brown, Louisville, Ky.—The invention is an improvement on that recently patented to same party. The link acts, as in that case, on a pivoted support for the coupling pin, so that the latter drops into its place as the cars come together. In this instance, the coupling pin is extended vertically to the top of the car, and is provided with a curved arm to act on a radial arm or projection of a similar extension of the shaft of the valve or said pivoted support, so that, the coupling pin being first raised, the support may be caused to move under it and thus place the coupling in readiness for automatic action without necessity for the operator to enter between the cars or descend from them for that purpose.

MEANS OF PROPULSION.—Seth R. Foster, St. John, Canada.—This invention relates to a new paddle attachment to steam engines for propelling vessels of various sizes, and consists in suspending the paddles directly from the ends of the walking beams of the propeller. The inventor proposes to impart the requisite vibratory motion to the beam by a jointed rod connection with a crank shaft, and to rotate the crank shaft by the pistons of two steam cylinders. The vibrations of the beam on its pivot serve to impart up and down motion to the dashes and paddles; but the horizontal sweep is imparted to the same by means of rods which connect them respectively with the cranks of the shaft. The invention can also be used for canal boats, in which case the propeller is placed on the bow or stern by a little alteration in its construction, namely, by having two walking beams instead of one, the sweeps attached to one end instead of both, and propelling machinery attached to the other end of each beam.

MILK COOLER.—Irving Wheeler, of Massena, N. Y.—This invention relates to an improved milk cooler by which a small quantity of water can be made to absorb nearly all the animal heat of the milk for the purpose of preparing it for market or for churning. The invention consists in the arrangement of a spiral water chamber beneath the milk pan for obtaining a large circulating channel, and, consequently, fully utilizing the heat absorbing qualities of the water.

INSOLE FOR BOOTS AND SHOES.—Garett H. Whittaker, Pittsfield, Mass., assignor to himself and Jacob Stewart, of same place.—This invention relates to a new insole for boots and shoes, with the object of keeping the feet warm by its use and of curing and preventing chilblains and other unpleasant and injurious diseases caused by cold feet. The invention consists in making the sole of three thicknesses of material, of which the lower is rubber cloth, the middle, palm leaf steeped in sulphur solution, and the upper, carpet.

SEED PLANTER.—John H. Dancy, of Dancyville, Tenn.—This invention relates to the class of seed planters in which the amount of seed required for a hill is elevated within the seed hopper and discharged through a hole in the upper part of the hopper into the drop tube. The object of the invention is to insure the planting of the requisite amount of seed at proper intervals and without injury to the seed. The invention consists in the use and new arrangement, with the vertical slide which elevates the seed to be dropped to the hole in the upper part of the hopper, of a cut-off, and other appurtenances which are necessary in order to make the slide effective.

SASH HOLDER.—William Wilson Amos, of Olathe, Kansas.—This invention has for its object to improve the construction of the sash holder and lock, for which letters patent No. 125,161 were issued April 2, 1872. The invention consists in a hinged box made inclined or tapering, and in it is placed loosely a small box, in which is placed a tapering rubber block. The box and its contents are held out against the casing by the spring. With this construction, when the sash is being lowered, the friction of the window casing upon the rubber block forces the said rubber block and its sliding box or case upward into the shallower part of the tapering box so that the rubber block will hug the casing and thus support the sash by friction.

STEAM EXHAUST FOR LOCOMOTIVES.—Thomas Davies, of Cleveland, Ohio.—This invention relates to an improvement in the means for supporting the ring jet pipes through which the steam is exhausted in certain marine boilers. An upright pipe, which is tapered and open at each end, forms a support for the ring exhaust pipe at any point in its hight, according to the predetermined size of the said ring and the point of its insertion in the smoke box.

SAWING MACHINE.—William C. Daniel, of Point Pleasant, Mo.—This invention relates to a new reciprocating buck saw, in which the saw frame and carriage are vertically adjustable and suspended from a windlass which unwinds automatically by means of an escapement attachment, so that the downward feed of the saw will be regular and gradual.

FORM FOR LAYING BRICK PAVEMENTS.—Samuel C. Brewer, of Water Valley, Miss.—This invention is embodied in a device for gaging the bricks for laying "herring-bone" pavement, calculated to insure regularity in the work. It consists of a brick paving gage, having right angled notches in one edge as deep as the longest bricks, and whose sides are arranged on angles of forty-five degrees with the long axis.

ELEVATED WIRE WAY.—George Killam, of Fort Dodge, Iowa.—This invention has for its object to furnish an improved construction for elevated railroads. The track is supported by two rows of posts, at a distance apart equal to the width of the track. The upper ends of the posts are fitted into and secured to castings which are made heavy and strong, and grooved transversely in the middle part of their upper sides with a deep and wide groove. The upper sides of the castings have grooves formed in them, of such a depth and breadth as to receive the flanges of the wheels of the car. The tops of the ribs between the longitudinal grooves of the castings are grooved sufficiently to bed the wires which form the track and are secured to the castings. The axles pass beneath the bottom of the car up along its sides, and project to receive the wheels at such a point that the center of gravity of the car may be considerably below the point of support. Directly beneath the upper wires are placed a second set of wires, the ends of which pass through the body of the castings. The shoulder upon the inner side of the castings, through which the inner wire passes, is made wide and is grooved longitudinally to receive the flange of the lower wheel. The lower wheels revolve upon the journals of arms which are formed upon the axles and project into such a position that the wheels may roll along the lower side of the inner wire and thus effectually prevent the upper wheels from leaving the wires.

ORE CLEANER AND SEPARATOR.—John H. Hillman, of Trigg Furnace, Ky.—This invention has for its object to furnish an improved machine for separating or cleaning ore by a current or blast of air. The ore after being crushed to the desired fineness is delivered into the hopper by any suitable means, and is fed into a cylinder which, by its motion, keeps the ore rolling and sliding about, causing it to pass down to the lower end of said cylinder. This movement of the ore rubs off the dirt and dust, which is carried out through the cylinder, pipes, and fan by and with the current of air. The smaller particles of ore will pass through the holes of the cylinder while the larger particles will be carried down to the ore receiving box. When the ore has sufficiently accumulated in the box, it will be discharged into any suitable receptacle provided for that purpose. A jacket is made to fit the cylinder at its ends and at its side edges, to prevent a current of air from passing in through the holes in the upper part of the said cylinder, thus making the current of air strong in the lower part of the cylinder where the small particles of ore must pass through.

ADJUSTABLE SCAFFOLD.—William A. Jester, of Holliday's Cove, W. Va.—The object of this invention is to furnish safe and convenient means for supporting house builders and painters with their materials and implements by the sides of buildings. It consists of a scaffold made of two uprights on which slides a triangular bracket. The platform upon which the workmen stand is supported by the bracket. In the top of the upright is a pulley. A clamp consisting of two or more jaws is attached to a horizontal bar. This bar is confined to the upright, so that it can slide up and down. One jaw (or pair of jaws) is rigidly fastened to the bar. The other jaw (or pair of jaws) operates as a lever, and the two are pivoted together and act much like a pair of pinchers. A rope is connected with the lower end of the jaw. This clamp, it will be seen, can be raised or lowered so as to be grappled on to roofs or projections of different hights from the ground. Two or more of the uprights with bracket and clamp attached are employed in supporting the platform.

LAST.—Joseph Anzer, of Ashtabula, Ohio.—The invention consists in providing means for locking the two parts of a last against lateral as well as vertical displacement.

PACKING BOARD FOR PENCILS.—*Orestes* Cleveland, of Jersey City, N. J.—This invention has for its object to produce a compact and symmetrical package of lead pencils, pen holders, crayons, or similar articles. A piece of wood or other material is inserted between the pencils that constitute a package, the inserted piece being grooved for each pencil to hold it firm independent of the other pencils. The inserted piece also serves to enlarge the package so as to produce a large surface for the admission of a showy label. This device is so constructed that it enables the retailer to withdraw several pencils from a package without losing the use of the label, the package still retaining its shape.

MACHINE FOR TURNING LOGS IN SAW MILLS.—George W. Baker, Elizabeth City, N. C.—This invention consists in the provision of a sliding carriage moving horizontally in ways or guides beneath the log deck and carrying a vertically reciprocating toothed turning bar, so as to enable the same to be horizontally adjusted for action upon logs of various lengths. The invention further consists in the combination with the movable carriage of a sliding self-adjusting weighted block for exerting a constant pressure upon the turning bar to hold the same in contact with the log.

MANUFACTURE OF SALT.—John McGrew, Ravenswood, W. Va.—The invention consists in providing the inside of a furnace with an air jacket and discharging the heated air into the bottom of a vessel of brine or salt water; in passing the unconsumed products of combustion through vessels of brine or salt water, thereby abstracting the heat and *utilizing* it for the general purpose of the apparatus; and finally, in a drying apparatus of such construction and so connected with the furnace that the salt is conveniently as well as effectually dried before it leaves the apparatus.

MEDICAL COMPOUND FOR THE CURE OF DIARRHŒA.—Mrs. A. B. Dorman, Cape Girardeau, Mo.—The invention consists in red oak bark, cinnamon, cloves, dandelion root, and brandy mixed in certain proportions with boiling water. This compound has been applied to the most obstinate cases with a prompt and marked effect, the diarrhœa yielding to the treatment in a very short time.

CAR COUPLING.—Darius Sutherland, Milo, Ill.—The invention relates to that special class of car couplings which are made to couple the cars automatically or by impact, and it consists in attaching the pin to a lever and weighted lift bar, arranged outside of the draw head and above the platform of car; whereby a projection from the top of one car is made to strike the lift-bar, whose weight turns the lever on its fulcrum and carries down the pin into the link.

WHIFFLETREE FOR DETACHING HORSES FROM VEHICLES.—Albert H. McAlister, Cotton Plant, Miss.—This invention has for its object to furnish an improved whiffletree, which shall be so constructed that should the horse or horses become frightened or otherwise unmanageable, or should other cause or causes render it advisable, they may be readily detached from the carriage and allowed to go free.

TUBING TONGS.—George A. Holden, Ruggville, Pa., assignor to himself and J. R. Holden, of same place.—This invention has for its object to furnish an improved tubing tongs or pipe wrench, designed especially for taking tubing out of and putting it into wells, and which shall be so constructed as to take a prompt and firm hold upon the pipe, and so as to enable two men to operate with the same tongs, thus avoiding the necessity of using two ordinary tongs, and the consequent risk of injury to the tubing.

ADDRESS PLATE FOR TRUNKS.—James E. Kirk, Marlborough, Mass.—This invention relates to a new construction of address plates for trunks, boxes, etc., in which the paper, slate, or other substance upon which the address is written is held beneath a small pane of glass by a hinged frame, said frame being locked by notched disks, to be unlocked and swung open whenever the address is to be changed. The plate in which the hinged frame and the notched disks are arranged is rigidly fastened to the trunk or box, and may further serve as a support for a handle.

CHECK PUNCH.—José R. Mesa, Brooklyn, N. Y.—This invention has for its object to produce an instrument for punching the number or amount to which checks or similar documents of value are drawn through the same and feeding the same forward to obtain the necessary spaces between the figures punched. It consists in a rotary cylinder with a series of vertical punches that represent the several figures and characters to be punched through the paper. The cylinder can be turned so as to bring any one of the punches under a knob or button, which, when struck by hand, forces the punch under it against the paper to perforate the same in the desired manner. Each punch is provided with a pendant by which, in its descent, it will work a pawl and ratchet, and thereby turn one of the rollers between which the paper is held to feed the paper in the requisite ratio.

BOTTLE RINSER.—James Roue, St. John, Canada.—The object of this invention is to provide convenient and efficient means for rinsing soda water and other bottles, tumblers, and similar vessels. It consists in the valve chamber or shell, consisting of a vertical tube with one or more branches, for attaching a supply pipe from the water fountain. The rinser is supported in any suitable manner in a sink. The lower end of the valve rod is connected with a paddle, by means of which the valve is lowered. The valve is held in position (or closed) by the spiral springs which surround the valve rod, with one end bearing against the valve and the other on the bottom of the valve chamber. With the water supply pipe connected with either of the branches and with a sufficient head of water, when the valve is pressed down the water will rush into the tube and be discharged from a rose head with a force proportioned to the hight of the head of water. This will effectually rinse the insides of bottles, tumblers and all similar vessels, when the tube is inserted therein.

TOOL REST FOR LATHES.—Charles F. Hadley, Chicopee, Mass.—The invention consists in the combination of a horizontal screw and nut with an inclined lever, which supports the tool rest, and which determines the hight of the same by its greater or less inclination. By this means the rest can be adjusted with great ease, and will set the tool to suitable hight without disturbing it otherwise. Heretofore the tools had usually to be loosened in their holders before they could be vertically adjusted, and were thereby often disturbed after their positions otherwise had been ascertained with care, thus causing much loss of time and labor. This invention may be found illustrated on page 274, present volume SCIENTIFIC AMERICAN.

TONGUEING AND GROOVING KNIFE.—William B. McClain, Sandusky, Ohio.—This invention has for its object to make tongueing and grooving knives adjustable, so as to enable their use for larger or smaller tongues, deeper or shallower grooves, without requiring their removal from the cutter head. This invention consists in making each cutter in three parts, the middle projecting or receding part being lengthwise adjustable between the others.

[OFFICIAL.]

Index of Inventions

For which Letters Patent of the United States were granted.

FOR THE WEEK ENDING NOVEMBER 12, 1872, AND EACH BEARING THAT DATE.

SCHEDULE OF PATENT FEES:

On each Caveat	$10
On each Trade-Mark	$25
On filing each application for a Patent (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Examiners-in-Chief	$10
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
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Auger, earth, I. N. Pyle 132,980
Baby jumper, S. G. Bigelow 133,008
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Wire rope, machine for compacting, R. P. Rothwell	133,059
Wire cloth for screening coal, J. W. Brock	132,949

APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending, for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the day hereinafter mentioned:

22,941.—RAILROAD CAR SPRING.—A. B. Davis. January 29, 1873.
22,947.—WRENCH.—D. P. Foster. January 29, 1873.
23,060.—ELECTRO MAGNETIC ALARM.—M. G. Farmer. February 5, 1873.
23,085.—LAMP.—E. J. Hale, C. H. Chandler. February 12, 1873.
23,875.—LAMP SHADE.—C. and A. C. Wilhelm. April 16, 1873.

EXTENSIONS GRANTED.

22,048.—LOCK.—S. N. Brooks.
22,071.—ELECTRO MAGNETIC ALARM.—M. G. Farmer.
22,104.—REFRIGERATOR.—A. H. Bartlett.

DESIGNS PATENTED.

6,244.—THREAD HOLDER.—T. W. Carter, West Meriden, Conn.
6,245.—OIL CLOTH.—H. Kagy, Philadelphia, Pa.
6,246.—OIL CLOTH.—C. T. and V. E. Meyer, Lyon's Farms, N. J.
6,247.—HUB BANDS FOR WHEELS.—O. S. Stevens, Belvidere, N. J.
6,248.—PRESERVE DISH.—H. C. Wilcox, West Meriden, Conn.

TRADE MARKS REGISTERED.

1,053.—FANCY GOODS.—Cochran, McLean & Co., New York city.
1,054.—MEDICINE.—V. Delaney, Santa Fe, Ill.
1,055.—COFFEES, SPICES, ETC.—J. M. Earle, New York city.
1,056.—NEEDLES.—Excelsior Needle Company, Wolcottville, Conn.
1,057.—WHISKY.—P. Fegan, Washington, D. C.
1,058.—SOAP.—S. W. McBride & Co., Chicago, Ill.
1,059.—SUGAR CURED HAMS.—A. Schoeffel, Louisville, Ky.
1,060.—SOAP.—J. W. Swalley, Erie, Pa.
1,061.—EMERY WHEELS OR BLOCKS.—J. Tyzick, St. John, Canada.

Value of Patents,

AND HOW TO OBTAIN THEM.

Practical Hints to Inventors.

PROBABLY no investment of a small sum of money brings a greater return than the expense incurred in obtaining a patent even when the invention is but a small one. Larger inventions are found to pay correspondingly well. The names of Blanchard, Morse, Bigelow, Colt, Ericsson, Howe, McCormick, Hoe, and others, who have amassed immense fortunes from their inventions, are well known. And there are thousands of others who have realized large sums from their patents.

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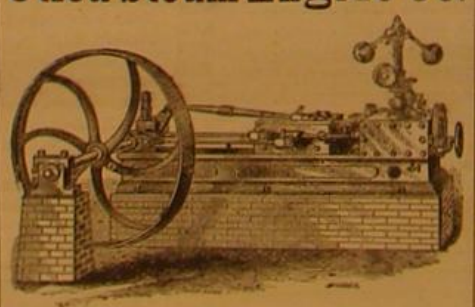

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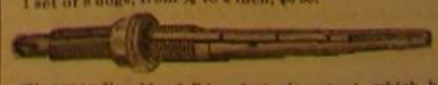

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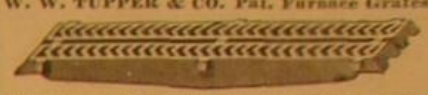
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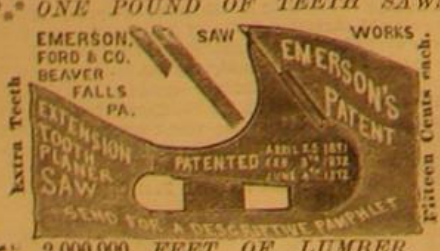

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Horace Greeley

Scientific American.

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STEAM ENGINE ECONOMY AND STEAM BOILER ECONOMICS.

A correspondent has been assured, by some one who pretends to have learned the fact (?) from experience, that one half the coal used by a non-condensing engine can be saved by passing one half of the exhaust steam into a heater, and heating the feed to a temperature of 220° Fah., and turning the other half into the ash pit under the boilers. The plan is urged by an engineer (!) who must be either very ignorant or very dishonest, for it conflicts with the teachings of our best scientific authorities and to the practical experience of the foremost men in the engineering profession.

A pound of feed water entering a steam boiler at a temperature of 50° Fah. and evaporating into steam of 60 pounds pressure, requires the addition of as much heat as would be required to raise 1,157¾ pounds of water one degree in temperature. Feed water at 220° requires 987¾ thermal units. The saving is therefore (1157·75—987·75)÷1157·75, equal to not quite 15 per centum in the case assumed.

To raise the feed water to a temperature of 220° Fah. would require that it be kept under a pressure 2¼ pounds per square inch higher than that of the atmosphere, and this would be so much additional back pressure upon the engine.

The best and most practicable pressure and temperature would be at about the pressure of the atmosphere and at as nearly the ordinary boiling point as possible, and even under these conditions, care must be taken to see that the feed pump works under a considerable head or it will be very certain to give trouble. At a temperature of 200° Fah. the economy, as compared with the use of feed at 50°, would be about 13 per cent, and, with a well constructed heater, there should be no trouble from back pressure.

The proposal to convey steam to the furnace, with the expectation that it may be there decomposed, and that its combustible constituent, hydrogen, may yield a large increase of heat by burning with the fuel, while its oxygen will intensify the combustion of the coal or wood, has been frequently made and often tried. The scheme is entirely without scientific basis. The amount of heat developed by the combustion of hydrogen and the chemical union of oxygen is the exact equivalent of the force required to separate them when once united. Consequently, while the combustion of hydrogen in the furnace would yield a great amount of heat, and while the union of oxygen with the fuel itself would develop a large quantity of heat also, the sum of these two amounts would be just equal to the necessary amount of force required to decompose the steam, were these elements obtained as proposed.

Incidentally such use of steam may be useful to a slight extent by causing a more complete transfer of heat to heating surfaces at a distance from the furnace, in rare cases; but even this is doubtful, and neither science nor engineering practice uphold the plan,

The question is also asked whether the experiment referred to, on page 322 of the current volume of the SCIENTIFIC AMERICAN, was correctly described. The experiments referred to were made by M. Donny, a French experimentalist, who published the results of his remarkable research in 1846. (*Annales de chimie et de physique*, third series, No. XVI.) He found that water, deprived of air, could be raised to a temperature of 138° centigrade (280° Fah.) without boiling, and that evaporation then took place explosively, the water discharging a sufficient amount of steam at a single burst to reduce its temperature to that due the pressure to which it was exposed. M. Deluc observed the fact even earlier than Donny, and many physicists have attacked the subject since. M. Dufour, by taking the most delicate method and observing the greatest care to avoid contact of rough particles and metallic surfaces with the water, succeeded in raising the temperature of very minute globules to 175° C. (347° Fah.), which is that due to steam under a pressure of 115 pounds to the square inch. It is found necessary, however, in such experiments, to operate with very clean water in very small quantities, and to be exceedingly careful to avoid the slightest motion of the liquid, and also to keep it from contact with metallic surfaces or mineral substances.

M. Donny's experiments were made with glass vessels, but M. Dufour was compelled to suspend his drops of water in a mixture of oil of cloves and linseed oil, to secure the success of his experiment. Such conditions evidently never occur where water is vaporized in steam boilers, and we may probably feel confident that such superheating is not likely to produce steam boiler explosions. The mass of water in the steam boiler is too large, and is invariably in contact with a metallic surface. It is probably always in motion to at least a slight extent, as the irregular distribution of heat in all ordinary boilers must produce generally some slight circulation at all times, and finally it rarely happens that feed water is absolutely free from impurities (Journal Franklin Institute; third series, Vol. XCIII., page 98). While, therefore, we cannot say positively that explosions have never occurred from this cause, we are fully justified, probably, in supposing it to be the fact.

THE PRESIDENT'S MESSAGE AND THE VIENNA EXPOSITION.

"To further aid American exhibitors at the Vienna Exposition, I would recommend in addition to an appropriation of money, that the Secretary of the Navy be authorized to fit up two naval vessels to transport between our Atlantic cities and Trieste, or the most convenient port to Vienna, and back, their articles for exhibition."

The above from the recent message of President Grant, though constituting the sole reference to the Vienna show, is sufficient to prove that our excellent chief magistrate, desirous, as he doubtless is, to promote the industrial interests of the country, has not fully appreciated the gross amount of the expenditure which he thus recommends to Congress. Assuming that the appropriation referred to will reach the figures demanded by the United States Commissioner, namely five hundred thousand dollars, let us add to this sum the expenses of two men-of-war to Trieste and back, covering say a period of seventy days for the voyage, and not including the time of fitting out and the period intervening between their return to the United States and the date of their going out of commission. It may, we think, be safely assumed that as but two vessels are specified they will be of the largest size, or "first rates," and also, as they are not to be used as regular cruisers, and consequently will not carry their full complement of guns, that their crew will be reduced, say from 700 to 400 men each, including clerks, petty officers and men. The number of officers, line and staff, will also be lessened in proportion. Calculating the pay of all for seventy days, adding thereto the cost of one ration per man, and the expense of coal under the assumption that the vessels will be under sail alone for at least half the above period, at the smallest estimate we make the expenses amount to $100,000 for both vessels. In addition to this $30,000 is a small allowance for the balance of time the ships are in active service and contingencies in the shape of detention by bad weather, prolongation of stay abroad and other necessary expenses. So that the total bill which the country is asked to pay for the privilege of being represented in Vienna by a few manufacturers and inventors and a large number of office-holders is $630,000. Now let us sum up the amount of floor space alloted to the United States in this show: 13,000 square feet in the machinery annexe; one transverse gallery 500 by 49 feet, or 24,500 square feet, and a portion of the central pavilion, at the most say 5,000 square feet; total 42,000 square feet, or, to make matters clearer, the entire space would barely equal that of a hall 207 feet square. Consequently the country is taxed at the rate of $14 per square foot for every inch of floor, including passage ways, waste space, etc. It appears to us that this will be more than all the machinery, etc., that can be placed thereon, will be intrinsically worth.

We should like to understand from our Congressmen elected under pledges of voting in favor of retrenchment and of the reduction of the already heavy burden of taxation, whether they propose to support this unwarrantable extravagance? Does the President in view of the above facts consider that $630,000 would be profitably expended? Referring to the taxes, he says, "It is very doubtful, however, whether any further reduction of so vexatious a burden upon any people will be practicable for the present." Can he, in face of this, urge an appropriation of which the greater portion, as we have shown, is to be devoted to the support of a pack of useless officials, and the total amount of which will inevitably be increased to a round million as soon as the people begin to discover that they can obtain so grand an advertisement free of expense? Can the United States afford to appropriate twenty-one times as much money as Great Britain for this purpose? A sum sufficient to begin the reorganization of our dilapidated navy, instead of allowing that branch of the public service to remain a disgrace to the country; and now still further weakening its pitiful force of 45 effective vessels by withdrawing two for transport duty.

We protest against any such waste of the public funds. The treasury is anything but replete, and every bureau of the government is now waiting for its yearly appropriation. If we have any surplus let it be devoted to the re-establishment of our commerce. If the country once more recovers its carrying trade and owns a mercantile navy commensurate with its rank as a first class power among nations, our industries will be a thousand times more benefited than by any number of such shows as this Vienna Exposition.

CONCENTRATED SOLAR RAYS.

A paper detailing some experiments upon solar rays which it was claimed resulted in the discovery of some hitherto unknown, and most remarkable properties of the solar emanations, was published on page 309 of the current volume of the SCIENTIFIC AMERICAN, and attracted some attention. [On Certain Undescribed Properties of the Concentrated Solar Rays, by George Robinson, M. D.]

A reader has been endeavoring to repeat the experiments described but was unable to obtain the results described in the paper, and experiments made, at our request, with the great 15¼ inch lens of the Stevens Institute of Technology also gave only negative results. We hope that our contributor will be prepared to repeat his experiments in presence of the faculty.

If the writer of the paper is correct, he has made one of the most wonderful discoveries. He should not lose the opportunity to make himself a name as a discoverer of equal rank with the greatest among those of either ancient or modern times.

A BADLY CONSTRUCTED BOILER.

"An engineer," writing from Philadelphia, encloses a sketch of a "sectional steam boiler" having V shaped water tubes, and states that it was tested with 105 pounds water pressure by the city inspectors, and that, four weeks later, on Thanksgiving Day, the engine driver, while cleaning flues, found several tubes burnt out and fallen to pieces, the fragments lying on the bottom of the flue, together with quantities of sediment, which, by stopping the circulation of water, had caused the mischief.

The usual pressure of steam is sixty pounds.

Our correspondent, who neglects to give us his name, asks our opinion of the boiler inspection department of Philadelphia.

We reply that what we have known of that department has led us to believe it to be unusually well conducted, and we must add that an anonymous writer is not usually considered to be entitled to notice. He is very liable to be suspected of unpraiseworthy motives.

Our deduction from the facts presented is that such boilers as that described are unfit for use where the water contains sediment or holds soluble salts, as the tubes are evidently not readily cleaned, and the deposit cannot always be blown out. In this case the tubes must soon have blown out, but the great advantage of the sectional form of boiler would then have been probably exhibited, as the explosion would have been unlikely to do any serious harm.

The boiler should be changed for one that can be cleared of sediment and incrustation readily, the fireman should be instructed to free the tubes of scale and deposit frequently, and the city inspectors should be informed of the circumstance, as it may be quite a novel incident. We believe the form of boiler referred to is quite lately introduced.

Let our correspondent send his name at another time, and if he does not desire to have it published, a request to that effect will always be complied with.

IF ANY ONE wishes specimens of the paper to examine before subscribing, tell him to write to the publishers and they will cheerfully mail them.

THE VIENNA EXPOSITION---PROFESSOR THURSTON EXPLAINS.

Professor R. H. Thurston, of the Stevens Institute of Technology, a frequent correspondent and valued contributor to our columns, has favored us with a letter, found on another page of this issue, in reference to our strictures upon the assertions contained in a certain circular, for which we have maintained the United States Commissioner to Vienna to be responsible. Our correspondent fails, we think, in his laudable endeavor to shoulder the blame. In a single sentence Professor Thurston first assumes the authorship, and declares Commissioner neither morally nor legally responsible for the the emanation, *except* as based upon information received from his office. Is not this rather inconsistent? Where should our correspondent obtain his authority or instructions save from the office of his principal?

The letter virtually says: "I am not responsible, and neither is the Commissioner, except for what he told me." Then General Van Buren in turn declares himself not accountable for the acts of his subordinates. Consequently we must infer that we have discovered an assertion which originated with nobody, for which no one is answerable, a sort of rhetorical "element," formed from no constituents and derived from a totally unknown source.

Our correspondent cites as an example for our emulation that the British Commissioners announce the space allotted to Great Britain as filled. Undoubtedly, and let us add by men who pay their own expenses, for $30,000 is all that Parliament has appropriated. The example to be followed is not in the fact that England has crowded her limits with her products, but in that her inventors and manufacturers have aided themselves, and have not waited for the nursing of a crowd of officials or for their government to show them how to take care of their own interests. The assertion, that unless the United States act promptly, our space will be occupied by other nations, and our industries abroad greatly

injured, is the offspring of our correspondent's zeal in the cause that he advocates, as we think he will hardly maintain on calm reflection that any such results would happen, even were we entirely absent from the Vienna show.

With the residue of the letter we agree. If, as we have repeatedly urged, gentlemen, in various parts of the country, who are fitted for the work will voluntarily aid in collecting and forwarding American contributions, and if, influenced by purely patriotic motives, such persons will subscribe toward defraying the expenses of national representation in the Exposition, they will have no stronger supporters than ourselves. We believe in international exhibitions. We think the Vienna show a grand and invaluable benefit to all exhibiting nations, and we will willingly head a subscription list for funds, or render all other suitable aid in its behalf. What we desire and hope to see is a cessation of these efforts to bleed the government. The Commissioner complains of our opposition. If he will remit his roundabout maneuvres to get at the public money, and seek funds directly from private parties, of whom he will find plenty sufficiently patriotic and interested to assist him, and if he will advocate the non-reliance of exhibitors on government, and urge them to independently meet their own expenses, he will not be wanting in every encouragement from the SCIENTIFIC AMERICAN.

IF ANY ONE WISHES AN ILLUMINATED CALENDAR for 1873, to hang in his office or shop, he can have it free on sending a request to this office.

TORPEDO WARFARE.

It need not be imagined, because the nations of the earth are happily at peace, that inventors are not as busy as ever in devising means for the destruction of their fellow men in time of war. New cannon, small arms, and army and navy equipage are constantly being invented, though perhaps no one subject is attracting a greater share of attention, nor indeed is of more importance in future maritime conflicts, than the submarine torpedo. As the iron protected ship has virtually driven the wooden vessel from the sea, so, it seems, is the torpedo boat as a means of harbor defense to supplant the floating fortress.

Although innumerable plans were proposed during the war for submarine crafts, few were put into actual use. Two or three, employed by the rebels, did their work, sinking the gunboat Housatonic and one of our small monitors, but in both cases the boats with their adventurous crews were lost, going down with the vessels they destroyed. Recently, a torpedo boat has been in process of construction at the Brooklyn navy yard, but it has fully demonstrated its utility by suddenly sinking at its moorings, thus adding additional evidence to the fact that no vessel of this kind is fit to trust a human life in, without the same is to be deliberately sacrificed. Many excellent forms of torpedo have been introduced, destined to be anchored in the channel and exploded at the proper time by electric wires leading from the shore; but the vessel of this description which can be manœuvred by a crew and destroy even a single ship without finding its way to the bottom, remains yet to be invented.

A new apparatus, which seems to be the most formidable yet devised, has lately been tested before a board of army and navy officers at Newport, R. I. From the report of the performances we are led to believe that the inventor, Mr. John L. Lay, has accomplished an important step in advance in the science of submarine naval warfare. The hull of the craft is about thirty feet long and three inches wide, cigar shaped, and formed, water and air tight, of iron plates. It is divided into three compartments; one for motive power, another for machinery, and the third for electrical apparatus. The motive power consists in carbonic acid gas compressed in sufficient quantity to drive a pair of oscillating engines of eight horse power and thus operate the screw, for the period of half an hour, during which time the boat is designed to travel some six or eight miles. The machinery is controlled by wires leading to a battery on shore, the opening or closing of the circuit or wire governing the throttle, and the same on the second wire actuating the steering gear. The cable containing the wire is paid out as the boat moves, and of course no crew is required on board. The vessel is almost entirely submerged, and being painted green, is indistinguishable at short distances by the unaided eye.

In the magazine are placed 500 lbs. of powder or nitro-glycerin, and in the forward portion of the vessel explosive shells are also arranged, to be fired by an electric spark passing through a third wire in the cable. The explosion of the shells may be effected without injury to the boat, but that of the magazine necessarily causes her destruction. During the experiment at Newport, a torpedo charged with ten pounds of powder was put in position and then the boat was started from the shore of Goat Island. It darted off like a harpooned whale, and described a complete circuit of the harbor, going a distance of about two miles. The operator, who remained on shore, had perfect control of the craft, and with his electrical switches moved her to port or starboard and stopped her at will. Having demonstrated for a considerable time the facility with which she could be propelled and guided, her course was changed to the shore or the point from which she started. Then she was again sent out in the direction of a large rowboat, which had been anchored as an imaginary vessel of an enemy a short distance from the island. The bow of the boat, the point where the torpedo was placed, was directed against the rowboat, and instantaneously there followed the explosion of the projectile. The water was thrown about thirty-five feet or more into the air, and the timbers of the boat were sent flying in all directions. Quite a large number of prominent foreign officers witnessed the tests, and pronounced favorable opinions at their close. We shall look with interest for further and more exhaustive trials, as the device, if thoroughly capable of fulfilling all the claims made for it by its inventor, must prove a highly important accession to our means of harbor defense.

ON THE RESISTANCE OF BUILDING STONES TO FIRE.

The recent extensive conflagration in Boston brings the subject of the behavior of building stones when exposed to fire again in the foreground, and it may therefore be well to publish a few remarks which may form a guide in selecting proper materials. It is only since the great fire in Chicago that the attention of the public, and more especially of builders, has been directed to this subject; and we possess, in an address delivered by Mr. Wight before the American Institute of Architects in the very same city whose fate we have now to deplore, an excellent summary of the various effects of heat on brick and stone. However, the account of Mr. Wight, notwithstanding the very valuable remarks it contains, leaves us in the dark with regard to many points. The facts alone are not always satisfactory; we wish to know the causes of such facts. Hence it can only be of local importance to be informed that the Athens stone was the worst to stand the test of heat, or that the Cleveland stone had not been injured at all. Mineralogy and chemistry can in very many instances serve the architect as a guide in the selection of his building materials: mineralogy because it makes us acquainted with the component parts, and chemistry because it teaches us at what degree of heat these elements will yield. Let us, therefore, review the facts brought before us in the light of science

It is stated that none of the limestones stood the test of heat; but some were worse than others. The Illinois limestone, generally called Athens stone, "was, in very many instances, entirely calcined, so that there was scarcely anything remaining of some buildings which were built of brick with stone fronts." "With regard to this stone," says Mr. Wight, "it was a common thing for it to explode when the heat came suddenly upon it and was very intense. It seemed to calcine with great rapidity, and I suppose the effect was very much like that seen in the manufacture of popcorn." At the moment we write this, we are yet unacquainted with any particulars regarding the effect of the late fire upon building stones, but expect soon to receive such information with regard to the various limestones employed in the ill-fated city. The limestones used for building consist essentially of carbonate of lime, or of carbonate of lime and magnesia. These stones, when exposed to a red heat, are decomposed, namely, the carbonic acid is driven off and the lime remains in a burnt state; hence they crumble, or are burnt off entirely, or are consumed. When heated in places easily accessible to currents of air, the gas is entirely carried off, otherwise a part of the carbonate remains but imperfectly decomposed. Limestones containing magnesia (or as they are termed, dolomitic limestones) are still less fit for building materials than ordinary limestones, because magnesia parts with its carbonic acid quite readily at a comparatively low temperature (at about 600° F.), while this same degree of heat leaves the carbonate of lime intact. The knowledge of this fact is all important to the manufacturer of cement, since, if burnt at a high temperature, the product (a mixture of caustic lime and magnesia) is rendered unfit for use.

Mr. Wight, in his report, speaks of the so-called "petroleum stone," which the newspapers reported to be entirely consumed, but which, in fact, stood the heat very well. There was one church in Chicago built of this stone, in which the amount of oil was so great that the heat of the sun would draw it out soon after the stone was set up in a wall, and it would run down in black streaks. "The effect of the heat on the inside of the walls threw out upon the exterior all the oil it contained, which formed a thick hard coating, about a quarter of an inch in thickness; and though the interior of the church was exposed to great heat, and every particle of wood in it was burned up so that there was not a scrap left in it, the interior sides of its walls were not greatly injured. In some places the stone had flaked off, and yet this stone stood the test better than any other natural stone used in the city."

In consideration of the fact that the stone was a limestone, it seems very singular that it should have been saved from entire destruction. Yet this is explained when it is known that oleiferous limestones are often largely impregnated with quartz and alumina, some containing from 20 to 30 per cent of these substances, which are distinguished by their infusibility. These materials evidently protected the carbonate of lime from disintegrating, while the oil in the interior was prevented from burning on account of its being inaccessible to air.

That the various sandstones used in Chicago have stood the heat best, and that such must have been the case in Boston, may be concluded *a priori* from their chemical composition. Sandstones are, in fact, exceedingly well fitted for fireproof structures. "The only building in the burned district, on the south side, which stood intact," says Mr. Wight, "was of Cleveland (sand) stone; and in that building there was not a flaw, nothing cracked or broken. In fact, it was not injured at all, except that the solder in the galvanized iron cornice was melted, while the lantern of a lamp-post on the sidewalk was entirely melted, so that pieces of the tin frame work hung down like ribbons." The predominant ingredient of sandstones is quartz, a substance particularly infusible. Its amount varies from 80 to 97 per cent, the other ingredient being mostly peroxide of iron, alumina, lime and magnesia. The brown sandstone of New York, for instance, consists of quartz cemented by oxide of iron

Granite, quartz, mica, slate and other rocks belonging to the primary formation are generally considered to be almost indestructible, yet it is known that they readily get cracked and explode, even when only exposed to the heat radiated from neighboring buildings. This is explained by the known fact that they all contain water. It is a fact well known among quarrymen that the surfaces of fracture in broken granite, syenite, etc., are often found to be more or less moist, and this moisture is found not only as an element in the exterior portions of rocks, but also even in the center of blocks a foot thick, and in masses separated by blasting.

Regarding the artificial (Portland) cement stone, now coming so largely into use, we possess in it a material in every respect suitable for building purposes. Being a compound of silicate of lime and alumina, with water chemically combined, not mechanically inclosed, it will, of course, stand heat almost, if not quite, as well as any sandstone. In respect to the buildings in Chicago erected of artificial stone, we learn from Mr. Wight that they were scarcely injured at all. Others say that they stood the test of the great fire better than any other building material in that city. Every stone left standing in the walls, our informant states, was found to be in a perfect condition, and builders have been drawing the blocks away to be used in the erection of other structures. In justice to the inventor, it should be stated that this was the Frear stone now so largely used all over the West.

With regard to bricks, we know that they do not readily give way under fire. Some say that, as they have been burned, they must be of the best material imaginable. Yet these people forget that bricks are very absorbent and retentive of moisture. True, their moisture may readily escape, but then the bricks are left porous; and if over heated and vitrified, as it is often the case, they lose their strength and give way. We know that almost the whole city of Chicago was leveled to the ground, but this is principally due to the fact that the walls of the buildings were uncommonly thin in proportion to their hight, and because they were generally built with a very inferior kind of material.

GERMANY IN THE VIENNA EXPOSITION.

The Berlin correspondent of the *Chronique de l'Industrie* says that Germany will have 7,861 exhibitors in the Vienna show. In Group 13, machinery, 763 well known firms are entered. There are 58 exhibitors of motors, generators, steam engines, turbines, etc.; 68 of machines for metallurgical purposes, forges, etc.; 78 of weaving and embroidering machines; 60 of paper-making machinery and printing presses; 55 of sewing machines; 125 of agricultural implements; 26 of sugar-making apparatus; 60 of distillers' machines; and 45 of miscellaneous devices; 42 houses will exhibit fire engines, and 42, locomotives and railroad fittings.

A very large proportion of the above are of American invention and largely manufactured and used in Europe. Why then should half a million dollars be paid by the country to rich manufacturers to advertise goods already thoroughly appreciated? Fifty-five exhibitors of sewing machines, from Germany alone, cover very nearly all the patterns in existence. Those made by such prominent houses as Wheeler and Wilson and Singer yield a yearly profit of millions. Is there any necessity for the country, already burdened with a too large national debt, to waste funds which ought to be applied in reducing the yearly interest on the same, on such immensely wealthy corporations as the above, or to pay a Commissioner and a host of assistants to collect articles already entered for exhibition?

HORACE GREELEY.

To those whose daily avocation called them to localities in which the well known face of Horace Greeley was as familiar as a household word, no counterfeit presentment will be needed to recall his features to the mind; to others, the engraving to which we devote our initial page will be doubly acceptable as a portrait and memento of the great and good man who so lately has passed from among us. Than Mr. Greeley, no one has contributed more, both by word and pen, to the rapid advancement in industrial interests of the United States. Eminently broad, liberal and charitable in his views, no scheme, having for its end the benefit of mankind, failed in obtaining from him at least a patient hearing and investigation, and often a strenuous advocacy in the columns of the journal which he so ably edited. His philanthropy sometimes outbalanced his better judgment, leading him to support projects and ideas which in the end proved chimerical.

Of the rights of labor Mr. Greeley was always the staunchest of champions; to the inventor, a firm and unwavering friend. An implicit believer in the future industrial supremacy of the country, his genius was earnestly devoted to the support of the producing classes. Himself a self made man, he spared no efforts in assisting others to help themselves; and with that benevolence which to him was an inspiration, even sacrificed his own interests and boldly faced public animadversion in behalf of those who, struggling against adversity, applied to him for counsel and assistance.

The life so nobly spent in battling for the cause of right and justice has indeed sadly closed. With ambition crushed and the frail foundation on which he built his hopes thrown to the ground, with the dark shadow of death invading his household circle, the grand intellect which for so many years had commanded the admiration of the world succumbed, and sinking under the full measure of affliction the great journalist calmly passed away, leaving to posterity in his name an undying monument and a shining example of genius and ability, patriotism and honor

NEW BURLINGTON HOUSE, PICCADILLY, LONDON.

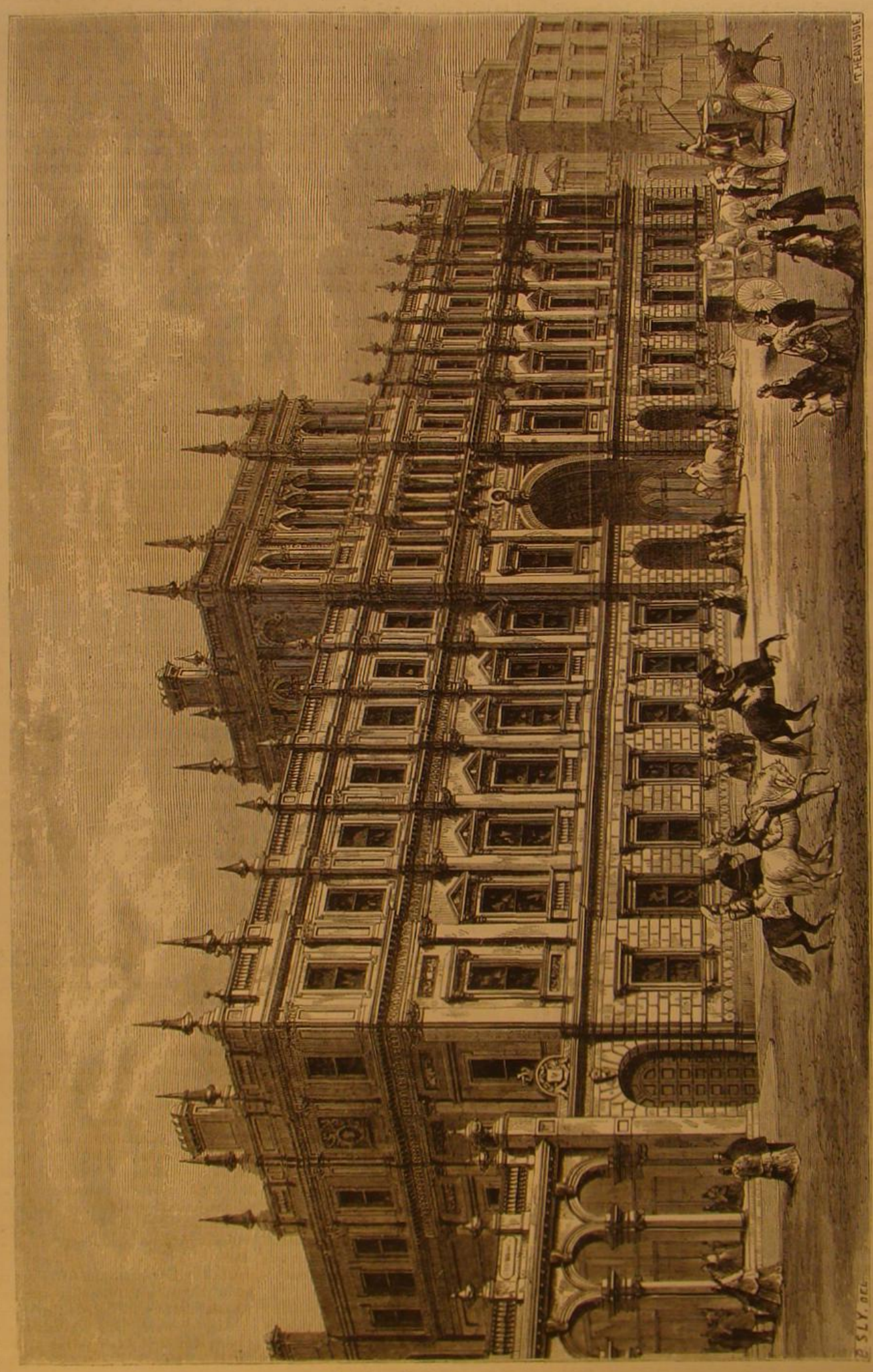
This splendid building has recently been erected for the accommodation of six learned societies, the importance of which to the public interests justifies the British Government in providing them with a home. They are: The Royal Society, the Royal Astronomical Society, the Society of Antiquaries, the Linnean Society, the Chemical Society, and the Geological Society. A list of the members of these bodies from their respective beginnings would indicate all the great scientists of the world. The Royal Society, the oldest scientific institution in the world, was founded by royal charter in 1662; and in the list of its presidents and secretaries we find the names of Christopher Wren, Samuel Pepys, Isaac Newton, Wollaston, Humphrey Davy, Halley, John Herschel, and many others almost as renowned. The Society of Antiquaries was founded in 1572, but was for many years lost sight of. In 1751, it was incorporated by royal charter. The Linnean Society was founded in 1788, and the three others are all dated since the commencement of this century.

In the New Burlington House, fitted interiorly in a manner worthy of the handsome façade of the building, these six learned bodies are now located. The Royal Society has the largest share of the space, and handsome rooms are provided for the meetings of its 600 Fellows, and for its scientific library, which is simply invaluable.

The building stands on the north side of Piccadilly, in front of the original Burlington House, which is now occupied by the Royal Academy of Arts. The entrances to the rooms of the six societies are on the interior quadrangle, to which the large gateway, shown in the center of our illustration, leads.

It will be seen that the architects, Messrs. Banks & Barry, have adopted a design of pure Italian architecture, of which there have been but few examples lately in London; and, taking as their key note the general features and proportions of the façade of Old Burlington House, which was to form one side of the quadrangle, the architects have endeavored to blend it with their new composition, with sufficient similarity of design to effect this, but with more finished details.

Great convenience is anticipated to scientific men from so many of the learned and scientific societies being placed in close proximity, as it naturally is the case that many individuals are members of several societies, and the meetings of several being held on the same days, members can readily pass from one to another. It was indeed suggested, at one time, that one or two large meeting rooms only should be provided to be used by arrangement in common by all societies, and that thus other scientific associations might also be accommodated in the building. It was, however, finally considered by the societies themselves, that from the differing organization of each, and the differences of the means at disposal of each, such a scheme would be attended with much difficulty, and each body, therefore, will now be self-contained in a division of the building specially appropriated to it alone.



NEW BURLINGTON HOUSE, PICCADILLY, LONDON

Chinese Mechanics.

There are no better carpenters, masons, or other handicraft men, more expert, or faithful to their employers, than heathen Chinese. When a contractor engages to build a house, for example, he incloses the premises and sets up cooking apparatus to supply his hired workmen with regular meals at the most economical rate. Having taken breakfast they work till noon, rest one hour, resume work, and leave off at five P. M, and return to their homes. On leaving, each takes a ticket, which admits him next morning. These tickets are daily vouchers of the artisan's presence. Counted up at any time a true account is rendered.

A man on the ground throws several bricks to another ten feet above, and he to another still higher. Thus the masons are supplied as they ascend with the wall. Instead of carrying mortar in a hod, it is thrown by a shovel full from one story to another, to any required elevation, without spilling particle, so expert are they by continual practice.

With a small brass wire, made tense in a bow, notched on the lower side, they saw out artistically complicated puzzles that are surprising specimens of art. Thus they excel in many ways our most skilled artists, almost without tools. In departments of science, in which we suppose ourselves in advance of Orientals, they accomplish results quite beyond our comprehension. Some of their chemical accomplishments far outgeneral very learned gentlemen of world-wide celebrity. In short, mortifying as it is to make the confession, our wisest men of modern science don't know everything.

A Scientific Carpenter.

When the steamship Idaho arrived at San Francisco, from the Sandwich Islands, not long ago, she had on board the novelty of a wooden cylinder head. It appears that when several days out from Honolulu, her cylinder head was broken into fragments, and the engine could not be used. She had just reached a point where the trade winds failed her; her sails were scarcely large enough to steady her in rough weather, and retarded as she was by her propeller, the chances for getting to San Francisco, or even back to Honolulu, were rather blue. In an ordinary breeze her sails just gave her headway enough to be steered, and as few vessels cross or follow the Sandwich Island steamship route, the passengers resigned themselves to fate, and made up their minds to endure a long and uncertain float. The captain was about to be petitioned to put passengers and crew on short allowance, when a carpenter, who was a passenger on board, came to the rescue.

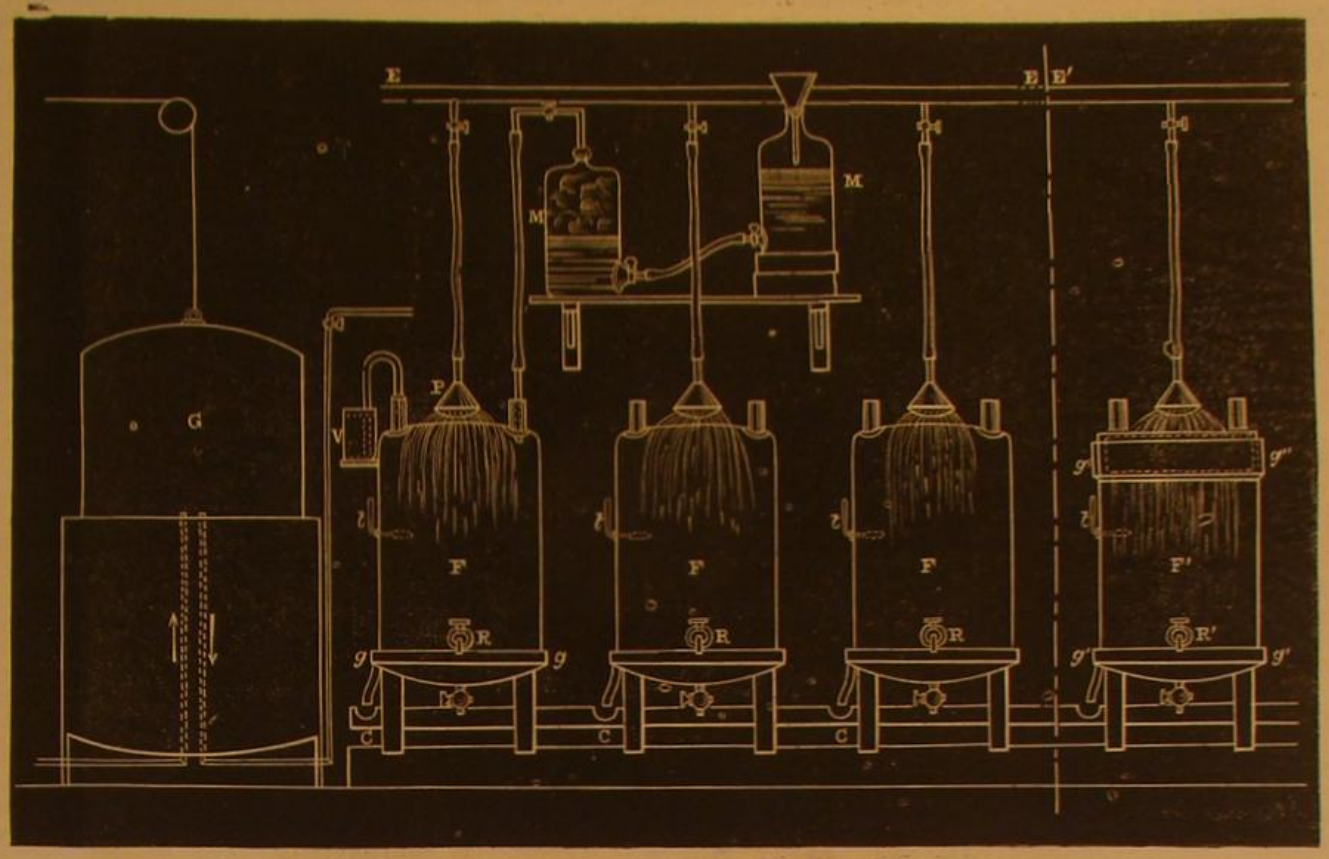
On examining the injured cylinder, the idea entered his mind that a stout cylinder head, of tough hard wood, migh stand a sufficient pressure of steam to run the engine at moderate speed. He stated this to the captain, who, after some hesitation, and as a last resort, reluctantly gave him permission to try the experiment. The carpenter procured his tool chest from the hold, and after twenty-five hours hard work, finished and inserted the wooden cylinder head. It was made of three thicknesses of hard teak board, rendered steam-proof by being covered with paint and canvas, and was calked tight, and held in its place by bolts, as in other cylinder heads, and by a piece of timber braced against its ends. When the carpenter announced that the engine was ready for use, and desired the engineer to turn on steam, there was a general scamper from the cylinder, where numbers of the passengers, sleepless and feverish, had anxiously watched the finishing of the work. Slowly the steam was turned on, the piston rod rose and fell, the propeller churned the water quickly, the Idaho moved on at her accustomed speed, and the wooden head was a success. The cylinder head, after being used for a time, swelled and collapsed like the lungs in respiration, but the invention stood the test to the end, and earned for the carpenter quite a reputation. He has become a very hero among sea-going men at San Francisco.

WHAT MORE VALUABLE PRESENT can be made to young mechanics than a year's subscription to the SCIENTIFIC AMERICAN? Employers will be doing their employees a great service by acting on this hint, and we feel sure that at the end of the year they will consider the investment a good one.

NOW IS THE TIME for forming clubs for the new year

NEW METHOD OF BREWING.

M. Pasteur, an eminent and well known French chemist, has for many months been engaged upon the development of a new system of brewing on what he conceives to be a more scientific principle than any yet adopted. The principle upon which he proceeds is that, by the exposure of the wort during the process of fermentation to the action of the atmosphere, the resulting product is materially deteriorated, owing to the absorption of oxygen. But the difficulty of inducing fermentation, under circumstances in which the atmosphere is expelled, or nearly so, from the square or other fermenting vessel, has been considered practically insurmountable, until M. Pasteur hit upon the method, the description and illustration of which we extract from the English *Brewers' Guardian*, and now lay before our readers.



PASTEUR'S NEW METHOD OF BREWING.

"I desire," says M. Pasteur, in a patent applied for in 1871, during the stormiest days of France's misfortune, "to take out a patent for a new method of brewing, which consists essentially in a system of fermentation apart from all contact with the atmosphere. The wort, after being boiled, is turned into vessels of wood or metal, cooled in a current of carbonic acid gas, and then set to ferment."

Such is the principle, and our illustration represents the construction of the apparatus devised to carry it into practice. E E E' are pipes for the conveyance of cool water, which is distributed by the rose nozzles, P, over the fermenting apparatus, F F F', At M M is shown the carbonic acid apparatus, and at C C C, the discharge pipes for the water from the troughs, *g g g'*, where it is collected very hot at the outset. F' is a different arrangement of the fermenting apparatus, in which a movable cover closes the cylinder by means of a water-tight casing, the bottom of which enters the outside trough *g' g'*. G is an ordinary gasometer, with entry and exit pipes. *t t t* are thermometers, which indicate the pitching, etc. The capacity of the apparatus can vary from 22 gallons to 220,000 gallons.

The carbonic acid gas produced during fermentation, after having traversed a washing bottle where it is freed from any froth it might contain, is delivered into a zinc or tinned iron reservoir placed a little below the fermenting apparatus. At the lower part of this reservoir are arranged a number of sockets and taps. When it is desired to cool the wort in the presence of carbonic acid, as it is useless to mix up this gas with the liquid, it is sufficient to put one of the taps of the reservoir in communication with one of the tubes of the apparatus F F F'. With a rapid cooling, carbonic acid may be dispensed with, and ordinary air may be allowed to enter in proportion as the bulk of the wort diminishes while cooling. The germs of disease in the wort are killed in the boiling, and those which the volume of free air just mentioned may carry will not have time to develop in the wort, if the cooling process has been prompt.

M. Pasteur states that cooling of the wort may be effected either by special tubes placed in the vessels, F F', where cold water circulates, or common refrigerators may be made to serve by inclosing them in a vessel full of carbonic acid gas or of air deprived of germs, and even ordinary air, if the vessel is of small capacity, or, in the manner shown in our engraving by a stream of water on the outside of the vessels.

The inventor has also devised a method of obtaining the ferment deposited in the vessel, F, in the shape of a cake, and has discovered that the *mycoderma vini* can be made the nucleus of a mild yeast. It can be made to develop itself in the wort of beer sheltered from the air. The advantages claimed are the disuse of cooling backs, the avoidance of loss by evaporation, filling up, etc., the abolition of store cellars, if needed, a great increase in the quantity produced, notwithstanding an augmentation of the strength of the beer, the development of a very agreeable bouquet, and the non-requirement of ice houses for fermentation at a low temperature.

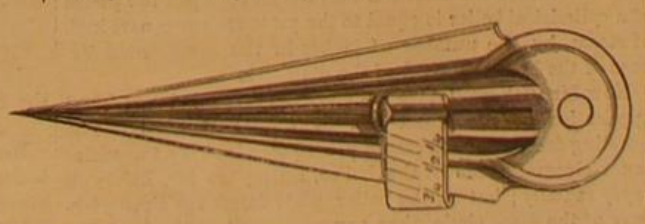
The *Moniteur Scientifique*, in speaking of the invention, says: "Tributaries of a nation whom we will never pardon for our undeserved disasters, it is our duty, henceforth, to resort to French sources alone for the supplies of that creamy drink to which Munich is so greatly indebted for her renown." It adds, that M. Pasteur, "preparing on his part the sublime revenge of genius," has required that all beers brewed under his method, be called abroad *Bières Francaises* (French beers), and known in France as *Bières de la Revanche Nationale* (Beers of the National Revenge).

Fireproof Paint for Wood.

Dr. Wiederhold says that two substances have been recommended for this purpose: chloride of zinc and silicate of soda (soluble glass) both being generally well adapted to protect wood against combustion. As regards the chloride of zinc, the author states that, in case wood impregnated with it be exposed to fire, a most offensive vapor would be disengaged, which would make the surrounding atmosphere entirely insupportable by man. The soluble glass, on the other hand, is readily washed off in places not protected from rain and snow, and may therefore be of no value in cases of emergency. There are two older recipes, which have always been used with success. The one calls for the brushing over, twice repeated, of the wood work with a hot solution of three parts of alum and one part green copperas. When dry, it is to be coated again with a diluted solution of copperas, into which white pipe clay has been stirred until the mixture acquired the consistency of a water color. This latter coat may be repeated once or twice. Alum and copperas penetrate deeply into the timber, and combine partly with the fiber, forming insoluble compounds which are not readily lixiviated. The coating of clay affords protection against excessive absorption of moisture, whereby freezing and washing out are prevented. It is evident that it will be advantageous to repeat the coat of clay from time to time. By the other method the wood is repeatedly brushed over with hot glue water, until it ceases to absorb it, which will be indicated by a coat of glue remaining on the surface. Now it is painted with a thicker solution of glue, into which, while yet semi-liquid, a powder consisting of one part sulphur, one part of ocher or clay, and six parts of sulphate of iron is sprinkled. These ingredients are, of course, to be well pulverized and mixed with each other. The author, a recommends these recipes from his own experience.

BUTTON HOLE CUTTER.

This instrument, suggested by H. Walker, of London, is made of thin sheet steel, with one sharp cutting edge, the other portions being corrugated to give the requisite stiffness.



The sliding gage being placed at a suitable distance from the point, it is held by the finger and the thumb; all that is then necessary is to place the point where the hole is to commence and to thrust straight downward, when it cuts a hole of the width required, and will cut any number of holes precisely alike. The one side has a cutting edge, and, the back being rounded, it cuts only in one direction.

THE fact of the SCIENTIFIC AMERICAN having been published by the present proprietors every week for twenty-seven years, should be a sufficient guarantee to new subscribers that they will get the paper regularly and all the numbers they pay for.

SPECTRUM OF THE AURORA.—Vogel has determined that the spectrum of the aurora may with great probability be regarded as a modification of the air spectrum, the variability of the spectra of gases under different circumstances of temperature and pressure being well established.

NOW IS THE TIME for old subscribers, whose subscriptions expire with the year, to renew.

NOW IS THE TIME for new subscribers to send $3 and commence with the new year.

A British Scientific Expedition.

The Challenger an eighteen gun screw corvette, of 2,306 tuns, is now lying at Sheerness, preparing for a lengthy voyage, which it is confidently believed will confer very great benefits upon science. She is commanded by Captain Nares, with Commander Maclear, of the Eclipse expedition, as second. The vessel is being fitted out by the Admiralty for the purpose of sounding, dredging, and investigating the "science" of the deep sea, the Government having acted in a very liberal manner in providing all the funds and necessaries required. The scientific staff consists of Professor Wyville Thomson, as director; Dr. Von Willmoes Saum, Mr. H. Moseley, and Mr. J. Murray, as naturalists; Mr. Buchanan as chemist; with sundry other competent assistants in the different branches of science. The Challenger will be well supplied with boats of different kinds, including a steam pinnace, and will carry an ample assortment of the various appliances used in dredging, and an almost inexhaustible stock of spirits and bottles for the preservation of "objects." Under the experienced supervision of Professor Wyville Thomson everything that can possibly aid in exploring the different seas through which the vessel will pass, will form part of her cargo; and a small aquarium will be constructed for the purpose of studying interesting animals in the life. The route of the Challenger is not yet settled, but she will leave England in the beginning of December, and the first haul will be made in "the Bay." From Gilbraltar she will probably visit Madeira, sailing thence for the West Indies, and after touching at sundry places on the Brazilian coast, cross to the Cape of Good Hope. The Islands in the Southern Ocean will then be examined, with a run to the ice, and after exploring the Australian seas and Oceania, the expedition will proceed to Japan, Kamschatka, passing through Behring's Straits to the Northern Ice, and back to Vancouver's Island and the western coast of the Americas, round the Horn and home. The voyage will occupy probably four years, and the expedition cannot fail to be of lasting benefit to science, if not directly to the nation at large.

Lowering Ship's Boats.

A correspondent, J. A. A., of Ill., comments on our article of November 16, entitled "Life Saving Inventions Needed," and calls public attention to an automatic life boat, tested by the board of supervising inspectors at Washington, D. C., in July, 1871. Means were taken to capsize the boat repeatedly, the persons in her hanging to her thwarts; and when bottom up, being allowed to take her own course, she righted herself in an instant, and emptied out all the water she had shipped in 30 seconds. She was 16 feet long, and would bale herself with five persons in her, and would carry 25 persons. When loaded, the inventor states she is harder to capsize than any other boat. The correspondent regrets the cost of this boat, which is about one third more than that of the boats with which the ill fated Missouri was supplied, and somewhat satirically suggests that owners of seagoing vessels may find this an insuperable objection. The inventor of this boat is a poor man, and is unable to push his invention, or to sell the boats for less than cost price to bring them into public notice. J. A. A. also reports the invention of a self-clearing boat launching apparatus by an inventor at Metropolis, Ill.

NOTE this fact that, for $3, a copy of the SCIENTIFIC AMERICAN is mailed every week for one year to any address in the United States.

Pattern Letters.

It will be seen, from an advertisement in another column, that Mr. S. E. Adamson, formerly of Philadelphia, has opened an establishment in this city for the supply of pattern letters. He is a practical die sinker and a skilled workman, having few equals. The specimens of letters he has shown us are very fine, having almost the accuracy and sharpness of printing types. His letters, we think, will be found to be superior to any thing of the kind now before the public.

REMEMBER that one year's numbers of the SCIENTIFIC AMERICAN, costing only $3, contain more than an equivalent of 4,000 ordinary pages of book matter.

Correspondence.

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

The Vienna Exposition---Letter from Professor R. W. Thurston.

To the Editor of the Scientific American:

I notice in your late issue a reference to a circular relating to the great international exhibition to be held at Vienna during the coming year, and there seems to be some misunderstanding about its authorship and the responsibility of the United States Commissioner. I must ask space in your columns to assume its authorship, and to state that the Commissioner is neither morally nor legally responsible for it, except so far as it may be based upon information obtained at his office.

The case is simply this, I think: The series of great international exhibitions, of which the last was the Paris Exposition of 1867, is to be continued by an exhibition at Vienna in 1873, which will vastly surpass in magnitude even that of 1867, and which bids fair to be equally preëminent as an exposition of the industries of the world. It is under the direction of the Austrian government, as was that of 1867 under the immediate supervision of the French Emperor. The Imperial Park has been given up to the management, and an immense building, nearly 3,000 feet long by 700 wide over its transepts, has been erected for the general purposes of the exhibition; and above it has been constructed an immense dome, covering its central circular hall, and large enough to receive into its vast interior that more ancient architectural wonder, the dome of St. Peter's, and still leave an immense amount of unoccupied space. The available floor space here is 222,000 square feet in area. The machinery hall is a separate building, 2,600 feet long and 150 feet wide, and has 122,000 square feet of available floor space. The total covered space at Vienna is about double that at Paris in 1867, and the area of ground, that may be rendered available if necessary, is six times the area of the *Champ de Mars*, at Paris. This immense space has been apportioned among those nations whose manufacturers and producers are expected to present themselves as competitors in this great exhibition of the world's industries.

The British Commissioners have already declared their space completely filled, and refuse to receive additional applications and, with several other nations, are asking for more space. Our own Commissioner has not been able to make such an announcement, and it has seemed possible that those nations which have already overflowed the space assigned them, exhibiting their finest trophies of industrial skill and labor, will be likely to reap all the benefits to accrue from this inestimably important exhibition; and that the United States will not only not reap any substantial benefit, but will be displaced in foreign markets and injured at home by the greater energy and enterprise of other nations now competing with us.

In view of these circumstances, a meeting was called by prominent citizens of New York to ascertain what could be done to aid the United States Commissioner in securing a creditable representation of the United States at Vienna; and at this meeting an advisory committee was formed, of which the Hon. Samuel B. Ruggles was chairman, and whose members were selected in such a manner that each should be able to pay special attention to some one of the nearly thirty groups into which the Austrian scheme divided the exhibits. It was intended that each member should be well fitted by experience and tastes to do the work thus assigned him. The services of this committee, as I understand it, are purely voluntary, and merely advisory.

The circular, to which you have referred, was issued by me as the member of this advisory committee to whom was assigned Group XIII (machinery of all kinds), and not as agent of, but as a volunteer aid to the United States Commissioner. Group XIII is still further subdivided, and these subdivisions are assigned to committees aggregating a large number of well known gentlemen who are also interesting themselves in this patriotic labor, and endeavoring to assist in obtaining a creditable exhibition of American industrial products and processes at Vienna. Altogether, I presume, that several hundred of our best known and most public spirited citizens are taking a more or less active part. I do not understand that it is proposed that this labor shall be other than voluntary, and I imagine that those gentlemen would feel greatly mortified and somewhat indignant were compensation tendered them. They consider this a work to be performed as a patriotic duty. For myself I can only say that I consider these international industrial exhibitions to be most important aids to advancing civilization and industrial progress, and that I feel an interest in that proposed for 1873 only second to that inspired by our own proposed Centennial Exhibition of 1876. This exhibition is not Austrian, it is a World's Fair, as we were in the habit of very appropriately naming the earliest of the series.

I can not conscienciously advise proprietors of valuable devices, of which they desire to keep possession, to take their machines to Vienna, but although I regret, with you, the injustice, not to say barbarism of the existing Austrian patent law, even as it stands, and in spite of the extraordinary concessions recently made, I think that you will agree with me that the United States section might and should be readily filled with such an array of our most important machinery and of labor saving devices, and with such a display of our wonderfully varied and valuable products as should enable every American visiting the exhibition to point with pride to those evidences of our advanced position among nations, and such as should open the markets of the world to our manufacturers and attract to our country a class of emigrants whose contributions of skill and labor should still further accelerate our progress.

Should the fact that our people decline to exhibit some of our most interesting and important examples of machinery induce the Austrian government to liberalize the present discreditable patent law of that country I shall heartily rejoice with you. R. H. THURSTON.

Stevens' Inst. of Technology, Hoboken, N. J., Nov. 29, 1872.

Origin of Storms.

To the Editor of the Scientific American:

In your journal of the 23d inst., Mr. Jacob Davis (page 321) writes, as conflictive to my theory that storms (terrestrial) are nursed into being by the action of electricity from the sun, and that the rays of the sun drive the storms before them, as follows: "On July 14, 1872, a gust came across this town at right angles to the sun's rays," etc.

In reply I would say, that I have not the slightest doubt of what Mr. Davis says, nor that he could in addition say (for I have repeatedly seen such myself), that black, stormy clouds advance, as it were, from the sun, make a stand overhead, mix, move, and run into each other in very great commotion; then begin to break, and act with fearful violence upon the earth, sending torrents of rain, and sometimes hail in an opposite direction to that of its former march. I have also seen gusts come up (I mean along through the clouds), and pass for some distance past Gloucester, N. J.; and after working through clouds and among clouds for some time, return, and act just as Mr. Davis has said that the storm of July did in his locality.

Nevertheless, while all he has said is true, it is equally true that the first move any gust makes is in a direction from the sun. I have lived in Gloucester for nearly 24 years, and, during the latter half of that time I have made a specialty of watching the first traces of gust march, and I have invariably found that morning gusts come from the east, midday gusts from the south, and evening gusts from the west, and I feel quite satisfied that if Mr. D. and other scientists will devote a little time to the first appearance of any coming gust, he and they will find and admit that there is truth in the theory I have advanced. I am also of opinion that solar electricity produces earth storms, and that most earthquakes are produced by the same agency.

Gloucester, N. J. JOHN HEPBURN.

American Hone or Razor Stone.

To the Editor of the Scientific American:

An extensive mine or quarry of a species of mineral, called by geologists "Novaculite" or "Razor Stone," was first unearthed by me last July. It underlies a quartz sand flagging stone in this vicinity, and is a vast bed or mountain. The flagging stone is a pure quartz sand, and at some remote age of the world was subjected to a long protracted and intense heat, as all the rocks overlying the flagging, and even that to a great extent, are igneous rock. This quarry has no nearly related rock in all the Hamilton group; it is surrounded by vast beds of blue stone quarries, and it has no parallel in external character or composition anywhere in this State. Underlying this vast mountain of hard, compact, and fine grained quartz or flagging stone, is a vast rock-formed bed of this fine grained, compact mineral, so closely resembling the Turkey hone in its external character, component parts, specific gravity, and all the other qualities that go to make up a superior stone for edge tools, that no one can fail to recognize it as nearly related to that deservedly popular hone. When calcined and reduced to a fine powder, it has thus far given entire satisfaction as an emery powder for finishing steam valves and faucets. This is only one of many minerals that are being developed in the mountains in Schoharie county. J. M. SCRIBNER.

Middleburgh, N. Y.

The Bursting Strain on Cylindrical Boilers.

To the Editor of the Scientific American:

In a recent issue of the SCIENTIFIC AMERICAN, Mr. Thomas Bakewell makes the assertion that the strain upon the plates of a cylindrical boiler is equal to the pressure per square inch of steam, by the number of inches in the semi-circumference of the boiler, instead of the diameter.

Now Mr. Bakewell dare not deny the truth and universal application of the grand law of virtual velocities. The bursting force is the pressure per square inch by the entire inner circumference of the boiler, acting (as Mr. Bakewell says) radially; but as the boiler plate forms the circumference of the same circle, then any movement of the bursting force radially must involve a movement or tension of the plates through a corresponding increase of circumference, or 6·2832 (the ratio of radius to circumference), the distance through which the bursting force moves; and since the strain by virtual velocity is inversely proportional to the distance, it must be $\frac{1}{6\cdot2832}$ of the bursting force, or equal to the pressure per square inch upon a surface having for one of its dimensions the radius instead of either the semi-circumference or diameter. Hence, to find the strain upon the plate at any point, taking length of cylinder at one inch, we have this, the only correct and extremely simple rule: Multiply the number of pounds pressure per square inch by the number of inches length of the radius; this gives the actual strain. To find strain per square inch sectional area of the metal, divide the strain found by above rule by the thickness (in inches) of the sheet. B. F. MCKINLEY.

Covington, Ky.

REMEMBER that the information contained in the SCIENTIFIC AMERICAN, on mechanical subjects, new inventions and discoveries, cannot be obtained through any other source.

Fragrant Bisulphide of Carbon.

To the Editor of the Scientific American:

I notice in your issue of October 19, a method for removing the disagreeable odor of bisulphide of carbon. Now if you can devise a way of removing the disagreeable taste from prussic acid, there will be another point made. What on earth people want to smell bisulphide of carbon for, I cannot understand. The more disagreeably it smells the better, for thereby some warning is given of its presence. It is a deadly poison. Its vapor when inhaled converts the iron of the blood into sulphide of iron, causing death. It is a very volatile liquid, and its manufacture is tolerably dangerous from the above mentioned reasons. I presume a vessel of it placed in a close room would cause death about as rapidly as carbonic acid or charcoal fumes. A cup full of the bisulphide placed in a tight apartment filled with grain will in a few hours kill not only every weevil but also its larvæ and eggs. It is a very useful substance, but at the same time, under certain conditions, an extremely dangerous one.

Cincinnati, Ohio. ANDREW VAN BIBBER.

Arresting the Spread of Fire.

To the Editor of the Scientific American:

In reading the account of the great fire in Boston, the thing that struck me the most forcibly was the helplessness of the fire department to arrest the spread of the fire from roof to roof of high buildings, owing to the want of an advantageous position from which to throw the water.

I propose an arrangement to convey water to the roof of high blocks of buildings. A wrought iron pipe of, say, three inches diameter should be connected with the street main, with means to stop or let on water. A light iron ladder, with the pipe, is to be attached to the building, and the upper end of the pipe should terminate in a hose.

The device is simple and inexpensive; it may be run up inside the building, but is preferably placed on the outside, in which case it could be made ornamental. Now I think it will appear to the common sense of any one that if water conveniences similar to this were placed at intervals all over a city—say 20 or 30 rods apart in all directions—firemen would have an advantage, to arrest the progress of the fire, such as they sorely needed in Boston. WM. CLEMSON.

Middletown, N. Y.

IT WILL PAY any one to invest $3 for himself, his sons, or his workmen, for one year's subscription to the SCIENTIFIC AMERICAN.

Strength of Iron and Steel.

A long series of experiments was recently made at the Camden and Amboy railroad repair shops, Hoboken, N. J., by Mr. F. B. Stevens, in presence of a number of well known engineers and Professor Thurston and his pupils, from the Stevens Institute of Technology. The samples tested were from lots sent into market by various manufacturers, and may be considered to represent, in most cases, an average quality of the several grades.

Thirty-three experiments were made upon iron taken from the exploded steam boiler of the ferry boat Westfield. The following were the results:

	lbs. per sq. in
Average breaking weight	41,653
Sixteen experiments were made upon high grade American boiler plate (Sligo):	
Average breaking weight	54,123
Fifteen experiments were made upon the best grades of American flange irons:	
Average breaking weight	42,144
Six experiments were made upon English Bessemer steel:	
Average breaking weight	83,621
Five experiments were made upon the best English boiler plate (Lowmoor):	
Average breaking weight	58,984
Six experiments were made upon samples of tank iron, by three makers:	
Average breaking weight, samples No. 1	43,831
" " " " No. 2	42,011
" " " " No. 3	41,249
Two experiments were made on iron taken from the exploded steam boiler of the Red Jacket:	
Average breaking weight	49,000

Referring to previous tests of iron from the Westfield's boiler, it will be noticed that these experiments reveal a greater variation in strength than was there found, while exhibiting about the same average strength, and thus tend to confirm the conjecture expressed by Professor Thurston in connection with the report of the first series of tests, that a weakening effect may be produced by the wrenching and twisting accompanying explosions. Mr. F. B. Stevens, and other engineers of experience, express the same opinion, and still further confirmation is afforded by the result of the tests of iron from the Red Jacket, that boiler having been constructed of carefully selected American iron of the best brands known in the market.

THE best paying German railways are two short coal rail ways, situated in the coal basin of Zwickau. One of them paid, in 1871, a dividend of sixty-one per cent, and returned forty cents for every wagon load. Its shares of 100 thalers are held at 740 thalers; while those of the other road (of 300 thalers) are held at 1,540 thalers. Why cannot our roads pay such dividends?

MR. CHARLES DARWIN, author of "The Descent of Man," is to be proposed as a candidate for the Lord Rectorship of Aberdeen University at the next election.

Curiosities of Natural History.

When I am reading, and a fly settles on my hand, I don't kill it; I watch it, with a glass perhaps, and see it clean its wings and its head, and make friends with it till I feel I can speak to that fly; and so it is with everything living. If we will humble ourselves and condescend to look at the apparently lowest creatures, we shall find instruction in the meanest of them. But all animals cannot live unmolested. The balance of Nature must be preserved, and everything has its enemy and its prey. The lion and tiger—*carnivora*—kill the herbivorous deer and cattle. The insects fall a prey to the birds and fishes; the fishes again to the birds, and in our attempts to preserve certain highly prized animals, and destroy 'vermin,' we must not forget this law." Mr. Buckland reminded his audience how rabbits and rats were increasing, and the ratcatcher had to be paid to destroy them because all their natural enemies, the weazels, stoats, owls, and hawks, were being exterminated. When he was in Staffordshire last week, a nobleman asked him if he could recommend any remedy for a terrible plague that had attacked his noble pine trees, the topmost shoots of which all died and withered away. "Encourage woodpeckers," said Mr. Buckland. "Why," said his lordship, "I have given directions for them to be destroyed." "And serve you jolly well right," interrupted Mr. Buckland, "that you are troubled about your pines."

Turning to the larger animals, the lecturer instanced the elephant, the largest of existing animals, so docile that it can be managed by a boy, but endowed with such strength that nothing can withstand its anger. Its tusks, he explained, are given as its chief means of offense, and also as a means of boring holes into morasses, in which collects the water that is sucked up by the trunk. The enormous power of an elephant, he exemplified by producing an iron plate, which had been bored through and through by the tusks of a young elephant, who did not appreciate the kindness shown to him in the devotion to his own use of a fine new elephant house. An elephant can protect himself against his natural enemies, but he can't invent, as man can, the means of exterminating such strange enemies as attacked an elephant in the Bristol Zoölogical Gardens. A poor animal confined there became so ill and so tender in its feet that it could not stand, and nobody could discover the cause of its lameness till Mr. Bartlett, of the Regent's Park Gardens, was sent for. He immediately, with his usual readiness, pronounced the disease to be—rats. These rodents, finding the poor elephant's feet good practice for their teeth, had operated upon his soft pads. Mr. Bartlett ordered a new house to be built, and now the elephant is "as jolly an elephant as any in the United Kingdom." These animals are led by the ear, and man has found out that his own tusks can be turned into trumpets, with which the natives imitate the sound produced by the elephant itself through its trunk, and so entice them till they can secure them. Two of these elephant tusk trumpets were produced by Mr. Buckland, who "played a tune" upon them, at the same time expressing a hope that none of the elephants in the neighboring Zoölogical Gardens would hear the call, and come rushing into the room.

Another large animal is the hippopotamus. Two of these animals have been born lately at the "Zoo," and Mr. Buckland excited the interest of his hearers by announcing that another was shortly expected, every preparation for the "little darling," though it is as big as a calf, having been made under the management of Mr. Bartlett, to whom Mr. Buckland appealed as the wet nurse, "to know if it had arrived yet."

Adverting to fish, Mr. Buckland exhibited many very interesting specimens of stuffed and dried fish and plaster casts, some of them beautifully painted by Mr. H. L. Rolfe. He showed the jaws of a large shark, the formidable quadruple array of teeth in each of which excited no little dread of meeting a living specimen of such a monster. Mr. Buckland easily passed the opened jaws over his head, and they nearly encircled his shoulders; so that, as he remarked, Mr. Shark would not have made much of a mouthful of him. The specimens of the teeth of shell-crushing fish, such as the gilt-head bream, were shown, and the lecturer asked if any one present believed that such beautiful mechanism, so well adapted to the habits of the several fish, was the result of anything but a well ordered and regulated system by an Almigbty hand. From fishes' teeth, he came to the other armament of fishes, the saw and sword of the fish named after those appendages, and the electric apparatus of the torpedo and electric rays and eels. An instance was given of the power of the sword fish in the case of the ship Dreadnought, whose bottom was pierced, and the cargo of rice spoiled, on a voyage from Colombo to London. The vessel was saved, and became the subject of a long law suit, in which Mr. Buckland gave evidence to show that the injury was most probably caused by the sword of a sword fish. A copper plate was produced showing the hole made—about half an inch in diameter. The jury could not come to any definite conclusion, and gave a verdict that the injury was done by a "cause other than water." This Mr. Buckland considers equivalent to saying that a boy, who gets a black eye, receives the injury from "a cause other than air."

Of the depredations caused by the saw fish, an example was given in the injury done to the Indian telegraph cable, which one day ceased working when messages on which, perhaps thousands of pounds, depended were waiting for transmission. The "fault" was discovered by the electricians, but to Mr. Buckland was left the honor of discovering the cause. Examining the cable, he found that it was pierced from one side only, some sharp substance having penetrated through wire, gutta percha, and all the outside covering to the "core." Had a fish bitten it, he argued, there would be a double mark, one on each side, so it couldn't have been a fish. At last he thought of the saw fish, which gets its living by "routing" about among the sand with its long, spike-covered snout, and found that a specimen he produced exactly corresponded with the remnants of a spike found in the piece of cable.

Mr. Buckland next explained the electric apparatus of the torpedo and electric eel; a cast of a specimen of the latter fish from the Amazon was exhibited. Mr. Buckland stated that the gentleman who brought it to England kept it alive till within a few days of Liverpool, when, putting his hand into the water, he received a shock which "knocked him flat on his back." He recovered, but the fish didn't. Casts of a sting ray, caught at Ramsgate, and of an eagle ray, and a stuffed angler fish, were also exhibited. The latter is a somewhat spherical-shaped flat fish, with a large mouth, and two barbules immediately over the head. These barbules, called its fishing rods, it waves about in the water, attracting the attention of other fish while it lies otherwise motionless itself. When its prey are attracted in sufficient numbers, it rears its head and opens its huge mouth, and the "angler" puts them in his basket. "Who," says Mr. Buckland, "believes that a fish ever grew a fishing rod out of the top of his head by wishing for it, if he wished for it, thousands of years? I never developed anything on my head."

Speaking of popular fallacies and vulgar errors, Mr. Buckland asked his audience—which perhaps contained young men who one day would be among the rulers and chief men of our land—to see for themselves, to hear all they could, but not accept as gospel what they heard till they had proved it. He wished to encourage a habit of examination and inquiry among young and old. He gave some amusing instances of attempts that had been made to impose on himself. A "monster," said to have been shot in the woods of Japan, was brought to him, and a large sum asked for it. A hideous wretch it was when produced, but he soon discovered that it was made of gutta percha, and was ingeniously fitted with eyes, teeth, nails, etc., from various incongruous animals.

A workman, at Windsor Castle, came one day to Mr. Buckland asking for a reward for a grand discovery he had made. Mr. Buckland wanted to see the curiosity first, and he won his way to the man's heart down his throat, by means of a glass of brandy; and was gravely told that the wonder consisted in the skeleton of King Charles I.'s parrot. Mr. Buckland was not long in seeing that it was the partial skeleton of a rabbit, perched on its hind legs.

The Chinese, too, try to deceive us barbarians with their pearls. The lecturer showed a large pearl shell, in which were seven or eight images of the god Buddha, coated with a secretion of mother of pearl. The Chinese say the oyster deposits this secretion itself, when Master John Chinaman inserts these images. Mr. Buckland was sceptical, but said nothing till he had proved that the secretion was as natural as the little images themselves. It was a solution of the real mother of pearl, artificially applied and painted over the images.

Then he showed up the delusion concerning the pilot fish, that little fellow crossed with blue stripes, that is said to pilot the shark to his prey—declaring that he is as much a pilot to the shark as the starling is to the sheep. Do we think the starling is in love with the sheep that it settles on its back? No; it is then busily ridding the sheep of its natural tormentors—its Norfolk Howards. Such an office does the so-called pilot fish fill in regard to the shark.

From fish proper the transition is easy to the water animals, such as the seal, the walrus, and narwhal. Some beautiful horns of the latter, eight feet long, were exhibited, and a magnificent stuffed head of a walrus, with its tusks, twenty-two inches long. The instruments employed in the capture of whales and eels were shown, and their use explained. The seal, Mr. Buckland regretted, was becoming more and more scarce, and he expressed his determination to "kick up a jolly good row" on the subject, and, if possible, get a close season established when it should be illegal to kill them. He handed round to the visitors a specimen of sealskin in its three stages of preparation for use, part being in its natural state, part with the long hard hairs taken away, and the third portion cleaned and dyed. As a hint to the ladies present, he recommended them not to have their sealskin cloaks made with the fur the wrong way; it was only a plan used by the furriers to make the cloaks wear out sooner. If they wanted sealskin cloaks, let them wear them like seals—the right way up.

We have not referred to half the subjects Mr. Buckland touched upon; but we must conclude by repeating the advice he pressed upon his hearers, that they would back him up, and he would do all he could to concentrate in England everything that is good. He wants more support from the public, and he will guarantee that they shall soon have salmon, at, for instance, 6d. a pound. But that is only one point, though a grand object to attain. He declared that he was endeavoring to follow his father's footsteps, and hoped that all his hearers would do likewise; then they would discern that there is a reason for everything, order in everything—and a Supreme Being to be seen and honored in all the various branches of life; and Science, instead of trying to controvert or clash with religion, would be one of its chief supporters.

EVERY EMPLOYER should present his workmen and apprentices with a subscription to the SCIENTIFIC AMERICAN for the coming year.

PATENTS IN JAPAN.

Japan is very rapidly taking her place among the progressive nations. Steam power, telegraphs, railways and modern appliances are everywhere being introduced in that country and in May last the following patent law was created. Like the patent law of Mexico it is a little behind the age, as its privileges appear to be restricted to persons resident in Japan:

THE PATENT LAW OF JAPAN.

Henceforward exclusive permission to trade in newly invented articles of all kinds whatsoever will be granted to the inventors; in consequence whereof, should any person residing in any part of the country be desirous of obtaining such exclusive permission, the application shall for the present be made to the Home office in accordance with the regulations which follow.

Patents shall be granted for a term of years to all persons who increase the conveniences of life, who newly invent any chemical apparatus, machinery, utensils, or furniture, weapons, woven fabrics, etc., or who improve existing furniture or utensils. The term of years shall be fifteen years, ten years, or seven years, according to the value of the invention.

Any person desirous of obtaining a patent shall send in his application to the local authorities of the district in which he resides, accompanied by a description, drawings, etc., which shall be forwarded to the Home office, and the Home office shall issue the patent.

The objects of the invention or the improvement shall be carefully drawn in cross section and plan, and in the case of machinery the parts must be numbered or lettered in accordance with the description, so that everything may be clearly comprehensive at a single glance; and the seals of the inventor and of his surety must be attached to the drawings. Models may be furnished of articles of which drawings can not easily be made.

When the document containing the patent is issusd by the Home office the local authorities shall deliver it after having obtained a receipt from the inventor and his surety.

A duty of five riô ($5.30) shall be paid annually in advance during the period for which the patent is granted into the hands of the local authorities. The duty may be increased or diminished according to the nature of the invention. The amount shall be forwarded to the Home Department as soon as it is collected. No duty shall be paid until six months have elapsed from the granting of the patent, that period being allowed for the inventor to try whether the sale be remunerative, and when he has ascertained that it is remunerative he will pay in one year's duty to the local authorities.

If from the trial made during the first six months the sale turns out to be unremunerative the application may be withdrawn at the option of the patentee, but in case such application be made after the expiration of the six months, the duty for one year already paid in advance will not be returned. The applications sent into the Home office will receive consideration according to priority of arrival.

Where the invention of another has simply been improved, the application must distinctly state the name of the original inventor and the nature of the improvement. Where the invention in respect of which an application is made resembles a prior invention by another individual, but actually differs in construction or use, the points of difference must be clearly laid down in the application.

No patent will be granted for articles of general convenience, though the inventor be known beyond the possibility of mistake, and be yet alive, if the invention has been in general use for several years previous to the application.

Separate patents will not be given to each individual who may have combined with others to produce an invention, but a single patent will be issued in the name of all the partners of the company.

The owner of a patent may freely dispose of it for such sum as seems fit, during the period for which it has been granted; and both parties shall make application to have the fact endorsed upon the patent. The patentee is at liberty to establish branch shops in his own name, or to teach others how to make the articles patented by him. Should the patentee die before the patent expires, he may leave the patent to a relation, but application must be made to have the transfer endorsed thereon.

The Home office shall publicly notify in each case that a patent has been granted to such and such a person, of such and such a place, giving also the names of the department, province, and the seat of the local authority, in consequence of his having invented such and such an article. Should the patentee incur such losses during the term of years as he is unable to make good, if the article after due inquiry is found to be of indispensable public necessity, an extension may be granted. Each separate article must bear the words "by Government sanction," together with the name of the inventor. Fines shall be imposed on persons who fraudulently make use of a patentee's name, or who, not being in the enjoyment of a patent, make use of the term "by Government sanction."

A PATENT POISONOUS PAVEMENT.

Tripler's patented process for preventing rot in wooden pavements consists in saturating the wooden blocks with chloride of arsenic, or arsenic and chloride of sodium. The bottom planking and the sand between the blocks are also to be saturated with the same material, which is antiseptic and preserves the pavement from decay. It seems to us that the remedy is worse than the disease. Think of arsenic dust as an addition to the ordinary pavement dirt, wherewith to fill the mouths of citizens!

KEY SEAT CUTTING MACHINE.

The accompanying engraving represents an improved machine for cutting key seats in the center holes of pulleys and gear wheels. A is the table on which the wheel, B, through which the seat is to be cut, is placed. The work is firmly held by the binder, C, placed above it and around the upright bolts, D D. The binder is secured by the washers, E E, which are made open at one side so as to be readily slipped on the upright bolts, and are firmly held by the nuts as shown.

The compound crank, F, in connection with the slotted arm, G, and pitman, H, receiving power from the main pulley, actuate the vertical cutter or saw, I, passing through the center hole of the wheel or pulley to be cut. The saw is pressed up to its work by means of a lever, the handle of which is seen projecting at the right hand of the illustration, which is hung upon a pin at the back of the machine. The manner of fastening the saw in the apparatus, so that it may be easily attached or detached, is more clearly represented in Fig. 2. The block, J, has two trunnions, K K, through which set screws, L L, pass and screw into conical sockets on the saw. The block has a wide notch at the point where the screws meet to admit the saw between them, and is mounted on bearings in the saw gate so as to oscillate on the trunnions when the saw swings forward to form the slant or draw of the key seat. The back of the saw bears against the bottom of the notch, so as not to oscillate on the points of the screw.

By the arrangement of gearing communicating motion, a slow movement of the saw when performing work is obtained, at which time the pressure of the lever is applied. On the return stroke, which is rapid, the lever is slacked so as not to injure the saw teeth. By this device, the machine can be run much faster than if the motion of the saw were uniform.

This invention may be seen on exhibition at the warerooms of Messrs. Charles Place & Co., No. 60 Vesey street, New York city. It will doubtless prove a valuable and labor-saving tool in the machine shop. Patented through the Scientific American Patent Agency, October 15, 1872, by Messrs. T. R. Bailey & Vail, to whom further inquiries regarding rights, sales, etc., may be addressed at Lockport, N. Y.

Fig. 1

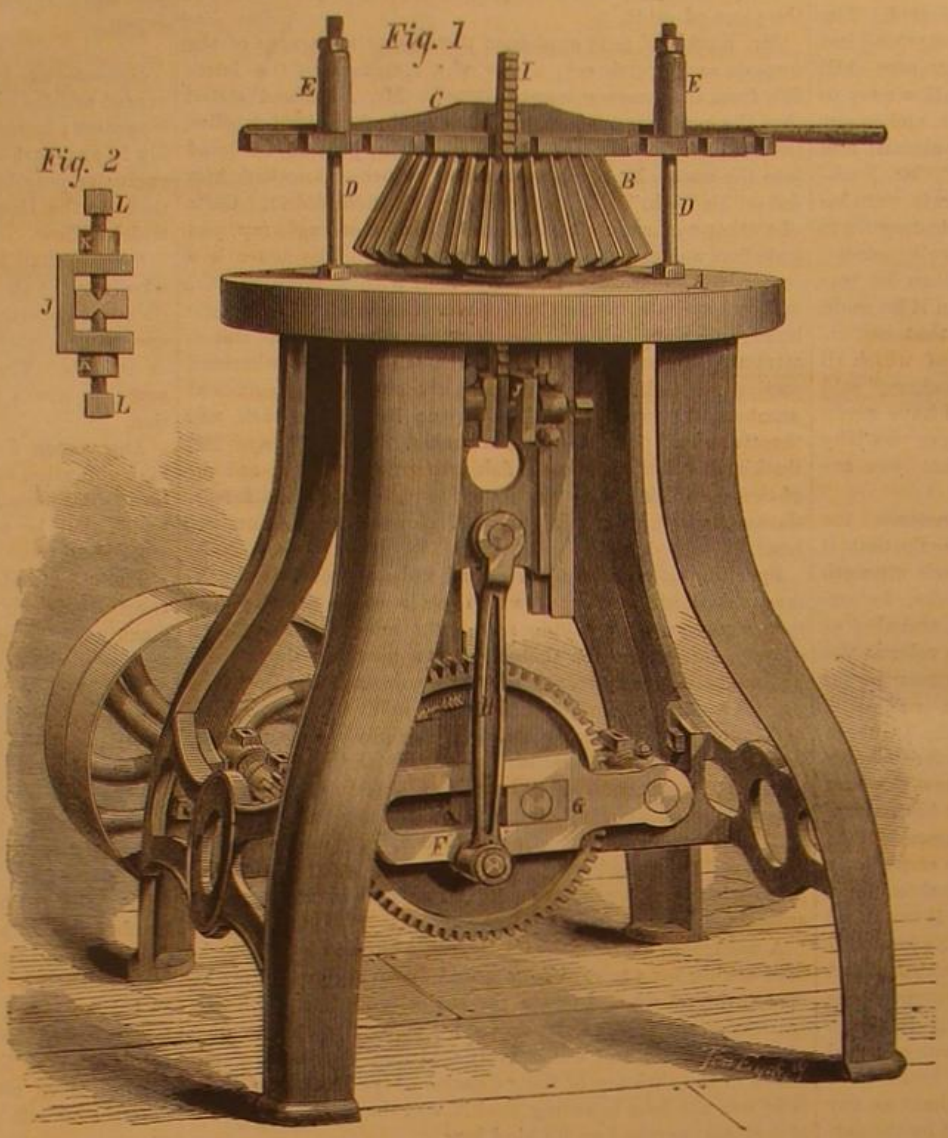


Fig. 2

ANOTHER TERRIBLE BOILER EXPLOSION IN OHIO.

We printed, on page 322 of our current volume, a letter from an engineer residing at Youngstown, Ohio, describing an appalling boiler explosion which took place near that place about a month previous to the date of the letter. The double fulcrum levers to the safety valves, shown in our illustration to the letter, were pointed out by our correspondent as most faulty arrangements, and were so considered by us in our remarks. We now hear that the boilers were repaired, the destroyed parts of the damaged ones being replaced with new plates, and some entirely new boilers being put in to restore the set of ten boilers *exactly to their former condition.*

About three weeks after the calamity above mentioned, a second explosion, of two of the boilers, occurred, killing two firemen on the spot and severely wounding five or six others. There is reason to believe that the water supply was not deficient, as the gage cocks, five minutes before the explosion, indicated plenty of water. Steam was blowing off at the safety valves, and the fires were going down, the engines being stopped. It is stated that, when the boilers were refitted after the first explosion, they were suspended to four beams, instead of three as shown on page 322, the two inner beams being made of cast iron. One of the cast iron beams broke, and the strain on the boilers, which are supposed to have been thus resting on the mud drums, created cracks, which could not be seen, as they were in the bottom plates of the boilers.

Our correspondent points out the danger of setting boilers in this way, as the slightest settlement of the walls on which the beams rest may cause the boilers to touch the surface beneath, and so be strained; and boilers 50 feet long by 3 feet diameter, as in the present case, might be seriously damaged without any fault being visible until a catastrophe, such as the two commented upon, reveals the terrible fact.

EVERY MECHANIC AND ARTISAN whose employer does not take the SCIENTIFIC AMERICAN should solicit him to subscribe for 1873.

A Spectral Face.

The picture of a man's head that graced the window pane of a house at North Beach, and created a marked sensation in this community, says the San Francisco *Bulletin*, is eclipsed by a fresh phenomenon at the dwelling house, No. 120 Valencia street. The head of a man, with black, curly hair, and sad, thoughtful countenance, has appeared on the bow window of the house, and is so clearly defined as to attract the attention of people passing along the street. It said that a handsome young lady has been in the habit of sitting at the window during afternoons, and that a gentleman living on the opposite side of the street, becoming enamored of her, stood at the window of his room for hours, gazing upon the fair charmer, and thus the picture was formed. An excellent view of the picture may be obtained from the street.

We would inform our contemporary that New York can beat San Francisco in spectral faces at any time. We have regular professors of the art, who for a fee of five dollars will call up the spectral faces of your departed friends, without glass, and make them smile and speak.

KEY SEAT CUTTING MACHINE.

IMPROVED DRAWING TABLE.

The device which we herewith illustrate will be gladly welcomed by draftsmen and artists generally. It consists of a drawing desk or easel so arranged as to be readily placed

Fig 1

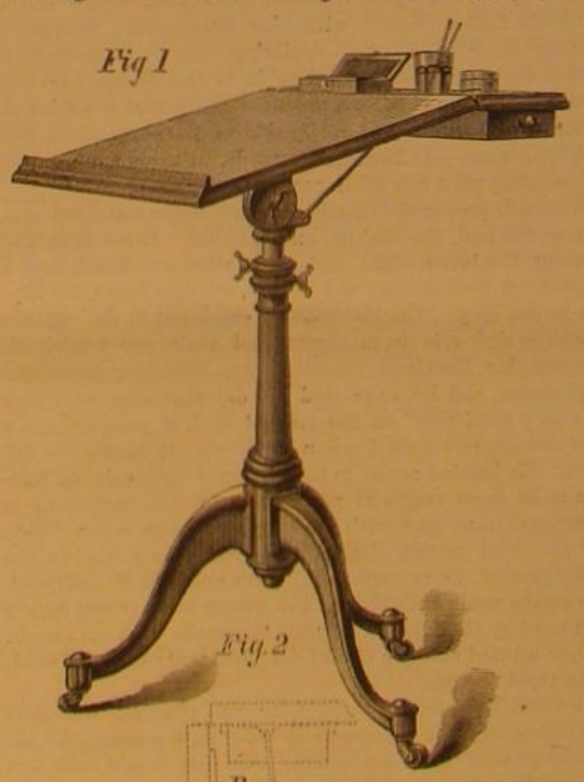
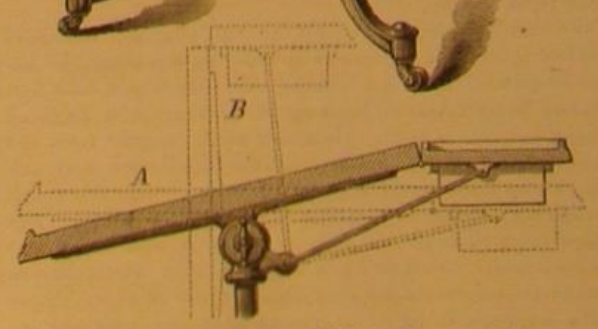


Fig. 2



at any required inclination or hight. Its support is composed of a tripod surmounted by a hollow standard in which slides the spindle sustaining the desk. The portion of the latter, on which the work rests, can be vertically rotated on its attachment to the standard, and as shown in the dotted lines of Fig. 2, either laid horizontal, as at A, vertical, as at B, or inclined as represented shaded. The ledge on which the instruments, water cup, etc., are placed, is connected by a rod to a lug on the standard, and always remains horizontal. The entire apparatus may be lowered so that the artist can work sitting, or the standard may be lifted to its full hight, secured by the thumbscrews shown, and the desk allowed to fall so as to form a perfect easel. By means of a collar on the spindle, the table may be turned to bring either side in front, so that the light on the work may be instantly altered by a mere touch. In the ledge are provided two commodious drawers for working materials, etc. The desk is mounted upon casters, handsomely finished in hard wood, and forms a pleasing ornament to the work room.

The engraving given herewith was drawn upon one of these tables, our artist expressing himself much pleased with the convenience and efficiency of the invention.

Patented May 21, 1872. For further information address Mr. M. P. Higgins, superintendent of the Washburn machine shop connected with the Technical Institute, Worcester, Mass.

Streeter's Carriage Indicator.

An admirable invention, intended to do away with the check string and speaking tube in carriages, has been patented by Mr. Streeter, of Conduit street, Hanover square, London. It consists of two dials, one placed inside the carriage, and the other on the dash board. The handle of the dial inside is connected by a chain with the outer dial, and by a simple and instantaneous motion directions can be telegraphed to the driver. The attention of the latter is attracted by a gong or bell, and by glancing at the dial he can tell whether he is to "stop," "turn to the right" or "left," "go slowly," "go fast," "proceed home," etc. In carriages used by professional men, the word "hospital" or any other can be inscribed on the dial. Mr. Streeter has also made a somewhat similar arrangement applicable to domestic purposes, by which servants may be summoned to "open the door," "bring hot water," "attend to fire," "serve" and so forth. In country houses, or in large establishments, much time and trouble may be saved by the use of the indicator, which may also be recommended for its simple arrangements and economy.—*Public Opinion.*

REMARKS.—This is not very much of an improvement after all. Two dials, with handles connected by chains, and a gong is an expensive and complicated substitute for a check string or a simple speaking tube. By the use of the latter, directions of any kind, night or day, can be readily given to the driver; but it would be difficult for him to see the pointer on a dial in the dark.

As to the use of the new device for domestic purposes is it not better to let the hot water run up stairs in its own pipe, instead of calling the servant by the double dial and gong arrangement? and is it not better to have a bell pull at the door so that the visitor may ring the bell at once instead of putting the parlor people to the trouble of summoning the servant, by operating the gong after the door knocker has been heard? Furthermore, is not the speaking tube the most convenient for quietly conveying orders below stairs, than any such clumsy machine as the above? Come over here, Mr. Britisher, and look at some of our admirable household conveniences and don't waste your time and talents on double dials, chains and gongs to whisper with.

Quick Telegraphing.

The President's Message reached the telegraph office in Washington at twenty-five minutes past one o'clock. Within forty-five minutes, the shortest time ever attained with so long a document, it was transmitted to New York, Philadelphia, and Baltimore. Twelve wires were used and the weather was favorable for working purposes. There were 11,339 words in the message. Within four hours after leaving Washington it was published in full in the evening papers and sold about the streets in this city.

PERSONS living in cities and large towns can obtain the SCIENTIFIC AMERICAN at the counter of any enterprising newsdealer in their place. It is commendable to patronize your local news agents by subscribing through them.

THE University of the City of New York announces a course of lectures, to be given in the small chapel, by members of the Faculty of Instruction. They will take place on Thursday evenings, as follows: December 5. *The Origin of Modern Science*, by Professor John W. Draper, M.D., LL.D. December 12 *The Solar Protuberances*, with illustrations, by Professor Henry Draper, M. D. December 19. *The Stability of the Solar System*, by Professor George W. Coakley, LL.D. January 2. *The Ancient Oriental Monarchies*, by Rev. Howard Crosby, D.D., LL.D. January 9. *Traditional Social Controversies*, by Professor E. H. Gillett, D.D. January 16. *The Scientific Relations of Prayer*, by Professor Benjamin N. Martin, D.D., L.H.D. January 23. *The Colonial System of the Ancient Greeks*, by Professor Henry M. Baird, Ph.D. January 30. *The Structure of the Appalachian Chain*, by Professor J. J. Stevenson, Ph.D.

THE NEW PRUSSIAN RIFLE.

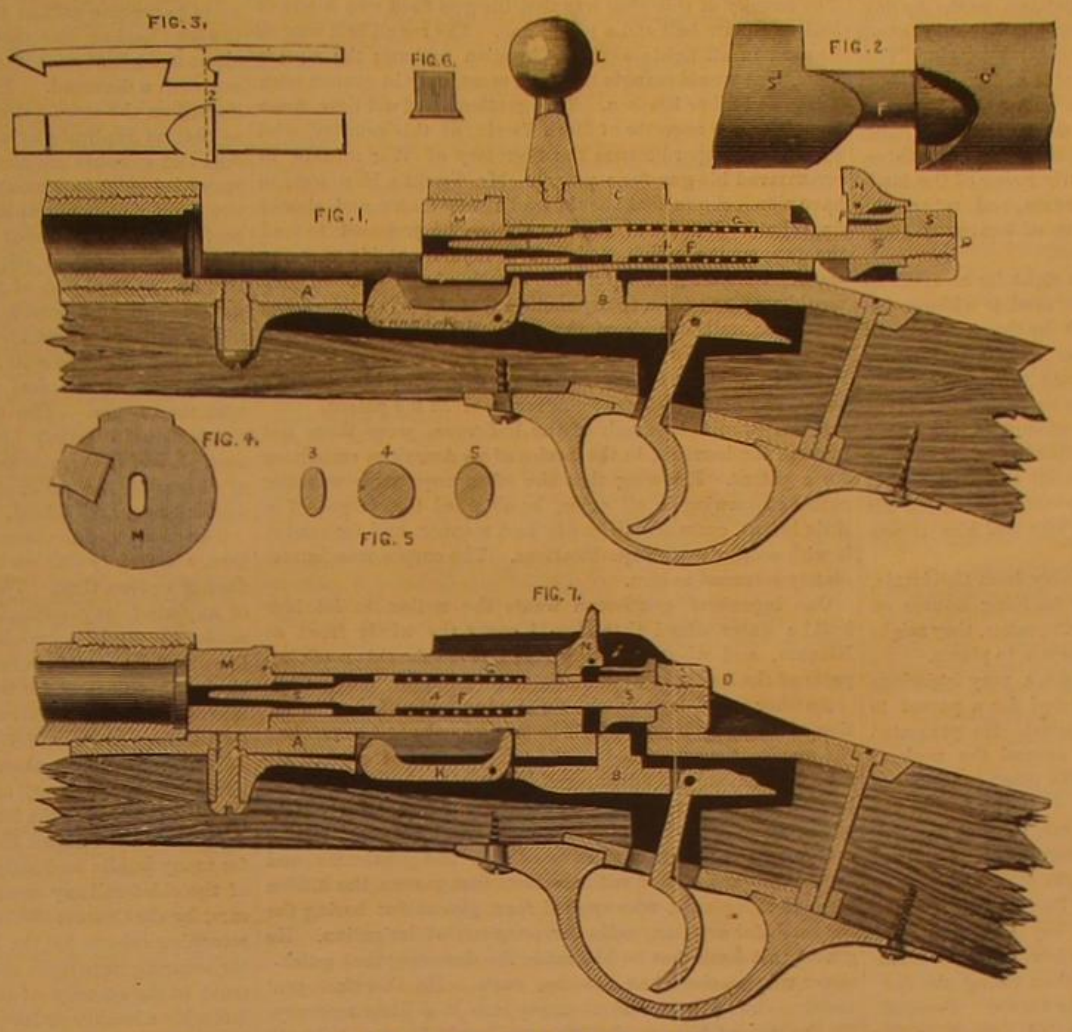
Very little information has reached this country with reference to the new rifle selected by the Prussian Government for the armament of its troops, and we therefore give engravings for which we are indebted to the *Engineer*.

Fig. 1 represents the breech open for loading; Fig. 7 the arm at half cock, or, more correctly, in a position of safety. The rest of the engraving illustrates details. In many respects the rifle resembles the Chassepot of 1866. The shoe of the breech, A, carries within it the cylinder or breech piece, C, which is perforated for the striker, F. The breech piece is worked by means of the lever, L, in the manner of all such guns. It is furnished with a guide block on its upper surface—like the Chassepot—which works between the two lips of the shoe, and which prevents rotation of the breech piece until the guide is clear of the lips or slot. The striker, F, is permanently attached to the cocking piece by the nut, S, and screw, Q, and this cocking piece can only move backward and forward without rotation, in consequence of the following arrangement: The striker is elliptical in section, as shown in the Figs. 3, 4, 5, which are taken at corresponding places in the striker; the face or movable head, M, of the breech piece is, moreover, detached from the breech piece, consequently the rotation of the cylindrical breech piece in opening and closing does not affect the position of the striker and its adjuncts. The striker is surrounded as usual by a spiral spring, G. The rear end of the breech block acts on the cocking piece by a kind of cam action, shown in detail in Fig. 2, and the object of this will be explained further on.

The extractor, shown in Fig. 3, and in section at Z in Fig. 6, works in a groove in the left side of the shoe, and its position in the movable head of the breech block is shown in Fig. 4. K is a supplement to the extractor, and is called the ejector. It is mounted in the trigger spring, B, and works through the shoe. Its function is to throw the extracted case out of the breech. A safety catch, N, is fitted to the cocking piece. It works upon a spring, like the back sight of a rifle, and when in use drops into the notch in the breech block, and prevents the striker reaching the cartridge.

The action of the gun is as follows: The breech being open as in Fig. 1, the cartridge is inserted, the breech block pushed forward till its guide is clear of the slot, then it is turned to the right, by which the breech is closed. The nose of the cocking piece is then bearing against B, and the striker spring is consequently compressed. The pressure on the trigger releases the striker which, impelled by the spring, fires the cartridge.

To open the breech and load again, the lever is turned from right to left; the head of the breech block and the cocking piece remain in the same position, for the reasons above given. The cam, C^1, of the breech block forces back the cam, S^1, on the cocking piece, and cocks the gun. The breech block is then drawn back; the extractor draws out the empty case, which, striking violently on the claw of the ejector, K, is thereby thrown out of the shoe. It will be noticed, from its form, that the ejector is acted upon through its rear claw, that nearest its pivot. A groove is therefore cut for it in the lower part of the breech piece, and it results that the front claw never projects except when the breech piece is drawn back.



THE NEW PRUSSIAN RIFLE.

A NOVEL RAILWAY FERRY BOAT.

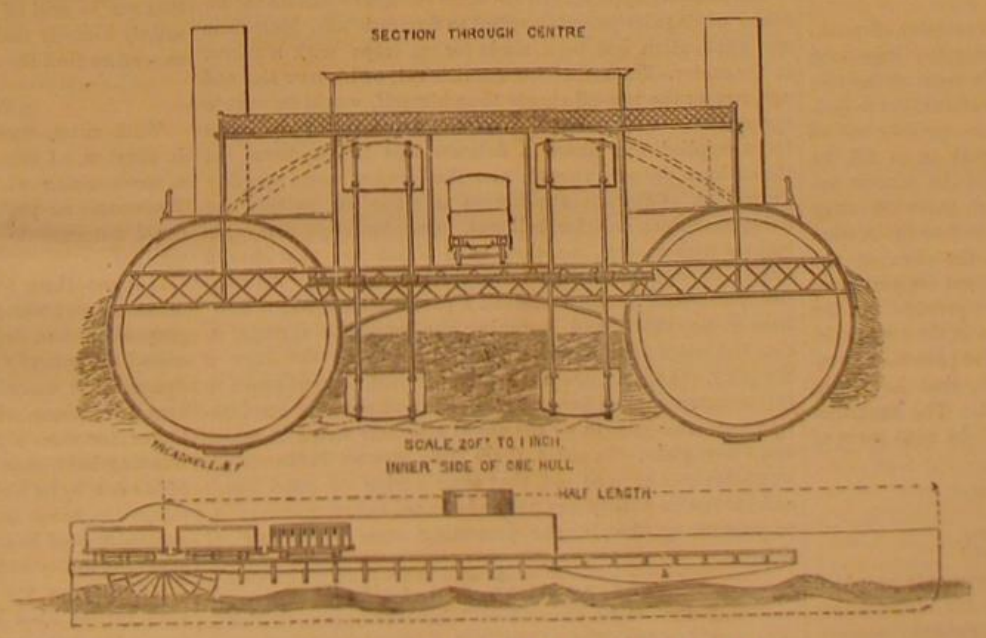
Mr. Alfred Goddard, of Hastings, England, has designed a new steamer, intended as a railway ferry boat for the English Channel. It is described as follows in the *Engineer:*

The form proposed is two cylindrical hulls 500 feet long and 25 feet in diameter, connected by transverse girders 80 feet long, which would be the extreme width of the vessel, and form between the hulls a platform deck 400 feet long and 30 feet wide. This desk, so far as covered in by an upper deck 240 feet long, to be close planked, with a central line of rails for carriages and to contain saloons, cabins, etc., for passenger accommodation. The parts of the deck beyond the inclosed, extending 80 feet each way towards the end of the vessel, to be laid with open jointed planking, under which, commencing from the extreme ends, is a breasting extending back the above 80 feet, and curving down to within 3 feet or 4 feet of the water line, as shown at A, on the outline sketch of half length. This breasting to be of close or open planking or iron work on the under side, as might be found best on trial, for taking the run of the seas between the hulls, the steering apparatus being formed under each of the breastings. The vessel is intended to work either way, both ends being alike; the hulls to contain engines, cargo, etc. From the above partial description of a vessel the author proposes the following questions:

Would the hulls, taking such long bearings on the water compared with their small diameter and circular form (see outline of section), be affected in respect of steadiness by heavy seas to so great a degree as a fuller or more wall sided or flatter floored vessel, whether single or double?

Looking at the power as well as the length of the vessel, would not her long bows, which finish with upright stems, cut through and break the seas to a great extent, and, with the breasting above described running over them, reduce them so far as to prevent their washing the under side of the covered portion of the platform deck, give the paddles constant and even play, and add to the steadiness and equilibrium of the vessel by causing the water between the hulls to be comparatively even for full two thirds of their length? The windward hull would act to some extent as a breakwater, its form, as above noticed, causing it to receive the concussion of the seas with comparatively little disturbance.

Supposing an extreme case, in a gale with the wind abeam. Would not the vessel; by being headed a few points to windward of her course, be steadier than a single hulled vessel of the same tunnage in the same circumstances?



A NOVEL RAILWAY FERRYBOAT.

It is the intention of the publishers of the Scientific American to make the paper next year better and handsomer than any previous year during the more than a quarter of a century it has been published.

Coach Painting in London.

An American gentleman, from this State, recently wrote to C. S. Windover, the celebrated coach builder, Huntingdon, England, inquiring his system of painting a carriage body, from the time it leaves the workshop to the time it is finished. The following answer was communicated to *The Hub*, and appeared in the number of that journal for November 15, over the signature of "An Old Spoke:"

"When a carriage body is finished from the hands of the woodman, and passes into the paint shop, it is nicely cleaned off, and receives in succession three coats of lead color, one coat each day, the color being mixed with gold size and oil, but with no dryers. After being thus primed over, the body receives three coats of the best filling, in three successive days. It is then faced down with dry pumice, after which it receives three more coats of filling, in all six coats; and in the case a brougham, one extra coat to the upper quarters, on account of their being covered with leather. The filling is mixed with varnish only, no size or any other ingredient being allowed. The whole is then rubbed down in the usual way and lead colored, after which it is faced, and the surfacing process may be said to be completed. The preparation colors are then put on, and the body finished, the full details of which I suppose no reader of *The Hub* now wants to know, so much having been written on the subject in your pages, both as to the English process and the American. It may be worth while, however, repeating here that before the last coat of varnish is laid on, the whole surface of the body should be flatted over with rottenstone, which, being closer than pumice, fills the pores of the preceding coats, and makes a solid surface whereon to lay the last coat, which will bear out like the face of a looking-glass.

"What Mr. Windover considers the advantage of his system of painting is, that it begins and ends with varnish, which at once gives a good surfaec, and from the first lays a solid foundation, which cannot be secured by the use of turps and dryers. All his colors are ground in varnish. The carriage work receives four coats of color, one coat of varnish color, and is finished with three coats of clear varnish.

Coffee and Tea Reservoirs for Firemen.

Some one, says the New York *Times*, writing to a scientific journal, proposes a plan for making buildings absolutely fireproof, which consists in constructing metal lined reservoirs in the walls and roofs, to be filled with water. Of course, water will not burn, and the inventor therefore claims that his water lined houses will be protected against the flames, except in cases where the heat of a contiguous fire is so great as to convert all the water into steam. The invention may be good so far as it goes, but it is certainly susceptible of considerable improvement. Why, for example, need the walls be filled with water only? They might, with equal safety, be made reservoirs of lemonade, coffee, or tea, and constructed with taps, so that the owner could have a beverage ready at his hand whenever he should be thirsty. The lemonade would be drinkable in ordinary circumstances, and in case of fire the tea and coffee would be heated so as to be fit for the refreshment of firemen. Naturally, coffee so prepared would not be of the best quality, but then most of us have been compelled to drink so much bad coffee that we should probably find it rather an improvement on the sort of article furnished by our landladies.

In the *Revue Chimie*, M. Müller describes a process of forming ornamental and useful objects of pure silica. The pure silica is reduced to an impalpable powder, formed into a paste, and molded. When heated to bright redness, the grains fuse together, become very coherent, and form objects of great durability.

PATENTS.

The amount of misapplied talent engaged on inventions that can never be used is as wonderful as it is prolific. There is a ludicrous element in many of the patents, and more of the applications, which is well worth investigation; and we extract from the records of the Patent Office, an account of some of these, that show more genius than common sense, and have produced more laughter than profit;

In 1870, the owner of certain beehives, irritated by the loss of his honey by the bee moth, asked for a patent for a combined hen roost and beehive. He had noticed that the beemoth travels at night, while the busy bee works by day. His desire, therefore, was for a device that should admit the worker by day, and keep out the thief by night. This his ingenuity effected by the erection of a hen roost pivoted upon a beehive provided with gates. The bees were expected to be in their cells just before dusk; the hens lighting on their roosts, were then to close the gates of the hive, and keep them shut all night. The early rising of the fowls would automatically open the gates again, and return the bees—their honey all safe—to the airs of heaven and the flowers of earth. He received his patent.

Another applicant asked for a patent right for an artificial moon, that should light each town that used it without expense. His eye had often been struck by the reflection of distant windows at sunset, and how far that light traveled. He therefore proposed a balloon for each town, sufficiently large to raise a huge reflector that was to be hoisted every evening at dusk (about the time the hens shut in the bees). The reflections of the sun's rays, cast downward upon the village, was sure to light it through all the darkness of night. Fortunately for himself, this inventor presented his application through a patent attorney, who told him it was doubtful if it could be obtained.

In the fall of 1871, a gentleman, probably from California, applied for and received a patent for building houses on wheels or rollers, so that, in case of earthquakes, they might roll forward or backward, but not be shaken to pieces.

Only three years have passed away since a very ingenious gentlemen from the rural districts applied for a patent to prevent cows from switching their tails! He presented two models—one shaped like a bottle, around the neck of which the cow's tail was to be curled; the other consisted of a square block, with a hole through the center, wherein the tail was to be put, and then tied in a knot, so that the animal could not withdraw it. On the presentation of the application, the official examiner thought it could not be granted because of a similar device in "Don Quixote," where Sancho Panza, trying, to sleep in the hay loft, was kept awake by the braying of his donkey below. His wakefulness gave Sancho time to reflect that, when riding the donkey, the animal switched his tail when he brayed. Descending hastily from the hay loft, the squire tied a block to the donkey's tail to prevent him from braying. But as this device originated with a Spaniard, and had never been repeated in this country, the office decided to grant the patent. Our readers will, therefore, remember that they cannot tie a cow's tail to prevent its switching without a payment of royalty to the owner of this privilege.

If "Don Quixote" anticipated one of our American patents, Coleridge's "Ancient Mariner" performed the same office for another, when he says:

> "The air is cut away before,
> And closes from behind."

Noticing how vessels are delayed by the necessity of pushing aside the water that obstructs their way, an ingenious gentleman asked for a patent for putting in front of the vessel a series of hollow wheels, whose blades should act as paddles. These wheels would lift the water so speedily out of the way that the vessel would have to rush in to fill the void. This motion of the vessel would give the wheels another turn, and then the wheels would once more lift away the water, and thus draw the vessel on. And so the motion of the vessel would turn the wheels, and the turn of the wheels would draw the vessel. This applicant for perpetual motion was so certain of success that, to provide for the only difficulty he could foresee—which was in the two rapid motion of the vessel, that would tear itself to pieces—he provided an anchor, with a spring cable to it, that he might check the vessel from its too rapid speed. The examiner however, might have given his decision in the next verse of the "Ancient Mariner:"

> "Fly, brother, fly! more high, more high,
> Or we shall be belated;
> For slow and slow that ship shall go,
> Till the mariner's trance is abated."

An applicant for a patent for wooden pavements proposed to mount each block of wood on springs. He claimed that this would remove all jar in riding, and obviate the necessity of springs on carriages.

Another gentleman applied for a patent for heating canals by steam, so that boating could go in winter as well as in summer. The office decided that this invention was worthy of protection, and gave him his patent.

Another applied for a combination of clock and bed, so ingeniously contrived that, when the clock struck, the bottom of the bed dropped out. He claimed that this plan would probably awaken the sleepers.

Speaking of combinations, he must have come from Missouri or Kansas who asked for a patent for a combination of cannon and plough. For this purpose he filed three applications, making the elongated handles of the plough hollow, so as to form two cannons. These were to be kept loaded till the guerillas were after him; the cannons were then to be fired, the guerillas shot down, and the farmer to go on his ploughing way rejoicing.

And he, too, must have come from the borders who asked for a patent of a combination of trunk and house. The trunk was made with triple sides, moving up and down. Doing duty all day in guarding clothes, when night came on, and no cabin near, the goods were to be taken out, the triple walls elevated into one, and the benighted traveler safely housed.

As early as 1718, Mr. James Pashile patented a swivel gun in England, with the motto

> "Defending King George, your Country and Laws,
> Is defending yourselves and Protestant cause."

The novelty of this plan was that his gun fired two kinds of ball—a square ball and a round one. The round ball was to be used in all fights against Christian nations; the square balls, that would mangle the flesh more, only in contest with Turks and other heathen. This gentleman of old time must have been the ancestor of Mark Twain, of this country, who so lost his temper because the Secretary of War refused to recommend his gun for a patent. Mr. Twain's idea was, to have a swivel gun that should load at the center and should fire off at both ends. In case of a seige, he proposed to load the gun, set it a whirling, and drop it just outside the city walls. Before the balls left the mouth of the cannon, they would acquire such a rotary motion that they would sweep round the walls outside of the town, killing off all the besieging host. We must acknowledge, however, that we have looked in vain, on the records of the office, for Mr. Twain's name, and hence we infer he never received his patent.

There would be much of the ludicrous, were there not more of the horrible, in the device of an American embalmer for a patent. Knowing that the office required a working model or drawing in all cases, he obtained the corpse of a little infant, embalmed it in his best manner, and forwarded it with accompanying specifications. The corpse was immediately returned to him.

One ingenious gentleman wants the nation to let him build a water wheel that should cover the whole front of Niagara, and whose shafting and power should reach all parts of the land.

Another asked for a patent for the invention of the generation of steam by boring a hole in the ground until he reached the waters that are boiled by the internal fires of earth. He set forth, among the advantages of his plan that there would be no danger of explosions, no expense for fuel, no necessity of engineers—all of which statements are undoubtedly true.

It must have been a relative of this last gentleman, and one equally acquainted with the laws that govern the hidden heart of this planet, who applied for a patent for boring the the earth for artesian wells for purposes of irrigation. He gravely set forth that he had made the discovery that quicksilver was heavier than common earth. He therefore proposed to start a hole, and to empty into it a little mercury. By the laws of Nature, that mercury would be sure to work its way downward till it struck water, and the water would then be sure to work its way upwards till it struck air.

Should it be said that such patents as this last, as that for the prevention of cows' switching their tails, for artificial moons, for ploughs doing the work of cannon, etc., must be jokes, we can only reply that shrewd Yankees are not wont to pay thirty-five dollars even for practical jokes, and that none of these designs have culminated into patents under less than that sum, and, when attorneys were employed, under double and quadruple that sum.

The *Journal* (Appletons) is not large enough to contain the account of singular patents applied to domestic use. More than one application has been made for rat traps with a mirror in the center. The rat, seeing another rat, of his own size and age, nearer the toasted cheese than himself, would be sure to spring for it. There have been quite a number of tapeworm traps applied for, where a delicate bait is let down the throat by a delicate thread, and the hungry worm speedily drawn up. Constant application is made for patents for flying machines and for balloons. One contriver arms his balloon with cannon, another with Greek fire that should burst and explode when just over the hostile army. An English gentleman actually received a patent for putting a howitzer on horseback, and mounting the horse on springs, so that the recoil of the howitzer should not break the legs of the pony. And, as late as September last, a gentleman in this country applied for and received a patent for accelerating vegetable growth by the use of alternate strips of white and violet glass. In short, there is no idea so ludicrous, so wonderful, or even so old, that some person of good sense and inevitable ability has not endeavored to throw around it, or something like it, the protecting *aegis* of the law of patents.

The American Seal Lock.

During the recent election at Wolverhampton, England, says the London *Times*, the ballot boxes employed were secured by an American invention, the Patent Seal Lock, which was several times mentioned in our columns in the summer in connection witht he robberies from the luggage of continental railway travelers that were then so much complained of. The seal lock is one in which the key hole admits of being completely covered bya sliding metal plate, which, when pushed fully into its place, is retained there by a spring catch. In this plate there is a small hole, through which the catch may be pressed back by a pin attached to the key, and the plate can then be drawn down so that the keyhole is exposed. The plate is countersunk to receive the "seal," which is a small square piece of glass, held in position, when the plate is pushed home, by the grooves in which it slides. The seal, therefore, covers the hole through which alone the spring catch is accessible, and this cannot be released until the seal is broken. So long as no seal is inserted the lock remains an ordinary lock, fit for all ordinary purposes. When the security given by the patent is desired, a seal is dropped into the place prepared for its reception before the sliding plate is closed. When this has been done no one, neither the owner nor any other person, can apply the key until after the seal has been destroyed. So long as the seal is intact there is absolute certainty that the lock has not been tampered with.

The seal itself is a piece of common window glass marked with a letter and number, and also with various irregular dots and splashes, in a sort of chocolate color. These marks are backed up by a white ground, and the whole is burnt in, so as to become part of the glass, and indelible. Each seal is about half or five eighths of an inch square, and a large sheet is made at once, the separate seals being afterwards cut out with a diamond. The lettering and numbering are conducted on ths same principle as on Bank of England notes, so that no duplicate of a seal will ever be made; and the dots and splashes are accidental in shape and position, being sprinkled on at hap hazard. Before the seals are cut the entire sheet is photographed, and the printed photograph is perforated like a sheet of postage stamps. The purchaser of the seals is supplied also with photographic *fac-similes*, so that he can send one of these, and not only the letter and number, to any person whose business it may be to verify the security of a package. For example, goods consigned to a distance might be sent in a box with a sealed lock, and a photograph of the seal might be enclosed to the consignee with the invoice. The consignee, on producing his photograph, would satisfy himself that the lock had not been opened, and the carrier would be relieved from the possibili- of claims for the loss or abstraction of goods which the package had never contained.

The essence of the security which the seal affords is, therefore, a certainty that no key has been inserted into the lock during a given time. The principle may be applied to a lock of any kind, any strength, or quality. What it does is to render the keyhole inviolable, or, at least, to show that it has been inviolate. Of course, the seal is easily broken, a smart tap being sufficient for the purpose; and it is protected on this account in the padlocks manufactured by the patentees by a strong cover which fastens down with a spring catch. When the seal is broken no proof is afforded that the lock has been opened; but, as long as the seal is entire, there is positive proof that the lock has not been opened.

In the United States the seal lock is extensively employed for many public and private purposes. It is used by some of the chief railway companies for the protection of their cars, by the Custom house for goods bonded or in transit, by returning officers for the ballot boxes, and by private persons for securing important matters which it is necessary to intrust to the custody of others. A box of deeds or papers left with a banker or lawyer, and a plate chest or wine cellar left with servants in the absence of the proprietor, may serve as illustrations of such uses. For deed boxes the arrangements for affixing the seal are peculiarly neat, not to say ornamental in their character.

The value of the seal lock depends entirely, as a matter of course, on good workmanship, and on the impossibility of releasing the spring of the sliding plate in any other than the way intended by the maker. If the plate worked loosely in its grooves, there might be means of getting at the catch in some illicit manner, or it might be possible to file or drill away some channel for the same purpose. But the most that can be said of this possibility is that the owner must satisfy himself that the metal work of the lock is uninjured, as well as that the seal is unbroken.

PHINEAS L. SLAYTON.

With much regret we record the decease of Mr. Phineas L. Slayton, of this city, in the 52d year of his age. He was a mechanician of remarkable genius and practical ability. There was no problem in mechanical construction that he could not execute in the most workmanlike and scientific manner.

It is one thing to invent a device, but quite another, and often more difficult, to construct a new machine, design, proportion, and erect the novel structure. Mr. Slayton possessed the gift of doing both. He was the builder of many complicated machines for other people, while among his own inventions which he put into actual operation were looms for weaving hair nets, for knitting Scotch caps, for weaving hats, machines to make brushes, etc. At the time of his death, he had almost completed a machine for making cigarettes, those little rolls of tobacco in paper that are so generally used in Cuba and Mexico. This machine involved great ingenuity and nicety of construction.

Mr. Slayton was an intelligent, industrious, unassuming man, gentle, kind hearted, pure minded. Esteemed for his manly integrity by all who knew him, greatly beloved in his home relations, his life was in all respects a noble one.

DO NOT overlook the fact that a single weekly number of the SCIENTIFIC AMERICAN, costing six cents, contains as much matter as most of the monthly magazines which are sold for 35 cents.

WIARD CANNON.—At Nut Island, Boston harbor, preparations are now being made for a trial of heavy guns, designed by Norman Wiard, one smooth bore and the other rifled. These guns weighing 20 tuns each, are of 15 inches caliber, and 48 inches in diameter at the breech, and 25 inches in diameter at the muzzle. The guns are to be fired at targets placed on the shores of other islands in the harbor.

IT IS THE INTENTION of the publishers to illustrate, by superb engravings, all new and practical inventions and discoveries that may be developed during the year.

DECISIONS OF THE COURTS.

United States Circuit Court, Eastern District of New York.

TARR *et al.* *vs.* WEBB.—PATENT FOR PAINT FOR SHIPS' BOTTOMS.

BENEDICT, *Judge:*

This case comes before me upon a motion for an injunction to restrain the defendant from making and vending a certain kind of paint used to protect ships' bottoms from worms, which is claimed to infringe upon a patent owned by the plaintiffs.

This patent was originally issued November 3, 1863. It was reissued in 1867, and again reissued in two divisions October 17, 1871. One of these divisions, designated as Division A, Reissue No. 4,598, is the patent relied on by the plaintiffs. The other is not in controversy here. The claim of this patent is as follows:

What we claim is a paint consisting of oxide of copper with a suitable vehicle or medium, substantially as described.

This claim, read in the light of the specification attached, seeks to secure for the patentee any mixture capable of being applied as a paint in which oxide of copper is an ingredient. The patent is not for a process but for a compound which the patentee claims as his own discovery. In this compound two elements and no others are described as essential. There must be oxide of copper in the compound, and there must be a vehicle which will permit it to be applied to surfaces after the manner of applying paint. It is not pretended that any new property of oxide of copper is developed or brought into action by this manner of using it. Nor does the compound itself produce any effect not before known. All the benefit derived from the use of the compound arises from the poisonous effect of oxide of copper—an effect long well known.

So understood, the patent is invalid. It discloses no discovery to be rewarded. Oxide of copper and its poisonous effect have long been known. Compounds capable of being applied to surfaces in order to protect the same are in universal use, and there was nothing new in the idea that oxide of copper could in this way be applied to surfaces.

The effort of the patentee has been to secure the sole right to use oxide of copper in any form which renders it capable of being applied to surfaces after the manner of applying paints. A monopoly of the use of a well known substance in a particular but well known form cannot be secured. Strychnine will poison dogs; and some one may yet discover that it can also be used to poison the worms of the sea; but that will not entitle the discoverer to an exclusive property in all mixtures which contain strychnine and are capable of being spread on surfaces. Furthermore, it appears that in 1849, prior to the plaintiff's patent, Dr. Ure gave in his dictionary a description of a metallic pigment to be made with pure oxide of copper, which description would enable any one skilled in the art to make a compound similar in all respects and having the same qualities as the compound described in this patent.

This being so, the subject matter of the reissue, if it be patentable, cannot be secured to the plaintiffs, because it is not new.

A further objection taken to this reissue is that the subject matter of it is not to be found in the original patent. To which one answer made is that, under the patent act of 1870 it is not necessary, in the case of a chemical invention, that the subject matter of the reissue be found described in the original patent—that it is sufficient if proof be that the subject matter of the reissue was in fact part of the original invention, and the grant of the reissue is decisive that proof was furnished.

In view of the opinion I have expressed upon other branches of the case, I deem it unnecessary to notice this objection to the patent in question, further than to say that I am of the opinion that no such effect can be given to the act of 1870 as the plaintiffs claim, but that in the case of a chemical patent reissued it is necessary to its validity that the subject matter be found described in the original patent.

The motion for an injunction is denied.

M. B. Andrus and *Causten Browne*, for complainants.
Frede. H. Betts, for defendant.

United States Circuit Court, District of Massachusetts.
Important Decision Concerning Assignments.

ASHCROFT *vs.* WALWORTH *et al.*

SHEPLEY, *Circuit Judge:*

The patent in this case was granted to James R. Brown, November 30, 1858. Previously to this time, November 6, 1858, Brown had conveyed to one William Freedly, one half of his interest in the invention and any patent which might be granted therefor. On the 31st of March, 1859, Freedly conveyed his interest to Silas B. Goldthwait. The title stood one half in James R. Brown and one half apparently in Goldthwait on the 16th day of June, 1860, at which time James R. Brown went into insolvency under the law of Massachusetts.

It is claimed by the defendants that by virtue of the proceedings in insolvency all the interest which James R. Brown then had in the patent passed to George H. Kingsbury, his assignee. The insolvent law of Massachusetts authorized the judge, "by an instrument under his hand, to assign and convey to the assignee all the estate, real and personal, of the debtor, except such as is by law exempt from attachment, with all his deeds, books, and papers relating thereto;" and it provided that "the assignment shall vest in the assignee all the property of the debtor, which he could lawfully have sold, assigned, or conveyed, or which might have been taken on execution upon a judgment against him, etc., * * * and shall be effectual to pass all said estate, etc., etc., etc." Under this statute it has been decided that the property vests in the assignee by force of the statute rather than by virtue of the terms of the assignment (*Clark vs. Minot*, 4 Metcalf, 346, 348.)

The act of Congress of 1836, chapter 357, section 11, provides that every patent shall be assignable at law, either as to the whole interest or an undivided part thereof, by an instrument in writing, which assignment shall be recorded in the Patent Office within three months from the execution thereof. This act clearly contemplates a written instrument, signed by the owner of the patent and duly recorded in the Patent Office, as necessary to vest the legal title in the purchaser.

The insolvent law of Massachusetts provides, further, for confirming the assignment made by the judge by making it the duty of the debtor "to execute all such deeds and writings, and do all such other lawful acts and things as may be necessary or useful for confirming the assignment so made by the judge, and to enable the assignee to receive or become possessed of all the estate and effects assigned as aforesaid, especially such part thereof as may be without the Commonwealth." This is an express recognition of the fact that there may be property so situated in other countries or States, or Territories, that the assignment itself would be ineffectual to pass it and transfer the title to the assignee without an instrument of conveyance from the debtor. Especially is this the case with patent rights, for, in the language of Mr. Justice Curtis, "these incorporeal rights (copyrights and letters patent) do not exist in any particular State or District; they are coextensive with the United States. There is nothing in the act of Congress or in the nature of the rights themselves to give them locality anywhere, so as to subject them to the process of courts having jurisdiction limited by the lines of States and Districts." (*Stevens vs. Gladden*, 17 Howard, 451.)

It might have been competent for the court under the insolvent law to have compelled the debtor to execute such an instrument in writing as, in accordance with the provisions of the patent act, would have been effectual to transfer the title in the patent to the assignee. If a right in a patent were such property as did not come within the exceptions of the insolvent law, as property not liable to attachment, or if it is of such a nature that it is subject to the operation of State insolvent laws, this would seem to have been the only proper and effectual mode to have made it available for the benefit of the creditors. Without such a conveyance as the statute of the United States contemplates, we do not think the assignee acquires any legal title to any interest the debtor may have in any letters patent. To invest the assignee with the legal title, the court must compel a transfer in conformity with the requirements of the patent act. (*Stevens vs. Cady*, 14 Howard, 531.) No title, therefore, vested in Kingsbury, the assignee, no such instrument in writing, assigning the debtor's interest to him, ever having been made and recorded in conformity with the requirements of the act of Congress.

The defendants did not acquire any title through the conveyance to Richard A. Brown and from him to Norton. Before the conveyance from Richard A. to Norton, he had reconveyed to his father, James R. Brown, and although that conveyance was not recorded it was good against Norton, for Richard A. only undertook to convey whatever right, title, or interest he had under the patent to manufacture the thing patented, not the patent itself or any undivided interest therein. Nothing passed but the actual interest the grantor had at the time. (*Brown vs. Jackson*, 3 Wheaton, 449.)

Norton was not a *bonâ fide* purchaser, but took the conveyance with full knowledge of the previous conveyances from Richard A. Brown to James R. Brown.

Plaintiffs are entitled to a decree for an account of the patented pipe tongs made, used, or sold by the defendants since the conveyance to the complainant, and for an injunction according to the prayer in the bill.

Decree for complainant for account and injunction as prayed for, decree to be drawn up and submitted to the court.

James B. Robb, for complainant.
C. Smith and *W. W. Swan*, for defendants.

PROFESSOR RAOULT, of Grenoble, has proved that nickel employed for twelve hours as a negative electrode in a voltameter, condenses at least 150 times its volume of hydrogen and abandons entirely this gas, when it is taken from the voltameter and plunged in water. M. Raoult has made several experiments on the production of caloric and has succeeded in demonstrating that the intensity of the heat developed by an electric current is independent of the system of battery by which the current is engendered.

NEW BOOKS AND PUBLICATIONS.

ROLL OF HONOR, No. XXVII.; Names of the Soldiers, who died in Defense of the Union, interred in the National Cemeteries of Beaufort, S. C., Natchez, Miss., Vicksburgh, Miss., and Pittsburgh Landing, Tenn. Washington: Government Printing Office.

VICK'S ILLUSTRATED FLORAL GUIDE FOR 1873. James Vick, Rochester, N. Y.

This guide is now published quarterly. 25 cents pays for the year, four numbers, which is not half the cost. The January number is beautiful, giving plans for making Rural Homes, Designs for Dining Table Decorations, Window Gardens, etc., and containing a mass of information invaluable to the lover of flowers. One hundred and fifty pages, on fine tinted paper, several hundred engravings, and a superb colored plate and chromo cover. The number before us is cheap at one dollar to any one who has a taste for floral matters.

THE NOTE TAKER, or the Elements of Tachygraphy. To be completed in eight numbers. Otis Clapp, Boston, Mass.

The first two numbers of this work are published in one issue, and contain a treatise on Lindsley's system of brief writing, which should be read by stenographers, and especially by those desirous of acquiring a rapid method of taking notes of a speech.

COFFEE, ITS HISTORY, CULTIVATION AND USES. By Robert Hewitt, Jr. New York: D. Appleton & Co.

This is a most interesting little book, and we believe it will be acceptable to all readers. It is printed and bound in admirable style and in excellent taste, and is a credit both to the author and the publishers.

Facts for the Ladies.—Mrs. J. C. Thomas, Bloomington, Ill., has used her Wheeler & Wilson's Lock-Stitch Machine constantly since April, 1865, making the heaviest and thickest coats, such as beaver cloth. See the new Improvements and Woods' Lock-Stitch Ripper.

Herring's Safes in the Boston Fire.

To the Editor of the Scientific American:

The owners of the Herring's Safes will be gratified to know that their reputation has been fully sustained by the recent ordeal in Boston, and that *no valuables intrusted to their care have been lost.*

Owing to the competition among local manufacturers, and past immunity of the place from extensive fires, our safes have never been offered for sale in that city, and the few that were exposed in the great conflagration were purchased by New York houses, and sent to Boston for use. *How well they did their duty*, let the following letters testify:

HERRINGS & FARREL,
Nos. 251 and 253 Broadway.

BOSTON, MASS., November 12, 1872.

Messrs. Herrings & Farrel, Nos. 251 and 253 Broadway, New York:

GENTLEMEN: In the "Great Fire" which has destroyed the business portion of this city, we had in use one of your "Champion" Safes, and which we were unable to recover from the ruins this P. M., on account of the intense heat which surrounded it. *When we opened it, we were agreeably surprised to find our books, papers, &c., in fine condition.*

Yours, &c.,
J. C. BURRAGE & CO.

ANOTHER.

BOSTON, November 14, 1872.

Messrs. Herrings & Farrel:

GENTLEMEN: Our store, No. 38 Summer Street, was burned in the late "Great Fire" in this city of Nov. 9 and 10. Our books and papers were in one of your "Patent Champion Safes," *and were all preserved in good condition.* Our store was burned about 10 o'clock Saturday evening, but, on account of the heat, we could not get at the safe until the Tuesday following—*over sixty hours after the fire.* We consider this fire no ordinary test for safes, and take pleasure in giving facts as above.

Very truly yours,
PORTER BROTHERS & CO.

Business and Personal.

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

Sewing Machine Needle Machinery, Groovers, Reducers, Wire Cutters, &c. &c. Hendey Bro's, Wolcottville, Conn.

For Sale or Exchange for Good Lathes—A Ferris & Miles Steam Hammer, 200 lbs. Stroke—nearly new. Wiley & Russell, Greenfield, Mass.

Patent Steel Measuring Tapes, manufactured by W. H. Paine Greenpoint, N. Y. Send for Circular.

$150,000 profit by an important invention. Only $1500 investment. Good references. Address A. D. P., 71 Essex Street, New York.

Gauges, for Locomotives, Steam, Vacuum, Air, and Testing purposes—Time and Automatic Recording Gauges—Engine Counters, Rate Gauges, and Test Pumps. All kinds fine brass work done by The Recording Steam Gauge Company, 91 Liberty Street, New York.

Steam Engines, Boilers and Pumps, Locomotives and Cars—New and Second Hand. Dulles & Co., 624 Walnut St., Philadelphia, Pa.

Wanted—A Partner or Company with Capital, about $20,000 to $25,000, to manufacture and sell Rafter-Hook-Fire-Escape-Ladders, as described on page 262, patented March 12, 1872. Great demand for it. Agents wanted. Address Patentee, C. G. Buttkereit, Toledo, Iowa.

I want to Buy a good Ice Machine. Address, with price, I. H. Smelser, Cleburne, Johnson Co., Texas.

Ross Bro's Paint and Grain Mills, Williamsburgh, N. Y.

Male and Female Agents Wanted—100 per Cent. Profit. Address, with Stamp, for particulars, P. O. Drawer 217, Buffalo, N. Y.

For Sale, two Patents. Address H. S. Ball, Spartanburg, S.C.

Dobson's Patent Scroll Saws make 1100 strokes per minute. Satisfaction guaranteed. John B. Schenck's Sons, 118 Liberty St., N. Y.

Diamonds and Carbon turned and shaped for Philosophical and Mechanical purposes, also Glazier's Diamonds, manufactured and re set by J. Dickinson, 64 Nassau St., New York.

Permanent Photograph Printing, just what is wanted by Manufacturers. Send for Circular and specimens to Amer. Photo Relief Printing Co., 1002 Arch St. Philadelphia, Pa. John Carbutt, Sup't.

Boston Fire! Goodnow & Wightman, 23 Cornhill, were not burned out, and are ready to fill all orders for Tools and Materials. Catalogues were all burned, but will have more in about two weeks.

The Berryman Manuf. Co. make a specialty of the economy and safety in working Steam Boilers. I. B. Davis & Co., Hartford, Conn.

First Class Steam and Vacuum Gauges, Engine Registers, Davis' Recording Gauges. New York Steam Gauge Co., 46 Cortlandt St., N.Y

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

Four Brick Machines, Combined with Steam Power (Winn's patent), makes 40 M. per day, for sale at a bargain. Address the manufacturers, John Cooper and Co., Mount Vernon, Ohio.

Absolutely the best protection against Fire—Babcock Extinguisher. F. W. Farwell, Secretary, 407 Broadway, New York.

Hydraulic Jacks and Presses—Second Hand Plug Tobacco Machinery. Address E. Lyon, 470 Grand St., New York.

Steel Castings "To Pattern," from ten pounds upward, can be forged and tempered. Address Collins & Co., No. 212 Water St., N. Y.

Heydrick's Traction Engine and Steam Plow, capable of ascending grades of 1 foot in 3 with perfect ease. For circular and information Address W.H.H.Heydrick, Chestnut Hill, Phila.

The Berryman Steam Trap excels all others. The best is always the cheapest. Address I. B. Davis & Co., Hartford, Conn.

T. R. Bailey & Vail, Lockport, N. Y., Manf. Gauge Lathes.

Williamson's Road Steamer and Steam Plow, with Rubber Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1859.

Belting as is Belting—Best Philadelphia Oak Tanned. C. W Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

Boynton's Lightning Saws. The genuine $500 challenge Will cut five times as fast as an ax. A six foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

For Steam Fire Engines, address R. J. Gould, Newark, N.J.

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

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

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

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

Presses, Dies & all can tools. Ferracute Mch. Wks, Bridgeton, N.J.

Machinists; Illustrated Catalogue of all kinds of small Tools and Materials sent free. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

Gatling guns, that fire 400 shots per minute, with a range of over 1,000 yards, and which weigh only 125 pounds, are now being made at Colt's Armory, Hartford, Conn.

A New Machine for boring Pulleys, Gears, Spiders, etc. etc. No limit to capacity. T. R. Bailey & Vail, Lockport, N. Y.

The Berryman Heater and Regulator for Steam Boilers—No one using Steam Boilers can afford to be without them. I. B. Davis & Co.

Notes & Queries

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

1.—How can I melt, for recasting, gum elastic?—D. K. N.

2.—How can I temper steel moldboards for plows, so that they will not spring in the process?—D. C. B.

3.—How can water be drawn about 400 feet horizontally and 60 feet up a river bank? There is no chance to put a pump in.—H. & B

4.—Will some one give me full directions for making a hand rifling machine for gain twist?—M.

5.—Can any one inform me of anything that will remove ink stains from paper without leaving other stains?—W. H. S.

6.—What is the cause of some dead wood burning into cinders, and is it a common occurrence? It has a close resemblance to that which we see at a blacksmith's furnace where common bituminous coal is burnt.—J. N. S.

7.—I have heard that a large manufacturer of builders' hardware finishes with a brown "dip" that does not require baking. It is kept a secret. Can any reader give me a clue to the ingredients of that dip?—R. S. B.

8.—Could not a house be built much cheaper in the form of a square or oblong, than by following the plan given in your paper for November 9? And, if the roof was nearly flat, would not the chambers be cooler in the summer and warmer in the winter?—E. E. S.

9.—I hear many complaints of Wishataw oil stones being too hard. Will not some one inform me of the best method of improving the grit or softening such stones?—J. H. Z.

12.—Owing to the frost getting into the iron of my engine I found it quite rusty. I have removed the rust, but cannot remove the stains. Will some one tell me how I can do it?—P. P.

ANSWERS TO CORRESPONDENTS

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at $1·50 a line, under the head of "Business and Personal."

ALL references to back numbers must be by volume and page.

J. J. F., of Texas, says: Enclosed please find a small piece of ore. What it is we are unable to tell. Answer: It is pyrites or bisulphuret of iron, not available as an ore.

W. S. N. asks: What is the process of giving to small wires the same point that is put on hair pins? Answer: They are generally pointed by grinding by contact with revolving grinding or milling wheels.

M. asks: Can iron be incorporated with a hair dressing? Is it harmless? Also, will sulphur prevent hair from turning gray? Answer: Preparations of iron and sulphur are used in hair dressings to blacken the hair. These substances probably injure the hair, but are not poisonous like the lead preparations so commonly used in hair dyes The use of sulphur does not prevent gray hair, but helps to disguise the gray.

P. B. W., of N. J., says: Enclosed is a mineral which I think is umber I send it to you for inspection. Is it of any value? The vein is all just like the piece that I send you; at first it was about six inches thick, and after digging three feet it was eighteen inches. The vein lays between slate rock. Answer: The specimen is an ochery oxide of iron or "umber" so called, and doubtless would make a useful pigment.

C. B., of Mich., says: I send you herewith three mineral specimens from Kansas. No. 1. is the magnesian limestone, and I am requested to inquire in regard to its suitability for building a dam. Will it stand the action of the water? No. 2. What is it, what kind of rock and what is it good for? As to No. 3, the questions are, what is it, what is it good for, and is it valuable? If so, what is its value? Answer: (1.) In our opinion is too soft for the purpose stated, and would not endure the wear of the water like the more compact limestones and tough quartz rocks. (2.) Is calcareous marl, the "chalk of America. (3.) Is ferruginous clay, of the same value as any other clay.

J. E. E. says: The enclosed mineral sample was sent to me some time ago from Arizona, and was described as a specimen of white topaz. I am of opinion that it is nothing more than quartz crystal in a molten state. It cuts glass very readily, as you will perceive. Answer: The mineral is chalcedony, a variety of quartz. Topaz is a third heavier, and is harder.

H. B. H. says: Will you please inform me of the compositions and materials used in filling in between the outside and inside lining of safes? Also state the per cent of water contained in each ingredient that the above composition is made of. Answer: Different safe makers use different filling materials. Ordinary hydraulic cement is a very common filling. Plaster of Paris is another. Plaster and alum another. The amount of water in the filling varies from 20 to 30 per cent of the space occupied by the filling.

J. M. S. says: If the levers of a horse power are lengthened so that the ends, instead of being fastened in the center of drive or bull wheel, pass on and are fastened on edge of said wheel, will there be power gained or not? My friend (who, by the way, is a subscriber to your paper) maintains that the power applied to the side of the wheel nearest the horses is the same in either case, and therefore, the lever being fastened on the opposite side of wheel, all the power there applied is gained. I, on the contrary, maintain that there is no power gained whatever, as the increased distance between the fulcrum and—weight, I suppose you might say, will exactly counterbalance the amount of power applied to the side of wheel opposite to that on which the horses are hitched. Answer: The use of levers does not in any case increase the amount of power applied. Levers are simply tools by means of which the power is employed, directed, or expended. In the case of a common lever horse power machine, the longer the levers are, or, in other words, the further their outer extremities extend beyond the center of the wheel, the more easily but more slowly the wheel will be turned.

E. S. C. asks: What per centage of water is returned to the boiler by a condensing apparatus, and how many gallons of water would suffice a 40 horse power boiler, for 12 hours, with a condensing attachment? Answer: The condensing engine requires from 15 to 35 times as great a quantity of condensing water as of feed for the boilers. Each pound of steam condensed yields to the condensing water something over 1,000 units of heat. Each pound of condensing water carries away from 20 to 70 thermal units, this quantity varying with the temperature of the injection water and the condition and management of the condenser. Probably four per cent of the condensing water, as an average, goes back to the boiler as feed with the ordinary condenser. A fair 40 horse power boiler should evaporate 15,000 pounds of water in twelve hours, and would require its engine to be supplied, probably with at least 4,000 gallons of condensing water per hour in summer, and 2,500 in winter.

P. M. says: How can I ascertain the loss by radiation from an exposed boiler front, with steam at 70 lbs. by the gage? If possible let me know before the middle of January, as it will do no good after that date; a case at law is involved. Answer: To determine approximately the loss by radiation from a metallic surface heated and exposed to the air, the temperature of the air and of the metal remaining constant: 1st. The loss or gain of heat, of a body so exposed, is proportional to the difference between its temperature and that of the surrounding atmosphere up to a limit which is, by some authorities, assumed at a difference of 50 or 60 degrees Fah. Where the difference is greater, a correction is required for accurate work. 2d. Multiply this difference in temperature, in the case observed, by the area in square feet and by 0·3. The product will be the number of units of heat lost. Consult Peclet's "*Traite de la Chaleur*," p. 373, *Paris*, 1859, *et seq.*, for further information, and call in an expert of known intelligence and integrity if anything further is needed.

J. E. W. says: A dispute has arisen between us in regard to the speed of steam boats, which we respectfully refer to you for a decision. The question is, simply: At what rate of speed per hour can still water be displaced? And is there not a limit beyond which water cannot be displaced, notwithstanding the force that may be used; that is, can a steamboat be driven through still water at a rate exceeding 19 miles per hour? Another question is: Can a tapering log 40 feet long (2 inches diameter at one end, and 40 inches at the other), be towed through the water faster with the sharp end, than with the blunt end, foremost? The reason assigned in favor of the blunt end is that it encounters resistance only at one place as it enters the water, and nowhere else; whereas the sharp end encounters resistance at the point all along the log and then drags dead water after it. Answer: There is no known limit to the displacement of water by the suitable application of power. Some of our North river steamboats have made from 22 to 25 miles an hour in still water. Such a log as you describe will tow easier sharp end foremost. It takes but little power to displace water. To push it sidewise is like moving a pendulum, and requires little more power than does a pendulum. The principal resistance encountered by well formed vessels in moving through the water is due to the friction of the water on the surfaces of the vessels. Blunt vessels lift more water up in front, and are therefore harder to move than sharp vessels, at same speed.

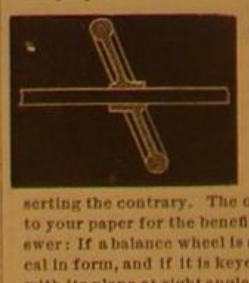
A constant reader asks:—Will a one inch perpendicular pipe filled with water and inserted in a barrel filled with water, the pipe being twenty-five feet high, have the same pressure as a two inch pipe of the same length; and if not, what would be the difference in pressure? Answer: The pressure will be the same in both cases.

W. McD., of Ohio, says:—The proprietors of the planing mill in which I work thought they could heat the carpenter shop from the exhaust steam from the engine. The size of the boiler is 20 feet long, 40 inches diameter, with two return flues. They had a galvanized iron pipe put in, 6 inches in diameter, the iron being about one sixteenth of an inch thick, leading from the engine through the room (about 20 feet), then into a drum at the top. The drum is 20 inches in diameter and 4 feet long. A 4 inch pipe leads from the bottom of the drum to the outside. The heat it gives off is just perceptible when we hold our hands or faces very close to the pipes or drum. Why does it not afford more heat, and what would be the best remedy? Answer: The temperature of your exhaust steam is probably but little above 212° Fah., and the exposed surface of the pipe is of too limited area to heat what we presume to be a room difficult to warm where the source of heat has so low a temperature. Put a lightly loaded valve on the discharging end of the heating pipe, or else draw steam direct from the boiler. Probably the latter method would be best.

J. G. Says:—I am building a large ice house, 100 feet square, over lager beer cellars; the joists used across the walls are oak, 6 X 12 inches, 20 feet in length, 20 inches apart; a 2 inch strip is nailed on the lower edge of each joist to support a 10 inch pine board between. I now propose to tar those joists all over, together with the board, with hot tar. I then want to fill between the joists, level with the top of each, with something that will not injure or rot the wood. I can get coal ashes from the salt works that are impregnated more or less with salt; or I can get saw dust or tan bark. The object in filling between joists is to protect the ice from exposure below. A floor is then laid over the whole, this is felted and tarred, and made water tight, similar to a roof; a rack is then placed on this floor to receive the ice, which will be from 12 to 15 feet thick. Owing to the immense weights those joists have to carry, it becomes necessary that the filling should be something that will not rot the timber very soon. Now which of the three, ashes, saw dust, or tan bark, would you advise? Answer: Your ashes, containing salt, will be certain to absorb moisture rapidly, and the weight and increased conductivity of heat consequent will be seriously objectionable. The sawdust, if perfectly dry at first, and if it can be kept dry, would be probably best as it is light, an excellent non-conductor, easily handled, and cheap. If, and we presume it will be the case, there is a probability that the filling around your ice house is likely to get moistened from exterior or interior, or both, we should advise tan bark. It is a good non-conductor, not liable to heat in consequence of dampness where the ice is removed, and the tannin remaining in the bark will be a good preservative of the woodwork in contact with it.

Seneca says:—I have had a dispute with a learned friend, and he will be ruled by your decision. He has a windmill on his farm, and uses the power to pump; I remarked that the rod, working perpendicularly, stopped at every revolution of the wheel; he says that as the rod takes its movement from a circular motion (the wind wheel), there can be no stoppage at all as long as the wheel turns. Please state how the matter stands. Answer: There is a cessation of motion at either end of the throw of the crank, but it is of indefinitely short duration. The period of rest is inappreciable and immeasurable by finite power. Seneca and his friend are approaching too closely the misty regions of metaphysics.

An old subscriber writes us to state the names of some cheap liquids, *not* of an oily character, which are not frozen by our coldest winters, and also please state if there is any chemical which will unite with water and form a compound not easily frozen. Answer: Pure alcohol, ether, bisulphide of carbon, and glycerin do not freeze at any temperature to which they have ever yet been subjected. Ammonia freezes at about 45° below Fahr. zero, and pure nitric acid at about the same point. Mercury freezes at —39° Fahr., sulphuric acid and some other substances require also a temperature far below the zero of Fahrenheit scale to produce solidification. The union of any liquid, which itself remains fluid at a very low temperature, with water will raise its freezing point. Experiment will best determine what liquids and what proportions will answer the purpose.



R. and W. say:—R affirms that a balance or fly wheel if in standing balance or, each side of equal weight need *not* be at right angles to the shaft, to run fast without affecting the *steadiness of the shaft*. Also that it may be keyed on at even 45° to the shaft without affecting it, except so far as the air may do so, as shown in the engraving; W. asserting the contrary. The one mistaken is to pay five years subscription to your paper for the benefit of him whose premises prove correct. Answer: If a balance wheel is accurately balanced and is perfectly symmetrical in form, and if it is keyed firmly on its shaft in any position except with its plane at right angles to the line of the shaft, it will always tend to turn itself until its axis shall coincide with the center line of the shaft This effort will be a constant one, tending to bend the shaft but does not necessarily produce unsteadiness in the shaft, as will be readily seen if the experiment be tried. R. is right. We shall be happy to settle many controversies like the above, on the same conditions. The loser certainly does the handsome thing in supplying the SCIENTIFIC AMERICAN for five years to his friend.

I was troubled with angle worms in my well, as "E. L." was with his, until I had a wood house built over it.—S. B., of Conn,

Keep the fur or woolen articles in paper boxes; paste a strip of paper joining the box and cover tightly. It is not possible for the moths' eggs to be laid through paper.—R. S. B., of Conn.

J. W. C., query 4, page 345, can silver brass by dissolving one ounce nitrate of silver, and two ounces cyanuret of potassa, in twenty ounces distilled water; let it stand until clear, then pour it in half ounce phials, each being two thirds full of Paris white: apply with a brush, and polish with a soft cloth.—F. S. B., of Me.

To T. J. S., query 26, page 314.—You may bleach broom corn in a solution of sulphurous acid gas (produced by burning roll sulphur) in water at a temperature of from 70° to 80° Fah.—A. O.

A. G., Jr., query 7, page 345, should learn the art of lithography, as, without a knowledge of it, all experiments in photozincography or photolithography must fail. Lithographic printing ink is used.—W. N., of N. Y.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges with much pleasure, the receipt of original papers and contributions upon the following subjects;

On Cheap Microscopes. By T. B.

On the Transmission of Motion. By L. S.

On a Method of Conveying Water to the Roofs of Buildings in Case of Fire. By W. C.

On Queer Freaks of a Leyden Jar. By N. E. F.

On a Premium Acre of Corn. By W. R. S.

On a Method of Constructing Cheap Fireproof Safes. By B.

On the Prevention of Fires. By W. C. D.

On Ball Lightning. By H. B. S.

On Marine Life Saving Inventions. By J. A. A.

On the Origin of Storms. By J. H.

On the Modern Atomic Theory. By R. D. W.

On the Formation of an Association to Assist and Encourage Inventors. By R. H. T.

On the Effect of Lightning upon Trees. By J. C. S.

On What Constitutes Credible Testimony in Regard to Scientific Questions. By J. H. P.

On Religion and Sciences. By J. F.

On Milk Sickness. By O. S. M.

On the Manufacture of Cotton Goods at the South. By E. J. C. W.

Recent American and Foreign Patents.

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

MEDICATED CONFECTION.—Nicholas Saltabassi, New York city.—This invention relates to a new and useful improvement in the line of confections, medicated in such a manner as to make it not only pleasant to the taste, but valuable as a promoter of digestion and a strengthener of weak digestive organs. It consists of equal quantities of grapes and Zante currants reduced to a pulp by heating, pressing, or macerating, or in any manner to form a homogeneous mass. The seeds and skins are then separated therefrom by straining or filtering, and the pulp reduced to a semi-liquid state. Equal quantities by weight of Mocha aloes and camomile flowers in the proportion of about one ounce of the extract to one pound of the above described pulp or sirup are then added. Before cooling, the composition may be run into "drops," and before or after cooling it may be divided into pieces of any form convenient for use, after which it is put up into boxes or packages f sale. Other ingredients, in addition to those named, may be added to giv the confection any desired flavor.

STEREOSCOPE.—Antonio Quirolo, New York city.—This invention relates to stereoscopes, and consists in a jointed handle permanently attached t the instrument and made attachable to a fixed standard, whereby the in strument is thus supported in the desired manner without requiring the handle to be detached.

ANIMAL TRAP.—George Barr, Clatskanie, Oregon.—This invention has fo its object to furnish an improved trap for catching and destroying mice, rats, squirrels, gophers, minks, etc., and it consists in a combination of springs, levers, and wheels whereby, on touching the bait, the animal is killed, and the trap automatically resets itself.

CEMENT.—William McKay, Ottawa, Canada.—To produce a hard, durable, and quickly setting cement the inventor makes a compound of marl or oyster shells, clay, road dust, wood or coal ashes (or equivalent alkalies), sand, soluble or other glass, or any one or more of the silicious ingredients, any one or more of the metallic oxides, carbonate of magnesia, or calcined magnesian rock. All the above mentioned ingredients, with the exception of soluble glass and ashes or alkalies, are mixed together with water and ground to a powder in a mortar mill or by any convenient process, after which the whole is brought to a liquid state by the addition of water. The compound is then run into tanks and left to precipitate. When the precipitation has taken place, the excess of water is withdrawn, and the ashes or alkalies are added and thoroughly mixed and incorporated with the compound. The whole is then dried either by artificial heat or in the open air, after which it is thoroughly calcined and ground to an impalpable powder in a flour mill or by any other process. The soluble glass, previously powdered, is then added and incorporated with the compound, which is ready for use in the same manner as other hydraulic or plastic cements.

OIL CAKE TRIMMER.—Washington Hawes, Port Richmond, N. Y.—This invention consists of an endless cutter and a press clamp with a table for holding the oil cake and suitable apparatus for working the cutter and clamp, arranged in such manner that one or more cakes placed on the table under the clamp may be trimmed completely all around the edges at one operation of the cutter. This invention also consists of a receiver for the trimmings and breaking apparatus combined with the trimmer, and adapted to break and pulverize them for being worked over again.

MACHINE FOR MAKING BUNGS.—Charles Abel, Morrisanis, N. Y.—This invention relates to a machine for manufacturing bungs for barrels and kegs and for similar purposes, and consists in a revolving tube, through which the timber is automatically fed in a movable tapering cutter head and spindle. When the bung has been turned and tapered a saw is brought down by a lever and the bung is cut off, and at the same time a burr bevels the corner of its large end. The operations of sawing off and beveling the corner are simultaneously performed.

HAY LOADER.—Anthony Garver, Lime Spring Station, Iowa.—This invention has for its object to furnish an improved device for loading loose grain, hay, etc., upon a wagon rack which shall be so constructed as to enable the loading to be done easily and rapidly, thus avoiding the necessity of binding the grain, and thereby greatly diminishing the labor and expense of harvesting. As the wagon is drawn forward, the loose grain or hay is gathered by the fingers or teeth, up which and up the platform it is assisted by the raker with his rake. As the grain or hay passes upon the rack, it is received and arranged by the loader. A lever extends up in such a position that it may be conveniently reached by the operator to raise the fingers from the ground in passing obstructions, etc. When the load has been completed the device is detached and left in the field, or attached to a second wagon while the first is being unloaded.

FLOUR BOLT.—John W. Johnson, Evansport, Ohio.—This invention consists of a reel with spiral ribs inside of the ordinary longitudinal ribs, the former arranged as wide apart as the width of a strip of bolting cloth, and the cloth arranged spirally on said ribs and nailed upon the inside.

CARTRIDGE BOX.—Polydore S. Thomson and Frank M. Thomson, of Hudson city, N. J.—The object of this invention is to make cheaper boxes and provide a better and more convenient arrangement of the cartridges; also to increase the capacity of the box. It is a cartridge box consisting of a wooden block having holes of the same length as the cartridges to be inserted, and any elastic perforated sheet, both covered completely by the leather body and all arranged compactly together.

FURROW STAFF.—George H. Comer, of Indiana, Canada.—The object of this invention is to provide a simple and practical instrument for determining the depth of furrows in millstones, so as to insure their equal depth throughout. The invention consists in the arrangement of a sort of sled, carrying a vertically adjustable furrow staff, which, in use, is painted to show the more elevated portions of the furrow by leaving paint thereo

EARTH CLOSET.—Henry Clark, Baltimore, Md.—The invention consists first, in providing the vibratory shaft of an earth closet hopper valve with a spring-retracted horizontal rod. It consists, secondly, in the peculiar construction and arrangement of a lock bar and catch in connection with the hopper. The case of the earth closet is made in the form of a washstand or oureau. The lower part of the front of the case is made in one piece, is hinged at its lower edge to the forward edge of the bottom of said case, and has cleats attached to its inner side to serve as ways or guides to the receiver when being drawn out and pushed in. The lower or small hopper is supported from the case in such a position that its bottom may be just above the receiver when said receiver is pushed in, and the discharge-opening of the said hopper directly above the opening in the top of said receiver, so that the earth from the said hopper may pass directly into the said receiver. The discharge opening of the hopper is closed by the door or valve, which may be closed and opened by turning a shaft. This shaft is connected with a rod which projects at the forward side of the case in such a position that the door, when closed, will strike against it and force it back, opening the valve and allowing the earth in the hopper to fall into the receiver. The discharge-opening in the bottom of the upper hopper is closed by a door or plate, so that when the said hopper is fully pushed back the said discharge opening will be closed, and when the hopper is drawn forward a little way the discharge-opening will be opened sufficiently to allow a small quantity of earth to pass down into the small hopper. The hopper has a bar so arranged as to draw it forward to supply the small hopper with earth by opening the door.

EYE GLASS.—Lucius B. Winslow, of New York city.—This invention consists in so forming the joints of the glass bows and arranging the connecting spring therewith that the screw for fastening the ends of the bow and securing the glass also fastens the spring to the bow, and holds it so that it can be adjusted to lengthen or shorten it and thereby vary its tension.

CAR COUPLING.—Robert Neisch and Charles G. Hirner, of Allentown, Pa.—This invention has for its object to furnish an improved car coupling so constructed as to couple automatically as the cars are run together, even though the cars to be coupled should differ in height, and which may readily be so adjusted that the cars will uncouple as they are drawn apart. A block or heavy plate is inserted in a seat in the frame work of the car, to which it is secured by bolts which pass through slots. Rubber springs, inserted between the inner edge of the block and the edge or shoulder of the frame work, are designed to diminish the shock when the cars are run together. As the cars are run together, the end of the coupling link enters one or other of the spaces between the plates, according to the hight of the adjacent car, and pushes back a lever, which allows the coupling pin to drop into place. By pressing down one end of a lever the movable parts of the coupling may be raised into place, and by pressing upon the other end the said parts may be lowered, releasing the lower end of the coupling pin so that the coupling link may be drawn from said pin as the cars are drawn apart, the hole in the block through which the pin passes being elongated into a slot to allow the lower end of the said coupling pin to be drawn outward. The pin is held in place in the forward end of said slot by a spring, placed in its inner end, and which is so formed as to be compressed and allow the pin to take an inclined position when its lower end is released and drawn outward. The lever may be placed beneath the frame if desired, in which case it should have rods pivoted to its ends and passing up through the said frame, so that the lever may be conveniently operated by the brakeman with his foot.

SMUT MACHINE.—George W. Grant, Middleport, Ohio.—This invention consists of certain novel combinations and arrangements of screening, separating, scouring, and fan-blowing apparatus. The hopper has a bottom composed of wires extending from the rear to the front, and diverging so that the spaces increase in width toward the front. Said spaces at the rear are too close together to let the grain fall, for allowing the sand and other small matters to escape to the spout below and be discharged through it, the coarse matters passing off at the front escape through a spout. The rear end of the hopper is arranged in the concave form shown, for breaking the force of the grain discharged against it, and a short distance in front of this back is a valve, which is swung up by the flowing grain in passing along the wires. This valve has longitudinal grooves in the side against which the grain comes, which grooves are designed to so act on the straws, sticks, and other matters having considerable length, as to turn them at right angles to the wires before letting them pass, to prevent them from falling through the wires. Along the middle portion of the bottom the grain falls through, between adjustable gates, into the hopper below. At the lower end of the bottom of this hopper is a gate which checks the descent of the grain and causes it to fall in a thin even stream through the space of the upper portion of the separator to the space below, to be exposed in such fall to a blast of air by a fan, to deflect the lighter grains and other matters inward to be separated into two grades by gates, which may be shifted to vary or regulate the separation. The first grade, consisting of the heavy grain, falls on the deflector, and is thereby chuted into the sides and bottom of the hopper, from which it is conducted to the scouring frame. The second grade falling between the gates passes into the oats and cockle separator, consisting of the concave metal plate and the wire brush or cushion wheel. The brush will have a slow rotary motion. From between the scouring devices the grain passes out into the case, between the blades, to the scouring action of which it is subjected for a considerable time, and is then forced up by them to the deflectors, where it is again subjected to a blast to have the scoured off light matters blown away; thence it passes out through the spout.

ENGRAVING AND CARVING MACHINE.—Thomas W. Minter, New York city.—This invention relates to a new machine for engraving and carving, die sinking, cameo and intaglio cutting, and similar fine and delicate work, in stone, steel, or other material, with the object of enabling the exact and artistic imitation of suitable designs. It consists, first, in fastening the engraving or carving tool in a spindle which hangs on a vibrating beam, said beam being also provided with the feeling or pattern pin. The chief novelty in this feature is in fastening the tool in a spindle which hangs horizontally on the beam, and in revolving said spindle by belt connection the same as a lathe spindle, so that the tool can be used to the very same advantage as that to which it is at present used on the lathe only. The next feature of novelty consists in fastening the pattern and the article to be cut upon platforms which can be tilted into a suitable inclined position. The tool can thereby be made to work at any suitable angle on the material to be cut, and consequently to incisions of all kinds, not only straight up and down, as in the present engraving machines, but also inclined, rounded, etc., as may be necessary for the making of reliefs for cameos or depressions for intaglios. The mechanism for thus inclining the pattern and the work is so united that both will be moved in exactly the same degree and offer the same angle of surface to the feeling pin and cutter respectively. This tilting motion is effected by worm wheel segments applied to the supporting platforms of the pattern and work, and matching both into the thread of a screw, which, when turned, inclines them. Furthermore, the invention consists in making and applying disks to the aforementioned platform which are jointly rotating and longitudinally adjustable in equal degree, and in providing the nuts that embrace the longitudinally adjusting screw, jointed to permit their being placed at suitable distances apart. Finally, the invention consists in hanging the screw which causes the joint rotation of the platforms in vertically sliding boxes, so that it will accommodate itself automatically to the greater or less hight of the platforms during their tilting motions.

PAPER CUTTING MACHINE.—Edwin R. Sheridan and Theodore W. Sheridan, New York city.—This invention has for its object to improve the construction of paper cutting machines. The knife bar and knife are moved up and down by the movements of the lever, which is connected with said knife bar by an adjustable connecting rod. The lever is pivoted and works in a guide slot in the lower part of the frame. To the end of the lever is attached the lower end of a chain, the upper end of which is attached to the shaft or to a drum placed upon and secured to said shaft. In the shaft or drum is formed a spiral groove into which the chain is wound as the shaft or drum is revolved in one direction, so as to raise the lever and draw the knife bar and knife down upon the paper to make a cut. The spiral groove in the shaft or drum keeps the coils of the chain parallel with each other, and thus prevents the coils overlapping and the chain from kinking while being wound and unwound, so that the movement of the knife may be steady and uniform. A block moves up and down loosely in grooves or ways in the frame and guide block, and is so formed that as the lever approaches the up per limit of its stroke it may strike against and raise the said block. The upper end of the block is inclined so that, as it is raised by the lever, it may move the free end of the lever outward, and thus allow the lever to descend by its own weight, raising the knife bar and knife to make another cut. The lever should have an adjustable weight attached to it, to enable its rapidity of descent to be regulated as desired. As the lever approaches the limit of its downward movement it strikes a spring attached to the lower part of the lever, which checks it, prevents rebound, and at the same time moves a second lever which is pivoted to the frame, and its upper end is connected with one end of the brake band or strap, which passes over the hub of the gear wheel, or a brake wheel attached to said gear wheel, so that the first lever as it reaches the lowest point of its descent, may apply the brake and stop the movement of the gear wheels, until motion is again given by throwing a clutch into gear.

GANG PLOW.—Joseph Lane, Eugene, Ind.—This invention consists in certain improvements in gang plows in which the plows are adjustably pivoted to the supporting frame, and connecting rods are used for connecting the plow beams with the evener, so that the draft on the evener forces the points in the ground and keeps them in; and one or more of the plows may be kept out of work while the others are at work, or some may be worked deeper than others, and all may be adjusted higher or lower; and in which rolling colters for cutting the sod, and a gage wheel for regulating the depth of cut and for supporting the weight at the front of the axle so as to take it off the horses, is used.

POTATO DIGGER.—Robert G. Dayton, North Granville, N. Y.—By suitable mechanism a shaft is actuated by the wheels, which revolve upon the journals of the axle. To the shaft are attached spur or chain wheels, around which passes the endless carrier, which also passes around spur or chain wheels attached to another shaft, that revolves in bearings in the lower forward part of the scoop flanges a little below and in the rear of the rear edge of the scoop. The carrier is formed of slats hinged to each other at their edges, and having flanges formed upon their lower edges to carry up the soil and potatoes more surely. From the carrier the potatoes and soil fall upon the shaker, through which the soil passes, and from the rear end of which the potatoes fall to the ground. By suitable construction the shaker is moved both laterally and longitudinally as the machine is drawn forward. A plate or apron is placed upon the forward part of the shaker in such a position as to receive the soil and potatoes from the carrier. The apron is held in position by rods, the lower ends of which are attached to the ends of the said apron, and the upper ends of which are connected with the carrier shaft, so as to keep the said apron always in the same position with respect to the rear end of the carrier.

EARTH AUGER.—Thomas C. Harris, Dresden Deep River, Iowa, assignor to himself and Amos Taylor, of same place.—This invention comprises certain improvements in the construction of the augers of well boring apparatus. The inventor proposes to make a large portion of the disk in front of each lip of thin spring steel plate, and attach said parts to the thicker parts rigidly, by riveting them or otherwise, by which a much more efficient and durable, as well as cheaper, arrangement is obtained than that in which the corresponding parts of thick and strong metal are hinged to the parts. In this case the spring plates yield sufficiently to allow the large stones to pass up with the earth raised by the bits, and they return to and retain their position for holding the earth when the auger is lifted out of the well much better than the hinged parts. These plates are curved inward and attached to the inner sides of the braces, so that the earth forced back on the auger will pass and not obstruct the turning of the auger, as it would if allowed to come against the front of said braces. These braces are made of gas tube or other like tubing, and the disk has holes where they are attached, so that air can flow down under the auger to prevent the forming of a vacuum below when the auger is raised; and below these holes the bow shaped spring cap plates are placed, so that they can slide back and forth as said caps spring up to the disk, when the auger is boring, to close the holes and protect them from clogging, and spring away again to open the holes and admit the air as soon as the auger is slightly lifted.

BRIDGE.—Hamlin G. Russell, of Lincoln, Ill.—The invention consists in arranging the bridge floor so as to leave a space between it and the lower chords, and so as to be below, or in the same horizontal plane with, the under side of said chords. It also consists in the arrangement of vertical tie bolts or rods, with the braces, cross beams, and chords, whereby a strong and durable yet comparatively light and inexpensive bridge skeleton is formed.

LATHE DOG.—Lorenzo P. Whiting, of Poughkeepsie, N. Y.—The object of this invention is to provide convenient means for holding bolts which it is necessary to turn, as in steam engine work, locomotives, and other nice pieces of machinery; and it consists in an adjustable dog in which each jaw is acted upon by a separate rib or scroll, and the ribs are placed at an angle which moves the jaws very quickly and saves time. The scroll plate is held to its place by the center plate, which is fastened to a stationary plate. The scroll plate is rabbeted for the center plate. By means of screws the dog is attached to the face-plate of the lathe, and by suitable means it may be adjusted to any distance from the face or side of the face plate, according to the length of the center in the lathe spindle. An orifice is provided through the plate, through which the center passes, and is allowed to come in contact with the bolt head with the point or center of the lathe.

[OFFICIAL.]

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For which Letters Patent of the United States were granted.

FOR THE WEEK ENDING NOVEMBER 19, 1872, AND EACH BEARING THAT DATE.

SCHEDULE OF PATENT FEES:

On each Caveat	$10
On each Trade-Mark	$25
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APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter named.

23,011.—WATER WHEEL.—N. F. Burnham. February 5, 1873.
23,022.—MOLDING STOVE COVER.—G. W. Gardner. February 5, 1873.
23,032.—STEAM PRESSURE GAGE.—T. W. Lane. February 5, 1873.
23,033.—HOSE COUPLING.—R. B. Lawton, W. H. Bliss. February 5, 1873.
23,040.—LOCKS.—L. F. Munger. February 5, 1873.
23,172.—TICKET PRINTING MACHINE.—R. M. Hoe. February 19, 1873.
23,792.—GAS PIPE CUTTERS.—J. E. Stanwood. April 9, 1873.

EXTENSIONS GRANTED.

1,946.—BARREL MACHINERY.—W. Trapp.
1,947.—BARREL MACHINERY.—W. Trapp.
22,129.—BOTTLE MOLD.—J. L. Mason.
29,152.—KETTLE FOR TRYING OIL.—J. L. Alberger.
22,157.—PIPE TONGS.—J. R. Brown.
22,166.—HOSE COUPLING.—J. C. Cooke.
22,174.—DEVICE TO PREVENT RUPTURE OF MAINSPRING.—D. B. Bitts.
22,185.—PRESERVATION OF FLESH.—N. B. Marsh.
22,186.—SCREW NECK BOTTLE.—J. L. Mason.

DISCLAIMERS.

22,129.—BLOWING BOTTLES.—T. L. Mason.

DESIGNS PATENTED.

6,249 & 6,250.—CARPETS.—A. Heald, Philadelphia, Pa.
6,251 to 6,258.—CARPETS.—H. Horan, Newark, N. J.
6,259.—CARPET.—A. M. King, Kidderminster, England.
6,260.—CARPET.—W. Mallinson, Halifax, England.
6,261.—CARPET.—A. Martin, Paris, France.
6,262.—CARPET.—W. McCallum, New York city.
6,263.—CARPET.—E. J. Ney, New York city.
6,264.—SHOE.—D. P. Brown, Reading, Mass.
6,265 to 6,267.—PRINTING TYPES.—James M. Conner, New York city.
6,268.—SLEIGH BODY.—J. C. Goold, Albany, N. Y.

TRADEMARKS REGISTERED.

1,062.—WATCH KEY.—L. F. English, Springfield, Mass.
1,063.—SHIRT BOSOMS.—S. Sibley, Boston, Mass.
1,064.—COMPOUND OXYGEN WATER.—G. R. Starkey, Philadelphia, Pa.
1,065.—HARMONICAS.—Strasburger & Pfeiffer, New York city.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]
From November 8 to November 14, 1872, inclusive.

AIR-HEATING FURNACE.—S. J. Gold, Cornwall, Conn.
BALING PRESS.—P. K. Dederick, New York city.
BOLT AND NUT MACHINERY.—F. S. Allen, C. F. Bitchel, New York city.
BORING AND DRILLING MACHINE.—C. F. Bitchel, F. S. Allen, New York city.
CLEANSING COTTON WASTE.—J. H. Post, New York city.
CLEANSING GRAIN, ETC.—J. F. Wood, Boston, Mass., F. F. Skinner, Detroit, Mich.
ELECTRIC TELEGRAPH.—J. B. Stearns, Boston, Mass.
FASTENING WINDOW SASHES.—J. M. Crossman, South Orange, N. J., G. S. Rice, Tarrytown, N. Y.
FLUID MOTOR.—W. C. Dodge, J. H., E. P., & R. W. Welch, Washington, D. C.
KALEIDOSCOPE.—W. Woodbury, New York city.
LOOM.—J. Lyall, New York city.
PIPE JOINT.—J. F. Ward, Jersey city, N. J.
PRINTING TELEGRAPH.—T. M. Foote, New York city

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AND HOW TO OBTAIN THEM.

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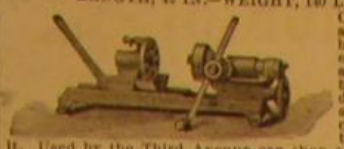

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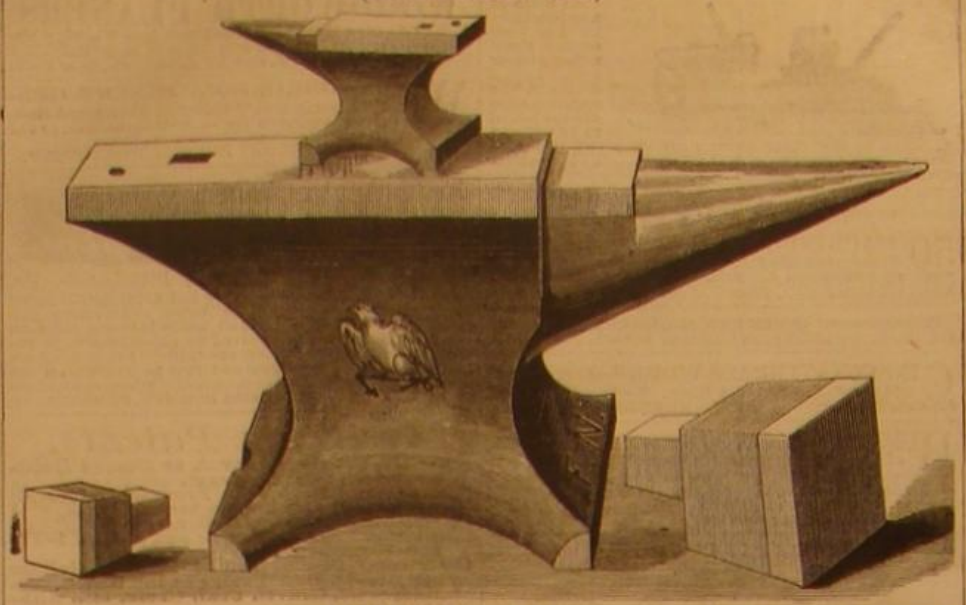

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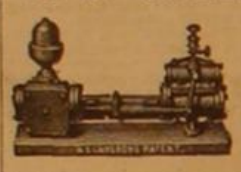

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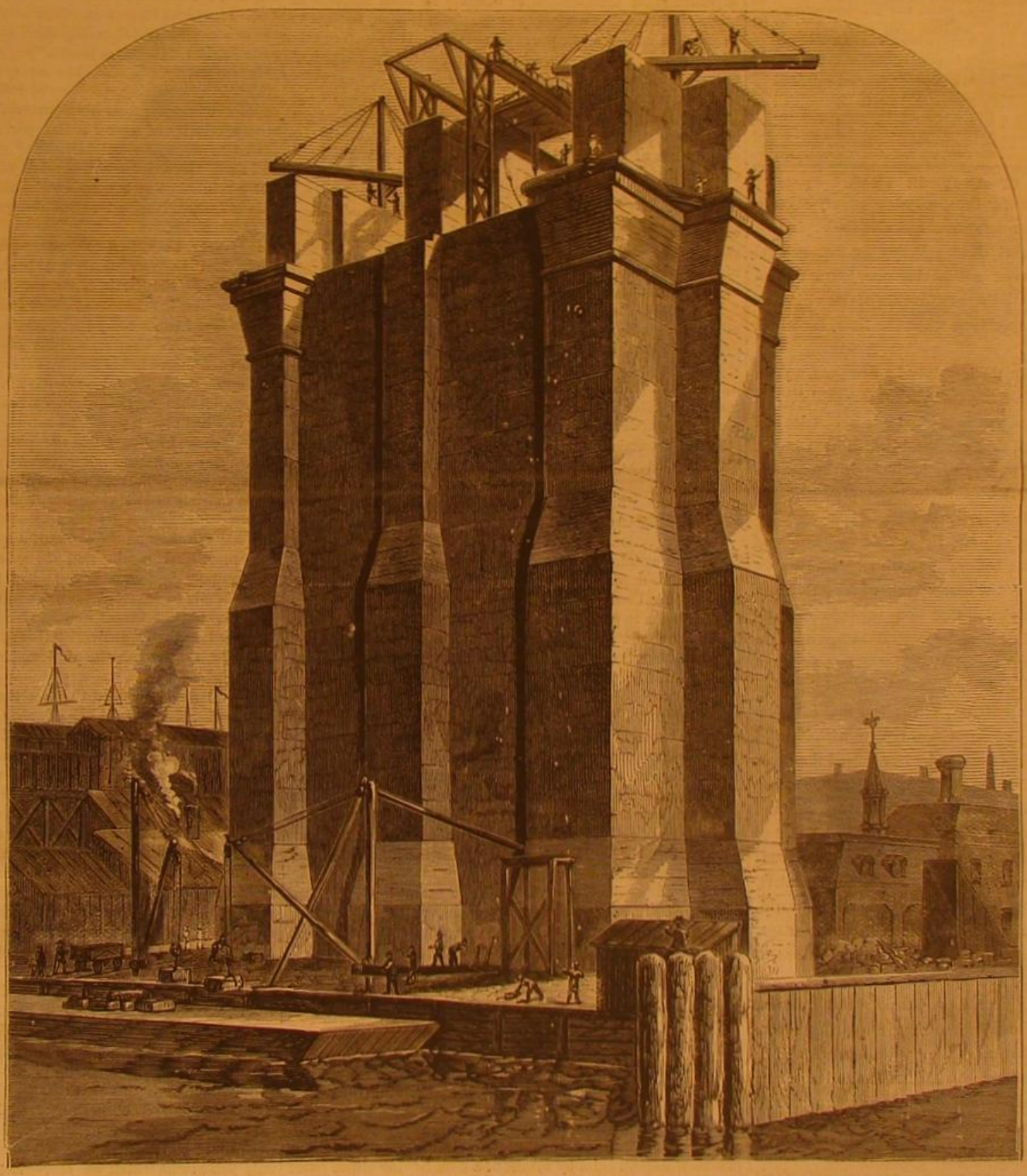
THE BROOKLYN PIER OF THE EAST RIVER BRIDGE.

On either bank of the East River, two great piles of masonry are slowly rising. One, towering far above all surrounding buildings, stands out in bold relief on the Brooklyn shore; the other, at the present time, scarcely half as high, faces its gigantic mate from across the stream. A river 1,620 feet wide separates these monster structures, between which, in due time, will be extended the graceful fabric of the great suspension bridge.

Our illustration will convey an excellent idea of the Brooklyn or eastern pier, as seen from the wharf of the Fulton ferry. Its total elevation is 144 feet above the water. The three walls on the summit are at present 26 feet in hight, and after being extended upward some 50 feet additional, they will be arched over, thus forming two grand portals leading to the floor of the bridge. The structure consists of three piers, united by connecting walls ten feet in thickness, thus leaving two wells, each thirty-three by twenty feet in dimensions.

The stone used in the construction is brought in schooners from various localities in Maine, and disembarked at Red Hook, N. J. Thence it is transported to the piers in scows, one of which is shown in the foreground of our engraving. On the Brooklyn pier, 82 courses have thus far been laid; the New York tower numbers but 52, one entire course having been recently lost by the sinking of the vessel of which it formed the cargo. The blocks, some of which weigh as much as eight tuns, having been brought alongside the wharf, are hoisted by derricks on to cars which travel on rails laid in various directions around the foot of the pier. Each stone is then wheeled around to the back of the tower and made ready to be elevated to the top when required. The hoisting is done by powerful engines which, with their boilers, are located at some distance to the rear of the structure.



THE BROOKLYN PIER OF THE EAST RIVER BRIDGE.

Situated in the middle spaces between the piers and projecting over the summit, are two heavy iron pulleys, in line with which, and extending down along the masonry, are strong timbers, to take the chafe of the stone as it ascends. Leading from a large drum on one of the hoisting engines, is a wire rope, which passes up over the left hand pulley, thence down to and under the ground, being led along by a number of sheaves, thence up again over the right hand pulley, and finally down to the second drum and engine. To both of the parts of this continuous rope, extending up and down the tower, are attached hooks which engage the Lewis bolts inserted in the stones. These hooks are fastened to the rope, so that one is descending while the other ascends; or, in other words, so that the elevation of one block overhauls down the line to which another block is to be attached. As each stone reaches the top of the tower, it passes between the rails of a track laid on framework, lengthwise the summit, from right to left in the engraving. As it rises above this railway, a low car is shoved beneath it, when the stone is transported under one of the derricks shown in the illustration. The last mentioned appliances, of which there are two, are of wood, strongly made, and each is provided with a small double cylinder engine geared to a drum, which winds up the fall of the tackle. Steam is supplied in pipes led from the ground. The stone is raised from its carriage by one of these derricks, and, if belonging to either of the outer superstructures, it is at once placed in position. If it is destined for the middle wall, it is swung by a tackle from a car, actuated by hand mechanism and traveling on an elevated framework, and thus readily transported to the proper point.

At the time of writing, work upon the Brooklyn pier is nearly at a standstill; on the New York side it has entirely ceased. The cause, we learn, is the non-arrival of stone; though in any event not over two or three more courses could be laid on account of the increasing coldness of the weather. Labor upon the bridge generally is now, as it indeed always has been, no slight task. At first compelled to work in the dense atmosphere of the caissons, the men are now obliged to toil at a dizzy altitude, where, in inclement seasons, there is always a strong and bitterly cold breeze.

In order to inspect the progress of the work, we recently mounted some dozen or two staircases, built as a means of ascent in an angle of the wall, and succeeded in attaining the summit, though in a somewhat breathless condition. From the floor of the bridge, that is, between the superimposed smaller walls, the view is magnificent. The cities of New York and Brooklyn lie at one's feet, while the eye can reach far out into the Narrows, over to the hills of New Jersey, and up and down the length of the East River beneath. From the center of the span, when completed, a prospect will be afforded which, for grandeur, will have no rival in the world; but, in spite of such attraction, with the wind howling around one's ears and blowing with a force sufficient to render it dangerous approach to the edge, neither the top of the Brooklyn pier nor the middle of the future bridge will, we imagine, be largely frequented by sight-seers in winter time. It is only necessary to pay a single visit to the breezy summit during the present weather to become fully convinced both of the above fact and also that the life of those who have to labor so far elevated skyward is not to be especially envied.

The solidity of the foundations has been thoroughly tested by the immense weight of these great towers which, we are in, formed, have given no evidence of settling. The entire weight of the bridge will be 4,900 tuns or, including that of snow, ice, etc., considered as transient, will amount to about 6,100 tuns. Its breaking strain is 30,000 tuns; that of each of the four main cables is 7,500 tuns, or, at the angle at which they will support their load, about 10,000 tuns. From the tower other cables extend to the floor of the bridge, so that taking into consideration their strength, with that of the four above mentioned, it is hardly probable that the structure will ever be loaded by a weight greater than one third its carrying capacity.

We shall, in all probability, have little to chronicle regarding this great engineering work until the return of spring. Title to the ground for the anchorages for the piers has not, as yet, been secured by the Bridge Company, and the cold weather, together with the deficiency of stone, will doubtless prevent, for the present, further additions to the hight of the towers.

Wetting Coal for Heating Boilers.

M. Seidler, in the *Practische Maschinen-Constructeur*, refutes the opinion, so generally prevailing, that wet coals burn better or produce more heat than dry ones. If the blacksmiths sprinkle their coal dust near the blast pipe with water, they merely do it to keep the top layer in shape. Wet coal burns as slowly as green wood, evidently from the fact that the water must evaporate before the fuel will burst out in flames. The author always obtained more steam by employing dry coal, and in a comparative trial, extending over a week, he saved fourteen tuns of coal by not wetting it.

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NEW YORK, SATURDAY, DECEMBER 28, 1872.

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THE END OF ANOTHER YEAR.

The present number marks the close of the twenty-seventh volume of the SCIENTIFIC AMERICAN and also the expiration of many thousand subscriptions. Following our general rule based on the desire of not forcing our journal upon those who may not desire the continuance of its visits, we cease forwarding it to subscribers when the term, for which they have prepaid, ends.

The next issue will bear the imprint of a new year, a year, we trust, which at its close may find our country still further advanced in prosperity and greatness, and our industries and manufactures even more thriving; and which will in the end, to the inventor and to the artisan, the brain and hands of the nation, be productive of those substantial rewards which their labors so richly deserve.

With reference to the volume, the concluding words of which we now write, we believe that without egotism we may truly assert that it is the best we have ever published. And we may add the conviction that in no other journal can the same amount of valuable and practical information be found, so attractively presented. We point with a pardonable pride to the number and character of the original engravings embellishing every issue; to the fact that fifty-two numbers so copiously illustrated and so replete with interest can be afforded at three dollars a year, less indeed than half the subscription price of the majority of our English scientific contemporaries. Other periodicals, both American and foreign, have repeatedly expressed a natural surprise that so low a rate can be maintained. The explanation is obvious: mechanics, inventors, manufacturers, engineers, chemists, indeed all interested in the industrial progress of the world, make up our list of *subscribers*; with such a patronage, failure is impossible; aided by such numbers, cheapness of our product is a necessary consequence.

To those who for many years have been constant friends, the promise of increased excellence during the coming twelve months, the assurance that, as in the past, no effort will be spared to make the SCIENTIFIC AMERICAN the leading paper of its kind in the world, seems almost superfluous. To others, the proof that former and similar pledges have been amply fulfilled is best found in our circulation, which though steadily increasing, is now larger than that combined of all other journals occupying a similar field. We have printed for some time past 50,000 copies per week, and we have every hope that before the end of 1873 this already large number may be augmented to 75,000.

In conclusion, we ask our old subscribers, many of whom for a score of years have appreciated and encouraged our efforts, not only to renew, but still further assist us by obtaining *new names*. As the last volume was better than its predecessor, so shall the coming series be superior to that just concluded, and thus we trust that each year may find us the same silent though faithful teacher and, as we advance, a wiser and better guide to all who, whether in the realm of science, industry or art, labor for the benefit of their fellow men.

PROPOSED CHANGE IN THE PATENT LAW.

We have received a copy of the proposed amendments to the patent laws, lately reported to the House of Representatives by the Committee on Patents, which amendments are understood to have originated with the present Commissioner of Patents, General Leggett.

The bill provides for the detachment of the Patent Office from the Department of the Interior, and the forming of a new department to be known as the United States Patent Office, the various appointments thereto and general supervision to be in the hands of the Commissioner.

The rapid growth of the Patent Office and its widespread influence upon the progress of the country seem to render this change desirable, and we should be glad to see it effected.

The bill next provides for the appointment of nine "chiefs of division" and one chairman of the board of appeals, at a salary of $3,500 each, who are to supervise and approve the work of the principal examiners, hear and decide all questions arising upon applications for patents and reissues, give judgments allowing and refusing the same, etc.

In other words, this is a provision to add a bureau of red tape to the business of obtaining patents, and to place unnecessary obstructions in the path of the inventor. One of the distinguishing features of the American Patent Law is the comparative absence of official circumlocution in the grant of patents. We say comparative, bearing in mind the superabundant interference of officials in such matters in other countries. We already suffer from it here, but not to so great an extent as it prevails abroad. It is sufficiently difficult now for the American inventor to get his patent promptly allowed.

It cannot improve the chances of the inventor to have the work of the principal examiners supervised by another set of examiners. We all know how such things work. If the examiner is of opinion that an invention is patentable, the chief of division will be just as likely to be of the contrary opinion. It is a matter of opinion on both sides, and unless the two parties were frequently to differ, the supervising chief would be apt to consider himself to be of little importance. The way to ensure official delays, circumlocution and red tapeism is to multiply officials and place one set to watch and criticize another set.

It seems to us that the new board of chiefs which this bill proposes is unnecessary. In former times, there was greater difficulty in making examinations at the Patent Office than now, for then there were no duplicates of the patents; but now the patents are printed, and the examiner is enabled readily to inform himself as to the state of the arts in his particular subdivision.

If the Commissioner needs more help in examining, let him have more examiners. But the plan of creating a body of nose men to smell out and poke over the doings of the principal examiners, we believe to be unnecessary and injurious to the efficient working of our patent system.

Another section of the bill relates to the qualifications of persons or agents who represent the inventor in making application for a patent. Such agent is to be required to produce, to the Commissioner of Patents, satisfactory evidence of his fitness to practice before the Patent Office. It seems to us that the law is well enough as it stands. It provides that persons who, by their acts, prove themselves to be unworthy shall be prohibited from practice.

If the inventor may apply in person for a patent, he certainly ought to be at liberty to appear by a representative of his own choice. The new proviso prohibits this, and requires the inventor to employ some person upon whom the official unction of the Commissioner has previously descended. Here the unnecessary red tape and official interference again makes its appearance. Give the Commissioner the power to say who shall and who shall not have the privilege of practicing before the Office, and you increase the difficulties and expenses of obtaining patents.

If any changes are to be made in the patent laws, let them be in the interest of simplicity, freedom, reduction of costs, and generous encouragement of inventors. The proposed changes we have criticized are likely to have an opposite effect. We shall refer to the subject again.

TIDAL WATER POWER; A NEW AND USEFUL SUGGESTION.

Mr. A. E. Gordon, the editor of the New Brunswick, N. J., *Times*, has made a suggestion in reference to the utilizing of the power of the tides, which appears to us not only novel but practical and important.

The use of tidal water power to drive mills is common along our coasts. The ordinary method is to shut off the mouth of a small inlet by means of a dam having sluice gates to admit the sea water which, by the rise of the tide, enters and fills the enclosure. By the fall of the tide the enclosed water derives sufficient head to drive a turbine or other wheel, and so give motion to the mill. But when the tide again rises of course the head is destroyed, so that the mill can only run alternately, during two separate periods of a few hours each out of the twenty-four. It is this alternating and irregularity in the hours of motion, together with the periods of entire inactivity, that prevent the employment of this species of motive power for general industrial purposes.

The improvement suggested by Mr. Gordon consists in providing two water basins, both of which are to be shut off by dams from the sea. One of the basins is to serve as a constant supply reservoir of water, and it is to have a close dam of such width and hight that the tide water, when it has risen to within one foot of its normal hight, will begin to pour over the dam and quickly fill the reservoir. The dam of the other basin is to be provided with swing valves which permit exit of the water at low tide but prevent ingress of water from the sea. This basin, we will now suppose to be empty. The water wheel is to be placed between the two basins, and the fall of water from the reservoir into the discharge basin will afford continuous motive power so long as the supply of water lasts and until the rise of water in the discharge basin destroys the head. But as this latter basin is entirely emptied at every tide, the head will be always kept good, presupposing, of course, that the reservoir and the discharge basin are made of proper size. In respect to this last point, it is well known that basin capacity on our coasts is almost unlimited, and there are thousands of localities where extensive water powers may be thus provided and maintained at a comparatively small cost. We trust that Mr. Gordon will proceed to elaborate his plan and place it before the hydraulic engineers of the country for discussion.

THE PLANET JUPITER AS REVEALED BY THE MODERN SPECTROSCOPE, PHOTOMETER, AND TELESCOPE.

From a cosmical standpoint our sun is only one of the millions of stars which fill the infinity of space, and its annihilation would scarcely be perceived, while our moon is of no more consequence than a pebble on the seashore. From a terrestrial point of view, however, they are the most important heavenly bodies, and next to them comes the planet Jupiter, for reason of his immense size, which is more than twelve hundred times that of our earth and nearly equal to all the other planets taken together, for which reason Proctor calls Jupiter "the giant planet."

It is not only his size, but everything in relation to him which is astonishing. His axial rotation of 10 hours is so rapid that masses near his equatorial zone are carried round with a velocity of over 7 miles per second, a velocity sufficient to overcome all terrestrial gravitation, as a cannon ball fired upward from the earth with this velocity would never return. The consequence of this is that Jupiter's polar axis is 7,000 miles shorter than his equatorial diameter, which is 82,000 miles.

It is clear, then, that the ordinary notion, the result of the study of our astronomical text books, that the planets Mercury, Venus, the Earth, Mars, are of about equal importance with Jupiter, is erroneous; those four inner planets are very insignificant when compared with the colossal outer planets, Jupiter, Saturn, Uranus, and Neptune.

The next remarkable feature of Jupiter is his low density. The specific gravity of his mass is not much above that of water, while that of the earth exceeds water six times; and this fact has been a puzzle to astronomers, especially as falling meteoric masses from the planetary space have never shown any substances not present in our earth, and also as the spectroscope appears to reveal to us that the whole universe consists of the elements which are all known to us by terrestrial investigation.

What can then be the cause of Jupiter's low density, when he is most likely a collection of the same elements and chemical compounds found on our earth? And here, three different kinds of investigation, each requiring its special apparatus, have been at command of the astronomers, and have satisfactorily answered this question. The first is the telescope, the second, the photometer, the third, the spectroscope.

The telescope revealed the fact that Jupiter is surrounded by a series of vaporous belts laying parallel to his equator. Some of these belts are creamy white, others of a copper color, becoming bluish near the poles. These belts are subject to immense changes. In 1860, a rift in one of them behaved so as to prove the existence during six weeks of a violent hurricane, raging over a surface equal to that of the whole earth, and with a velocity of over 150 miles per hour. Such a storm on earth would destroy every building, tree, ship, etc., in fact would totally desolate the earth's surface. In 1870, it was discovered that the creamy white belt on the equatorial zone became orange, lost its sharp outline, and showed appearances which astronomers compared with post-holes, pipe bowls, oval moldings, etc.; while at the present day Lassell, President of the Royal Astronomical Society of England, and Father Secchi, possessing the finest telescope in Rome, agree that Jupiter is now presenting a most wonderful aspect, which only can be explained by the hypothesis that what we see of his surface is nothing but vapors of different substances, and that thus the planet possesses a much higher temperature than our earth.

The photometric observations of Zöllner in Germany, and of Bond in America, prove that Jupiter gives more light than could be reflected at his distance from the sun, if it was only solar light which we see. Zöllner found that he gives four times more light than would be the case if his surface was like that of our moon, and the conclusion to which we are driven is that the planet shines partially with its own light, is in fact red hot, and is surrounded by vapors.

The spectroscope has verified this view, and proved that the visible surface of the planet contains enormous quantities of aqueous vapor highly heated; in fact, it consists chiefly of superheated steam, of such very high temperature that it is self-luminous, and thus the planet itself is of a much higher temperature still.

The four satellites, in the meantime, are cold; they are so much smaller that they have cooled down far below the temperature of the planet, and may be inhabited, while the heat of the planet makes up for the great distance from the sun. Our earth and moon were probably once in the same condition, geology proving that the earth's crust was once in the fluid state, and our globe surrounded with red hot vapors. At that time the moon had probably not cooled down

to its present low temperature, and received light and heat from sun and earth both.

The proof of this condition of Jupiter's satellites is furnished by the observation that, when a satellite passes over the light disk of the planet, it forms a perfectly black spot, while its shadow is not black but shows the luminosity of the vaporous surface on which it fell. Perhaps this vaporous envelope is of great extent, and the solid or fluid nucleus of the planet is much smaller than Jupiter appears to us.

The conclusion then arrived at, by astronomers of the present day, is that, when comparing the sun, Jupiter, and the earth, Jupiter is midway in temperature as well as in size; the sun is about one thousand times larger than Jupiter, and Jupiter about one thousand times larger than the earth. While the sun is most intensely white hot, Jupiter is moderately red hot, and the earth only radiates obscure invisible heat.

PROGRESS OF THE HOOSIC TUNNEL.

The great railway tunnel through the Hoosic Mountain, near North Adams, Massachusetts, is progressing very effectively, and it is probable that the bore will be completed in October, 1873. The boring has for the past year or more been carried on at four headings, one on each side of the mountain and two, in opposite directions, from the bottom of a vertical shaft which is sunk near the middle of the mountain. The 12th of December was an eventful day among the workmen. After some unusually heavy blastings, a junction of the two headings between the east end of the tunnel and the central shaft was then effected, greatly relieving the contractors by the immediate drainage of the water from the central shaft. The central shaft is 1,030 feet in depth, and, since the junction was made, it is found to operate like an immense chimney, producing a strong draft through the whole length of the eastern section of the tunnel, a distance of nearly two and a half miles. It has not yet been ascertained wha., any, difference exists between the lines of the two borings which have just been united; but it is believed that there can be only a trifling variation. The working of the pumping machinery, previously required to keep the shaft free, was a difficult and expensive operation. The water will now flow down grade into the Deerfield river and the pumps may be removed. A distance of about four thousand feet remains to be cut in order to complete the bore. The total length of the tunnel will be almost five miles. It is the second longest tunnel in the world, the Mont Cenis bore, through the Alps, being nearly eight miles in length. But the St. Gothard tunnel, through the Swiss Alps, which was commenced during the present year will beat both of the above, as it will be thirteen and a half miles in length.

THE FIRE AT THE FIFTH AVENUE HOTEL.

The Fire Marshal of New York, after an exhaustive examination of many witnesses, is of the opinion that the recent fire at the Fifth Avenue Hotel was caused by accident. The testimony clearly shows that the flames originated in one of the servant women's chambers, through which passed the laundry elevator, the opening therefor being a square aperture, cased with dry wood, extending from top to bottom of the building, about ninety feet. This elevator opening formed, in effect, an immense chimney for the rapid progress of the flames. The woman who occupied the chamber testified that she was in bed, sound asleep, and awoke to find herself surrounded by flames. Her clothing was destroyed, the bed clothing on fire, and she herself was badly burned. She escaped into the hallway, and gave an alarm; but the fire had already traveled to the attic, and an alarm been given. The Marshal thinks that the woman, in getting into bed, probably stepped upon a match, which ignited her clothing; the fire smoldered for a while, but at last increased, the flames entered the elevator, the draft carried dense smoke to the attic, which there suffocated the eleven unfortunate females, who lost their lives long before the flames could have reached their bodies.

The evidence goes to show that the Fifth Avenue Hotel was well provided with the apparatus for extinguishing fires, in the use of which the men connected with the hotel are frequently drilled. All the floors are provided with water mains, to which hose pipes are kept constantly attached, and there are also steam pumps always in readiness in the basement. In the present case it was not half a minute after the alarm was given before some of the hose had been stretched and water directed upon the flames. But the fire had evidently been burning for some little time before its discovery, and it was then too late quickly to check its spread.

RETIREMENT OF JUDGE NELSON.

After nearly half a century's honorable service on the bench, Judge Samuel Nelson has retired from the Supreme Court of the United States, thus closing a judicial career, in point of time, unparalleled in the history of jurisprudence.

Judge Nelson was appointed Judge of the Sixth Circuit, which included Otsego county in this State, in April, 1823, and held the position until February, 1831, when he was made Associate Justice of the Supreme Court of the State of New York. In 1837 he succeeded Judge Savage as Chief Justice, and in February, 1845, he was elevated to the bench of the Supreme Court of the United States, being appointed by President Tyler. His most notable decisions were in the celebrated Dred Scott and legal tender cases, though especial deference has always been paid to his opinions in questions of admiralty law and intricate patent suits. In deciding the latter class of litigation, Judge Nelson has probably had a greater experience than any judge that has ever lived, and has won the highest honors for his strong common sense, broad views and ready grasp of the weightiest subjects.

The Judge has, with slight exception always enjoyed robust health, and has never been absent from duty at the State or United States Courts but one term, that of last year. At the closing session of the High Commission in the spring of 1871, he incurred a severe illness which confined him to his house for several months. From this he has since recovered and now, impelled by his weight of years and need of repose, retires from the position which he has so long and so ably filled.

While expressing our regret at the necessity which causes, to the inventors of the United States, the loss of so honorable, wise and faithful an arbiter, we but join in the general public opinion in thus placing upon record our earnest appreciation of the "purity, dignity and impartiality which have commanded the confidence, esteem and admiration of an entire nation, and the acknowledgement of jurists in other lands."

THE CENTENNIAL OF 1876.

The organization of the United States commission appointed under a recent act of Congress is now perfected, and two meetings have been held at Philadelphia. Funds are now needed to carry out this great and patriotic work; and, in order that our readers may understand the salient points of the undertaking, we extract the following from information furnished by Mr. J. V. L. Pruyn of Albany, the United States Commissioner from New York.

It is proposed to celebrate the one hundredth anniversary of American Independence by holding a Grand International Exhibition of the arts, manufactures and products of the entire world, in the city of Philadelphia in the year 1876. The United States Centennial Commission is made a body corporate authorized to issue stock to the amount of ten millions of dollars, in shares of ten dollars each, for the purpose of defraying the necessary expenses. Subscriptions will be received at all incorporated banks, State and National, and by numerous private bankers; the books will be opened for one hundred days, beginning in New York from November 21st. The stock is apportioned *pro rata* among the States and territories, according to their respective populations. In New York, the quota is $1,136,660.

We sincerely trust that this call for money for so laudable a purpose will meet with a most generous response. The exposition for which we have three years to prepare will be the grandest the world has ever seen; and we indulge in no egotism when we predict that it will throw far into the shade the World's Fairs of London and Paris, and even the much vaunted Vienna show.

It will exemplify the unprecedented progress of our nation during its brief existence of one hundred years; and, while attracting to our shores the products of other countries, will exhibit to the world at large not only what we have accomplished, but the vast resources of our territory remaining yet to be developed. Such an exhibition will be of incalculable benefit to the whole land, and we are confident that no efforts will be spared or assistance denied which will tend to make it a worthy commemoration of the greatest event in the history of the United States.

AMERICAN INVENTIONS IN EUROPE.

In referring to the dangers of infringement of his patent rights incurred by the American inventor contributing to the Vienna Exposition, we have frequently alluded to the fact that Austria is by no means the only country in Europe which, under cover of a so-called protective act, countenances the piracy of the property of strangers. The same is true to a greater or less extent in all the continental nations, though from the evidence of Mr. Henry Bessemer, the English manufacturer, recently published in our columns, and from the facts given below, it may be fairly conceded that the new German Empire rivals its southern neighbor in systematic injustice. The Paris *American Register* prints a letter from a correspondent in Berlin, in which we find it authoritatively stated that the Prussian field artillery, which figured so largely in the recent war, is the invention of a prominent American, who applied for a patent in Prussia some years since and was rejected. The inventor at the same time offered his invention to the Government and solicited a proof, but the Government condemned it without a trial. Later, under the noted Prussian manufacturer's name, Krupp, it became an invention and was adopted. The new small arm (described in our last issue) was invented by an American, and a patent applied for, but as usual the application was rejected. Trials were made with it before the Prussian Government, in 1868 which attracted little or no attention, but recently it also has been adopted under the name of a Prussian subject.

In further corroboration of the assertions above made as regards German injustice, we have lately received a communication from an American inventor, detailing his experiences in both Austrian and Prussian patent law. He favors us with the following copies of official letters received by him, and adds that they may prove of especial interest from the fact that the identical invention has since been adopted by the German Government and a patent thereon granted to a native of the country. We give the documents *verbatim* so that they may explain themselves:

(TRANSLATION OF REFUSAL.)

BERLIN, May 21, 1868.

The demand for patent, contained in the papers hereunto annexed, of the 21st of March, for improvements said to be novel in breech-loading firearms, with sliding and turning bolt, relates, according to the opinion of the Technical Commission charged to examine the patents, to the shape of the grooves and channels which serve to operate and secure the locking. As such they are not patentable, inasmuch as patents cannot be granted for modifications in forms already known. The assemblage of a spring, furnished with a hook on the locking piece in order to remove the cartridge shell from the gun, is a combination well known, and has been the object for many demands of patents. In consequence, the patent cannot be granted.

THE MINISTRY OF ETC., ETC.

(COPY.)

BERLIN, September 16, 1871.

To your application of August 30, we reply, returning documents, that the patent applied for Mr. Benjamin Berkley Hotchkiss, of New York, "improvements in projectiles," cannot be granted, because nobody can be prevented attaching to the point of a projectile a whistle, etc., to produce a loud sound.

Ministry of Commerce, Trade and Public Works,
IV. Department.
(Signatures illegible.)

These literal translations, we think, will supply adequate proof of the Prussian mode of conducting patent business. The plan is simply either to urge inventors to make experiments, and after all possible information is elicited to inform the would-be patentee that his device is no improvement or not enough of a one to justify the further proceeding of the trials, or else, to assert that the invention is a mere modification, and as such not subject to the grant of a patent. Of course it is practically impossible to discover where a modification stops and where an improvement begins.

Dismissing here the Prussian law, we have yet a few words to add regarding the Austrian regulations, in the shape of the following extracts taken from the letter of a practicing attorney in Vienna, sent to his American client and by the latter gentleman transmitted to us. The communication states that if the American Government would take cognizance "of the way in which patent affairs are treated in Austria, it might feel it a duty either to make the Austrian Government aware that it must either ensure protection for patents or the American Government would be obliged to warn its citizens from being entrapped by a mere show of protection at the exposition." Further "there is no doubt but that the ministry will not alter its proceedings, having given no order as yet." "Your papers have again wandered to the Polytechnic School, and if they do not call experts to inquire into the affair in your presence, so as to give you an opportunity to explain the matter, it is evident the suit will never be finished, except if they think it admissible to decide against you." The date of this document is October 26, 1872, proving that, as late as two months ago, nothing had been done to alter the existing laws.

There is little necessity of our entering further into the details of this subject. No treaty between the Austrian Government and our own has as yet been concluded, nor in the slow circumlocution of diplomatic negotiations is there much probability of anything of the kind being done in due season to prepare goods for exhibition. Moreover, there is no use in patching up a bargain with Austria and leaving Prussia untrammeled; there is just as much danger to be apprehended from one country as from the other. Altogether, we can hardly see how any new American device can be forwarded to Vienna unless the owner chooses to risk the dangers we have pointed out. If then it is expedient to send novel inventions, our display must necessarily be confined to already well known products, and in reference to these there must be a decided objection to Congress wasting public funds, by appropriating money sadly needed for many purposes of direct national benefit, solely to secure an advertisement for established and wealthy manufacturers.

SCIENCE RECORD FOR 1873.

The forthcoming volume of the above, for the new year, will be ready sometime in January, and promises to be a most interesting and valuable work.

The unexpected success which attended the issue of the volume for 1872 has encouraged the publishers to undertake its enlargement and improvement. The RECORD for 1873 will contain almost twice as much matter as the preceding volume. The new RECORD will have six hundred octavo pages, will be illustrated with a large number of engravings, and will contain accounts of all the leading facts of interest that have transpired during the preceding year in the various branches of science, embracing Chemistry, Metallurgy, Mechanics, Engineering, Railways, Navigation, Electricity, Light, Heat, Sound, Technology, Botany, Horticulture, Agriculture, Rural Household Economy, Materia Medica, Therapeutics, Hygiene, Natural History, Zoölogy, Meteorology, Terrestrial Physics, Geography, Geology, Mineralogy, Astronomy, Biography, Necrology, etc. In short, the general scientific progress of the world during the preceding year will be faithfully represented in SCIENCE RECORD for 1873. It will be a volume packed full of useful information, exceedingly convenient for reference, and should have a place in every library. Price $2. Published by Munn & Co., office of the SCIENTIFIC AMERICAN, New York.

NEW GALVANOMETER.—M. Bourbouze of Paris is the inventor of a new galvanometer. It consists of a magnetized steel balance beam, delicately poised and capable of being adjusted by means of sliding weights. This beam, which is enclosed in a coil of wire, is provided with a long pointer at its center, and the end of the pointer passes along a graduated arc. This galvanometer is so delicate that it shows a considerable deflection when the hand is brought near a thermopile connected with it.

MALLET'S METHOD FOR OXYGEN.

This method is based upon the property of water to retain the oxygen of the air in preference to the nitrogen. Atmospheric air, as well known, is composed of 20·55 parts oxygen and 78 16 parts nitrogen, by volume, the remainder being carbonic acid and vapor of water. The air dissolved by rain water of a temperature of 50° Fah. has been found to consist of 33·76 parts oxygen, 64·47 parts nitrogen and 1·77 parts carbonic acid, by volume, showing thus an increase of 13·21 parts oxygen and a decrease of 13·69 parts of nitrogen. One quart of water, according to Dalton, is capable of dissolving 2·44 cubic inches of air. This dissolving action of water is correspondingly increased by pressure, and Mallet has made use of it in the following manner and by the apparatus represented in our engravings. There is a series of chambers, A, B, C, etc., eight in number, consisting of strong sheet iron, almost entirely filled with water. There is also a series of double acting air compression pumps, a, b, c, used in connection with the chambers as shown. The pistons and slide valves of these pumps are all moved by the same shaft. Piston of pump, a, in its descent presses atmospheric air at p into chamber A. m is a perforated plate, so arranged that the air may be divided and pass up through the water in fine streams. In its passage through the same a part of the oxygen is absorbed and retained in the water, while the air, deprived of oxygen (the nitrogenized air) rises to the upper part of the chamber. When the piston of pump, a, descends, piston b ascends, and *vice versâ*, and when stopcocks, E, E, E, are opened, those at their right are closed, and *vice versâ*. This latter operation is performed by hand and by the system of paralellograms indicated. For the better understanding of the working of the apparatus, we will suppose that the pumps have been in operation for a short time. The first, third and fifth chamber, etc., in the position of the pistons as indicated, will contain nitrogenized air in their upper portions; in each succeeding one, the portion of nitrogen is less than in the preceding chambers. The second, fourth and sixth chambers contain, on the other hand, in their upper portion an oxygenized air, the air being more highly charged with oxygen the more chambers it has passed through. When the first piston descends, the nitrogenized air from the top of chamber A is carried over through pipe C to the upper side of the piston in cylinder a; simultaneously the nitrogenized air in the top of chamber C is drawn into pump c. This air is drawn into the cylinder when the piston goes down, and is discharged therefrom at the arrow into the surrounding air, when it rises. In its descent, fresh portions of atmospheric air are driven into chamber A. Now as to piston C, it is evident that, when it rises, an exhaustion takes place in chamber A; hence the oxygenized air, which, up to this moment, has been dissolved in the water, is caused to escape and is drawn over below cylinder b. When piston b descends this air is forced through pipe C into the water of chamber B. In its passage through the water, oxygen is again absorbed and retained, while the air deprived of oxygen rises to the upper part of the chamber. While piston b descends, this air is drawn through C in the direction of the arrow into the cylinder, which it aids to press downwards, and when piston b rises, it escapes in the direction of the small arrow into the surrounding atmosphere.

The same operation repeats itself in the succeeding chamber C. In the positions of the pistons, as represented, the cylinders of pumps a and c hold oxygenated air; the cylinder of pump b, however, is charged with nitrogenized air. Chambers A and C hold nitrogen in their top portions. The oxygenated air in cylinder of pump c is forced over into chamber C, and so forth. To the last chamber a simply acting pump is attached for the purpose of drawing the oxygen, now almost pure, into the gas holder, in which it is retained for use. The air, after having passed through eight chambers, consists of 97·3 volumes oxygen and 2·7 volumes nitrogen, the presence of this amount of the latter gas, for most technical purposes, being quite unimportant. The machine described has been in use in Frankfort-on-Maine for more than two years, and the oxygen produced by it is used by Philipps in his new system of illumination, which consists in the combustion of a highly naphthalized fluid (carboline) by means of oxygen in a lamp constructed for the purpose. The inventor uses only air of 53 per cent oxygen, and claims that it gives the same intensity of light as pure oxygen. The light of this lamp is equal to one hundred candles or to ten ordinary gas flames. It is bluish white, and is very similar to the magnesium or electric light.

THE APPLICATION OF CHEMICAL FERTILIZERS TO HORTICULTURE.

M. Jeannel, says *Les Mondes*, has made a series of experiments in the Jardin d' Acclimation in Paris, in the use of chemical fertilizers in the process of horticulture. It has been found that plants can receive, in solution with the water with which they are irrigated, the mineral constituents necessary to their organism, and which manure does not furnish until decomposed in the soil. The following results are given of three specimens of potted plants:

First series: Plants cultivated in sand watered with ordinary water; plants cultivated in mold similarly irrigated; plants cultivated in sand supplied with common water and receiving weekly a portion of mineral manure in solution. The truly extraordinary success, says the author, of the latter mentioned specimens can hardly be imagined. They became doubly developed, more green, and flowered far more profusely than the plants raised in mold. Naturally, he adds, the plants cultivated in sand without the aid of the fertilizer proved puny and miserable. Second series: Two specimens of each plant were placed in pots of exhausted earth, one receiving ordinary water, the other a weekly supply of the mineral manure. The latter flourished with a most luxuriant development of both floral and foliaceous organs. Soil watered with these mineral ingredients, it is stated, never becomes exhausted. The constituents that the plant abstracts are daily returned. M. Jeannel has produced a *Tradescantia virginica* in a two liter pot, the earth of which has not been changed for fifteen months. The plant forms a tuft of exquisite green over 1·6 meters in length and ·8 meter in diameter. The proportions and ingredients of the chemicals used are as follows:

Nitrate of ammonia	400
Biphosphate of ammonia	200
Nitrate of potash	250
Chlorhydrate of ammonia	50
Sulphate of lime	60
Sulphate of iron	40

Pulverize, mix, and preserve away from moisture. The method of employing the above compound is quite simple. It suffices to dissolve 4 grammes of this mixture in a liter of common water, and to give to each plant weekly 25, 50 or even 100 grammes of the solution independently of the ordinary waterings. It is recommended to place the pots on plates and to regulate the quantity of the fertilizer applied by the size of the former and the development of the plants. The cost of the compound should not exceed three francs (sixty cents) per kilogramme; so that one liter of the solution, serving for forty weekly waterings, need not cost more than one fifth of a cent to replenish.

This fertilizer is but moderately useful for leguminous and is hurtful to saxifrageous and bamboo plants; it retards the germination of the latter and hinders the growth of the young shoot.

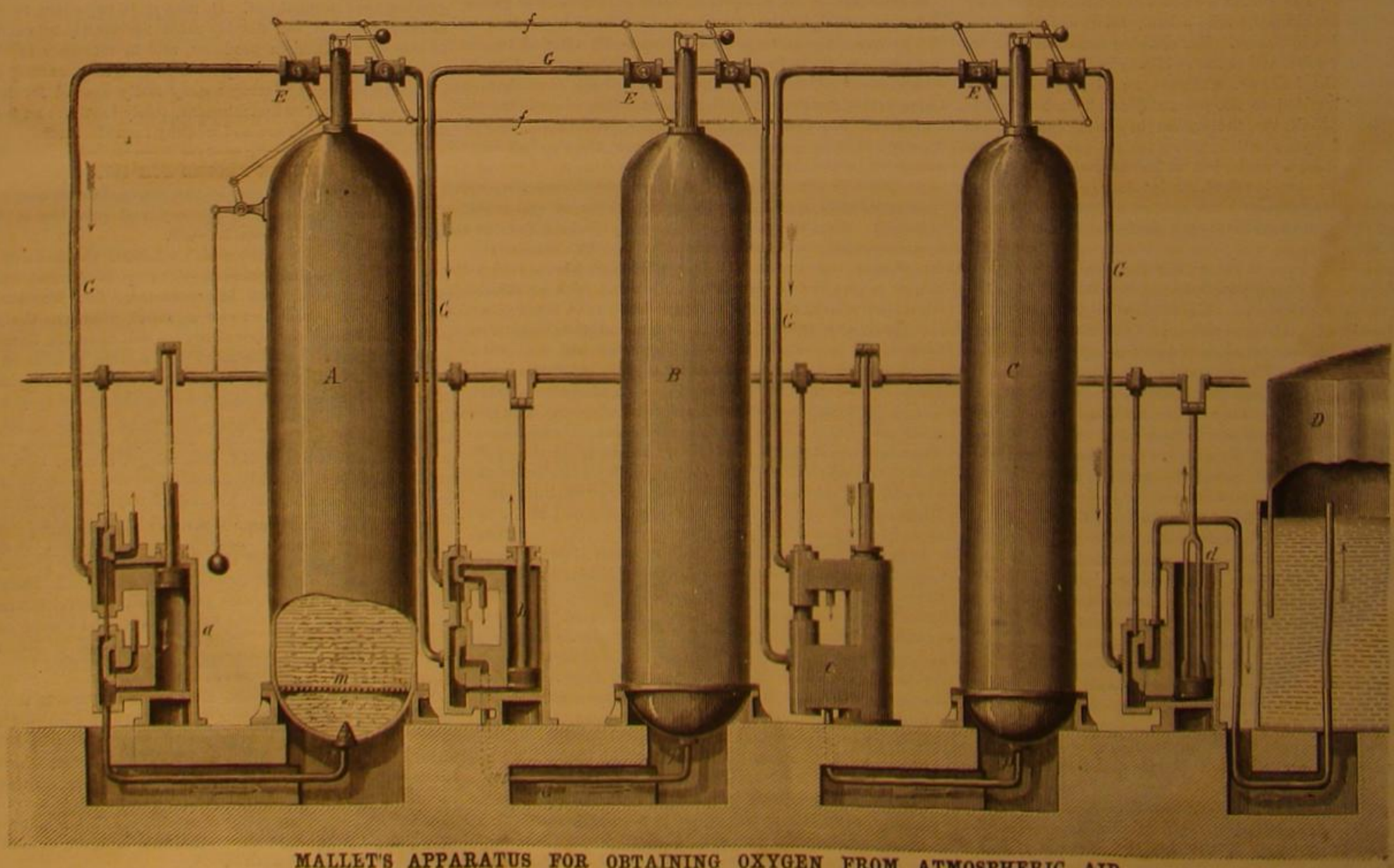
Prussian vs. English Guns.

Many of our readers have, no doubt, noticed in the papers, says the *Engineer*, statements, quoted from the *Börsenzeitung*, as to the startling results recently obtained at Berlin with the new 11 inch Krupp gun against iron plates in August last. According to the *Börsenzeitung*, the 11 inch gun, with a success exceeding "all expectation," has driven its shot through a "12 inch solid plate, a wooden backing of 26 inches, and an inch plate or skin," after which it had "a considerable amount of force left in it." We do not hear at what range this took place, which is an important element in the question, but we understand that 100 yards is the one generally adopted, and report says that a charge of about 70 lbs. was employed. We speak, however, subject to correction; we have accepted the facts as represented by our German contemporary, and proceed to give the results obtained here most nearly bearing on the question.

Our own 11 inch gun about July, 1871, fired four rounds against a structure known as No. 33 target, at Shoeburyness, consisting of 8 inches iron, 6 inches wood, 5 inches iron, 6 inches wood and 1½ inches of skin. The range was 200 yards. Three rounds were fired with charges of 85 lbs., and the last with 75 lbs. of pebble powder—one shell and three shot being used. In every case the projectile completely penetrated the target and passed on, and this being so, we presume we may safely add, in the words of our German friends, that "it had a considerable amount of force left in it." Indeed in one instance we can speak more definitely, for a deep indentation was made by the shot's point in a plate some distance to the rear and in the line of fire.

We are next informed that the Krupp 10 inch gun is expected to penetrate the same target as the 11 inch. This is, however, only an expectation, based on the assumption of an increase of charge not yet determined, to which is added as a crowning triumph that the 12 inch Krupp is expected to drive its 660 lbs. projectile through plates from 15 inches to 16 inches thick. Our readers will find recorded in the *Engineer* of June 28th the actual effect produced by our 12 inch 35 tun gun against the above mentioned No. 33 target strengthened by a front plate 4 inches thick, on June 20th last. We may here state briefly that the projectile, fired with a charge of 110 lbs. of pebble powder at a range of seventy yards, drove its head and shoulders through 18¼ inches of iron and 12 inches of teak. As a shell the effect was less, but the conditions of the question were complicated by the introduction of an air space.

CAUSTIC LIME, freshly slaked, is often an excellent preparation for a crop on a clay soil.



MALLET'S APPARATUS FOR OBTAINING OXYGEN FROM ATMOSPHERIC AIR.

(Reported for the Scientific American.)

ELECTRICITY.

A Lecture delivered by President Henry Morton, at the Stevens Institute of Technology, Hoboken, N. J., December 3, 1872.

In the second lecture of the series, President Morton confined himself to the consideration of the different ways in which electricity passes from one object to another, and in treating of these he adopted, for commencement, the customary division into (1.) Conduction, (2.) Convection, and (3.) Discharge.

When electricity passes tranquilly through bodies without making any special manifestation of its presence, it is said to be conducted, and the bodies which convey it are called conductors. The best conductors are, as is well known, the metals, and the poorest, such substances as glass, hardened rubber, dry wood, and dry air. It is Professor Morton's opinion that damp air may also be a non-conductor, and that it has been classed with conductors because bodies exposed to it are apt to be covered with a film of moisture and then conduct electricity.

RED LEAD GLASS UNFIT FOR INSULATION.

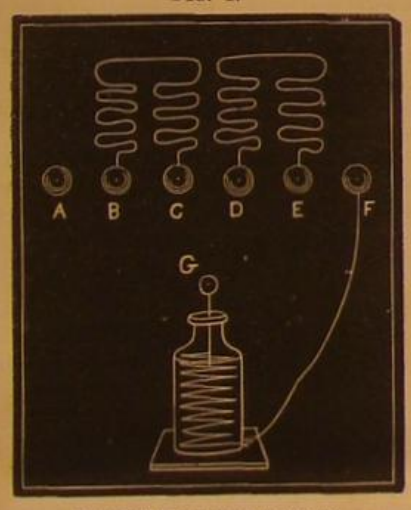
Another remark was made, in this connection, which is, in our opinion, of importance to such of our readers as have to do with the construction of electrical apparatus; it is that red lead, although one of the best of non-conductors, will render glass a very good conductor, if it enters into its composition. Such glass, which is usually of high refracting power, and therefore brilliant in appearance, is utterly unfit for purposes of insulation.

The subject of convection was but briefly alluded to. It takes place when electricity passes from an excited body into the air and sets the particles of the latter in motion. This motion was made visible in the preceding lecture, by placing a candle near the brass point of an electrical machine. The candle was nearly blown out, so strong was the current of air produced by the escaping electricity.

ELECTRICAL DISCHARGE.

What is called an electrical discharge takes place in three different ways. When an electrical machine is excited in a dark room, a glow is frequently observed around the plate or cylinder. This is one form of a discharge. Another is seen at the brass points of the prime conductor of machines, where it becomes manifest as a luminous pencil or brush. The most important, however, is what physicists call the disruptive discharge. When an obstacle is opposed to the progress of electricity of sufficient strength or tension, the electricity leaps over it, and a spark of greater or less brilliancy is the result. Now, this spark has enabled Wheatstone to measure the velocity of electricity by the following ingenious method.

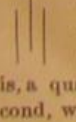
FIG. 1.



VELOCITY OF ELECTRICITY.

A coil of copper wire, a quarter of a mile long, connects the two brass balls, B and C, in Fig. 1, and another similar coil connects the brass balls, D and E. F is connected with the outer coating of a charged Leyden jar. Now, if A is connected with the inner coating of the jar, a discharge will take place, and the spark will jump from A to B, from C to D, and from E to F. The three sparks, however, are not simultaneous, although the interval between them may be very small. The electricity requires a certain time to pass through the half quarter of a mile of copper wire from B to C and from D to E. To measure this interval, Wheatstone caused these sparks to be reflected in a rapidly revolving mirror, where they appeared in three lines of light of equal length, the middle one lagging somewhat behind the other two, as in Fig. 2. The mirror revolved 800 times a second.

FIG. 2.



On measuring the distance which the middle line was behind the others on the cylindrical mirror, it was found to be about $\frac{1}{2}°$. The time it took the discharge to travel from B to C and from D to E, that is, a quarter of a mile, was $\frac{1}{360} \times \frac{1}{800} = \frac{1}{288000}$ of a second, which would give for electricity a velocity of 288,000 miles per second. We are far from obtaining such velocity, however, in our telegraph wires; and Faraday has shown that the nature of the conductor and the intensity of the electrical charge causes the velocity to vary.

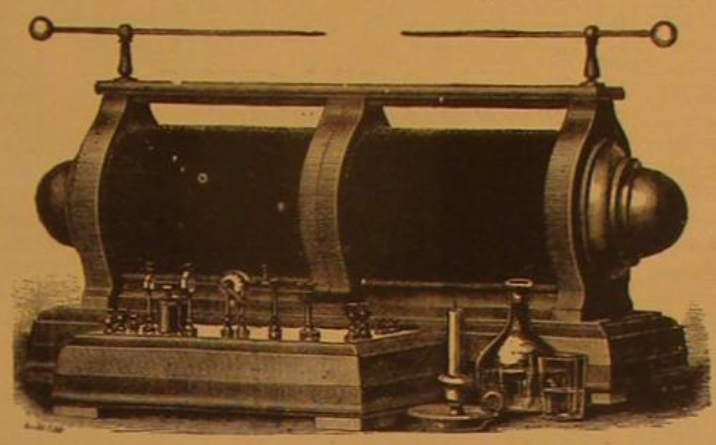
THE NATURE OF ELECTRICITY.

There is another point of considerable theoretical interest attached to the above experiment. As our readers are doubtless aware, there are two theories, or rather hypotheses, by which physicists seek to explain electrical phenomena. The real nature of electricity being entirely unknown, these hypotheses serve only to arrange and classify the facts, thus rendering it easier to remember them. Unless one of them, therefore, is disproved, it is merely a question of convenience which shall be preferred. They are known as the single fluid and the double fluid theory.

Since the text books generally regard the above experiment as demonstrating the incorrectness of the former theory, Professor Morton showed the theory to be capable of explaining the phenomenon as well as the other.

We quote the following paragraph, pointed out by the lecturer, in Müller's "Chemical Physics," page 353, for the two-fold purpose of giving the two fluid theory explanation and showing the opinion of one of the leading writers:

"This experiment affords a convincing proof of simultaneous action and reaction in the operations of electricity, and of its existence as a duplicate force; at the same time that a positive influence leaves the inner coating, an equal amount of negative influence leaves the outer coating, and these two neutralize each other at the central point of the conductor, that is, between C and D in Fig. 1. It appears from this experiment that Franklin's theory, though in many cases a simple and convenient mode of explaining facts, is not the true representation of the phenomena. The theory of two fluids, or rather of two forces acting in opposite directions, seems, by this experiment, to be demonstrated."



THE RHUMKORFF COIL.—FIG. 3.

According to Franklin's theory, however, the electricity entering at A acts upon B by induction, pushing the electricity from B into C. This crowding out of B's electricity takes place, however, against its natural resistance, and consequently C will then be charged less strongly than A. It will have to wait for re-inforcement before it can leap to D. The same thing, however, does not take place between E and F; for although E acts on F by induction, yet there is no resistance to counteract, the electricity naturally and easily passing out of F into the earth.

The lecturer then proceeded to experiment. The source of electricity was the enormous Rhumkorff induction coil of the Stevens Institute. This instrument gives a spark 21 inches in length.

HOW ELECTRICITY MOVES.

To impress the fact that electricity will not confine itself to one path if any obstacle is interposed, but will leap in different directions, a large sheet of metallic paper, suspended on a banner, was connected to one pole of the coil. A long wire from the other pole, insulated by a glass tube, was taken by the lecturer and made to touch the metallic surface of the paper, which had previously been crumpled so as to break the metal. When the room was darkened, vivid forked lightning shot over the paper in different directions, leaping over the cracks in the metallic surface.

The back of a mirror was connected with one pole of the coil, while the other pole was presented to the front of the mirror. The electricity jumped along the surface, in order to make connection by passing over the edge to the silvering behind. The flashes together with their reflection in the mirror formed a very brilliant and effective experiment.

The greater part of the electricity will pass through the way in which it finds the fewest obstacles, and we can therefore determine its passage beforehand. The lecturer had prepared a pane of glass, on which were pasted narrow strips of tin foil close together. These he had cut at intervals with a penknife, in such a manner as to cause the spark, in passing, to exhibit the design of a butterfly.

LIGHTNING RODS—AN ARTIFICIAL THUNDERSTORM.

The practical value of the knowledge of this tendency of electricity to select several paths was illustrated by a little model of a house furnished with a lightning rod only on one side. If the thunderstorm comes from the other side, it may strike that side notwithstanding the lightning rod. On darkening the room, and approaching the house from the unprotected side with the wire from the coil, the lecturer caused an artificial thunderstorm to burst upon the house, and the audience could see one portion of the flash enter the lightning rods, while another struck the side of the house. Combustibles previously placed in the model burst into a blaze, and showed the disastrous effects of insufficient protection.

TENSION AND INTENSITY OF ELECTRICITY.

When considerable electricity is set free at once it has what is called tension, or force, to overcome obstacles. While the spark from the Rhumkorff coil is about twenty-one inches long and faint blue, its electricity, when bottled up in a Leyden jar and then set free in one single spark, is intensely brilliant, and sounds like the report of a pistol. By making the electricity pass through his condenser, consisting of a number of glass plates coated with tin foil and connected like a battery of Leyden jars, Professor Morton obtained a spark fourteen inches long, which was of intense brilliancy and accompanied by a loud noise. (See Fig. 4.)

DURATION OF THE ELECTRIC SPARK.

The extremely short duration of the spark was shown by causing it to illuminate a rapidly revolving disk of paper containing a number of slots. Although it was moving so rapidly that the slots could no longer be seen, it seemed to stand still every time the spark flashed; it had no time to move perceptibly while the spark lasted. Short as is the duration of the spark of a Leyden jar, Professor Rood, of Columbia College, has shown by his beautiful researches that it is composed of several. (*American Journal of Science and Arts*, 1871, p. 160). This was exhibited by means of a revolving disk containing four slots, which was illuminated from behind by means of the electric spark. Each slot appeared like two or three, showing that the spark must be composed of two or three. Professor Rood found the duration of a single spark to be less than ninety-four billionths of a second (·000,000,094), a quantity which is entirely inconceivable.

ELECTRICAL FLOW IN VACUO.

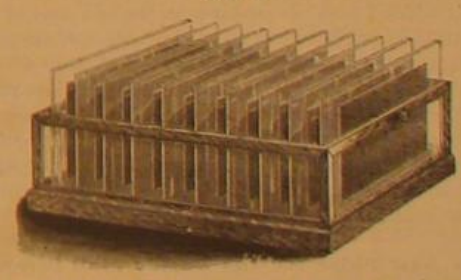
The most beautiful experiments of the evening, however, were those illustrating the electrical discharge in a vacuum, or rather in exhausted glass tubes containing minute quantities of various gases and vapors. The most magnificent colors and soft tints of light were produced as the discharge passed. Some of these tubes, known as Geissler tubes, were arranged on frames to show the contrast of their colors, but there was one especially, containing, near its two ends, several globes blown one inside of the other, and filled with minute quantities of hydrogen, carbonic acid, and nitrogen, which showed the splendors of the light to the greatest advantage. In it, too, was perceptible that curious classification or layering of the electric light, which has never been satisfactorily explained. A large number of the tubes were connected together, forming a circle over five feet in diameter, with a large initial S in the center, also composed of tubes. When the spark was passed through them the effect of the different soft colored lights was entirely beyond our powers of description.

Gassiot's cascade was also shown. It consists of a goblet made of uranium or canary glass, and coated partially with tin foil. When this was placed under a receiver of the air pump, the air being exhausted, an electric spark made itself luminous (fluorescence being a property of uranium glass), and it seemed as if floods of yellow light were welling up from the interior of the goblet and gently flowing over its sides.

CONTINUOUS LUMINOSITY.

The concluding experiment showed the effect of an electric spark on circular tubes filled with traces of anhydrous sulphuric acid. These have the curious property of continuing luminous for about half a minute after the electricity has ceased to pass. Becquérel supposes that the particles have the property of keeping up the vibration after the cause has ceased to act; but it seems as though this were but another way of stating the fact instead of an explanation. Others

FIG. 4.



endeavor to explain it by supposing chemical decomposition takes place, and that the afterglow results from the recombination. It hardly seems possible, however, that the infinitesimal quantity of sulphur they contain is able to keep burning for half a minute. For this reason we are still obliged to wait for the true explanation of this, as indeed of many other phenomena in electricity.

Taking Cold.

If a cold settles on the outer covering of the lungs, it becomes pneumonia, inflammation of the lungs, or lung fever and in many cases carries off the strongest man to the grave within a week. If cold falls upon the inner covering of the lungs, it is pleurisy, with its knife-like pains and its slow, very slow recoveries. If a cold settles in the joints, there is rheumatism with its agonies of pain, and rheumatism of the heart, which in an instant sometimes snaps asunder the cords of life with no friendly warning. It is of the utmost practical importance, then, in the wintry weather, to know not so much how to cure a cold as how to avoid it.

Colds always come from one cause, some part of the body being colder than natural for a time. If a person will keep his or her feet warm always, and never allow himself or herself to be chilled, he or she will never take cold in a lifetime; and this can only be accomplished by due care in warm clothing and avoidance of drafts and exposure. While multitudes of colds come from cold feet, perhaps, the majority arise from cooling off too quickly after becoming a little warmer than is natural from exercise or work, or from confinement to a warm apartment.

THE educated live longer than the illiterate: the rich, longer than the poor; the good, longer than the bad.

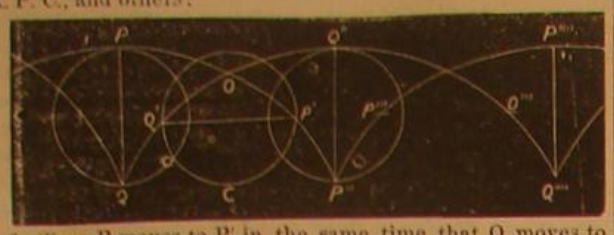
Correspondence.

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

Comparative Velocities of Different Points on a Driving Wheel.

To the Editor of the Scientific American:

As some of your readers have asked for information on this subject, I send the following for the benefit of A. P. C., and others:



1. Since P moves to P' in the same time that Q moves to Q', their average velocities will be respectively as the distances, namely, the average velocity of P, is to the average velocity of Q, as distance PP', is to distance QQ'. But $PP'=2r\sqrt{2}$, and $QQ=2r(2-\sqrt{2})$, r being the radius of wheel; therefore, vel. of P : vel. of Q :: $\sqrt{2} : 2-\sqrt{2}$ :: 1·414 : ·586. It will be seen that the average velocity of P, thus far, is more than double that of Q.

2. At P' and Q', the velocities are equal.

3. The average velocity of P, from P' to P'', is to the average velocity of Q, from Q' to Q'', as ·586 is to 1·414.

4. The average velocity from P to P'' is the same as from Q to Q''.

5. The velocity at P, Q', P'', etc., is a maximum; at Q, P'', Q'', etc., a minimum.

6. The velocities are the same at P and Q', at Q and P'', at Q' and P', at O, and at any two points on the same horizontal line.

7. The velocity of P is inversely the same as that of Q; or, in other words, P ends with the velocity at P' that Q starts with, and P starts with the same velocity that Q ends with at Q''.

8. While the center moves a distance equal to $2\pi r = 6{\cdot}283 \times r$, the point P moves over a distance equal $8r$.

J. T.

Indiana University.

Remarkable Astronomical Phenomenon.

To the Editor of the Scientific American:

On Friday, December 13, 1872, there was a brilliant display on the surface of the sun, of the hidden forces within. The sky was cloudless, and at a little past ten o'clock, A. M. I was observing the sun with one of my transit instruments, for the purpose of adjusting the lens, when there appeared streaming forth from the western limit of the sun something similar to the flashes of the aurora, which obscured so much of its advancing edge that I could not proceed with the adjustment until matters became more quiet. Some of the flames reached to a distance, outward from the surface, equal to one eighth of the diameter of the sun, which would amount to over 100,000 miles. These appearances subsided in about 15 minutes after I first noticed them.

For the last five years there have been but very few clear days in which I have not spent more or less time in similar observations, but have had no good evidence of any such disturbance before, and had no reason to look for such things, as I only employ one lens, and that is of very low power. I hope the astronomers at some of our observatories were fortunate enough to be at their eyepieces at the time; if so, I trust we shall, from some of them, have a full description of this interesting phenomenon. EDWARD PREVEAR.

Leominster, Mass., December, 1872.

The New Ships for the Pacific Mail Company.

To the Editor of the Scientific American:

In your issue of December 14, in an article entitled "Revival of American Ship Building," you inform the public that the two steamers for the Pacific Mail Steamship Company have lately been launched at Wilmington, Delaware.

The Colon was built by the Delaware River Iron Steamship and Engine Works, situated at Chester, Delaware Co., Pennsylvania, (John Roach & Co's. yard), and launched Nov. 16, more than a week prior to the launch of the Acapulco at Wilmington, Delaware, on which account the Colon gets the engines which are being or were built in Scotland for the one that should be first launched. The Delaware River Iron Steamship and Engine Works have the sister ship nearly ready for the water and are preparing to lay the keels for two more ships for the Pacific Mail Company, which are to be 420 feet over all; which, when done, will be the largest vessels ever built in this country. I do not like the Scientific American to be in error; I quote it too often. N. RULOW.

Chester, Pa.

The Antiquity of Man. Letter from Professor Kirkwood, LL.D., of the Indiana State University.

To the Editor of the Scientific American:

Your paper of October 12, owing to some unusual delay, did not reach me till this morning. It is not proposed to renew the discussion on "Theology and Science." To most of your readers any further agitation of the subject would perhaps be undesirable. In a scientific paper, however, facts should not be given without careful scrutiny. I beg therefore to correct the following statement of a correspondent on page 328 of your current volume:

"The greatest age of human antiquity, if theology is true, as maintained to-day is less than six thousand years, beginning in the days of Adam and Eve. Yet the Chinese records in astronomy go back twenty thousand years. The eclipses and conjunctions of planets in the days of Fedo, 10,000 years ago, have been recalculated by Baily and other astronomers, and they have mathematically demonstrated the truthfulness of the Chinese astronomical records, showing a difference of time of but fifty-one seconds."

Now the earliest eclipse of which the date has been preserved occurred in the twenty-second century before the commencement of our era. This is recorded in the Shoo King, "which is considered by the Chinese as the most ancient of their books." See Chambers' Descriptive Astronomy, page 198, the Memoirs of the Royal Astronomical Society, vol. XI., page 47, and the Monthly Notices of the Royal Astronomical Society, vol. XXIII., page 238.

The statement quoted in regard to planetary conjunctions is no better sustained. The most ancient account of an occurrence of this kind is found, it is true, in the Chinese annals. Its date, however, was but 2,449 years before the Christian era. See Observations of Comets, extracted from the Chinese Annals, translated by John Williams, F. S. A., one of the Secretaries of the Royal Astronomical Society, and first published during the past year.

In regard to the antiquity of man I express no opinion. But a cause, however good, cannot be permanently promoted by a loose statement of facts. DANIEL KIRKWOOD.

The November Meteors.

To the Editor of the Scientific American:

Since November 27, I have looked in vain for some notice of an unusual meteoric shower that took place at that time. I first noticed it at seven o'clock, P. M., and called my wife to see the celestial display. By facing in opposite directions, we were able to count more than three hundred meteors, of various sizes and degrees of brightness, in half an hour. Had the sky not been partially obscured by clouds, we doubtless could have counted many more. From the decrease in the frequency of their fall, we inferred that the finest part of the display had escaped our notice. They radiated in all directions from a point in the constellation *Perseus*.

D. B. MOAK.

Norwood (near Cincinnati), O.

Condition of the Patent Office.

The Secretary of the Interior, in his recent annual report, says: The number of applications for patents, including reissues and designs, during the year ended September 30, 1872, was 19,587; the number of applications for extension of patents, 284; the number of applications for the registering of trade marks was 589. During the same time were issued 13,626 patents, 233 extensions, 556 certificates of registry of trade marks, and 3,100 caveats have been filed. This shows a small increase over the number of the preceding year. The fees received during the same period, from all sources, amounted to $700,954.86, and the total expenditure to $623,553.90, making the receipts in excess of the expenditures to the amount of $77,400.96.

Over 200,000 applications for patents have been filed since 1836, and about 133,000 patents have been granted. The drawings, models, and files accompanying these applications must be so classified and arranged as to facilitate access to them, otherwise there would be constant danger of duplicating patents upon the same invention, and each year's accumulation adds largely to this danger.

The Commissioner urges the importance of a separation of the Patent Office from the Department of the Interior. The matter is embraced in the bill now pending before Congress for a reorganization of the Bureau.

The work of the Office has been conducted in the most satisfactory manner during the entire term of the present Commissioner (General Leggett), and I most cheerfully attest his efficiency and capacity for its manifold and delicate duties.

Researches on Santonine.

Santonine is the active principle of the *semencontra*, and for some years past has been prepared on a large scale for therapeutic purposes. M. de Saint Martin, says in *Les Mondes* that if santonine is, as claimed, really a phenol, its formula, $C^{30}\,H^{18}\,O^6$, indicates that, by its methodic reduction, there should be obtained, 1st, a diatomic phenol, $C^{30}\,H^{18}\,O^4$; 2d, a monatomic phenol, $C^{30}\,H^{18}\,O^2$, and 3d, a carburet of hydrogen, $C^{30}\,H^{18}$. This last carburet would present the composition of a homologue of napthaline, isomeric or identical with amyl-naphthaline. The author states that he has prepared monatomic phenol $C^{30}\,H^{18}\,O^2$ and designated it by the name of *santonol*. In a crystalized form, it resembles the stearine which separates itself in fatty bodies. Liquid santonol is a very alterable substance, turning brown under the influence of air.

A Stolen Lens Recovered.

The object glass of the Alleghany Observatory, at Pittsburgh, Pennsylvania, which was mysteriously stolen on a dark night some time ago, has been found and restored to its place in good order. Its value was $4,000. It was carried off by an intelligent sort of a thief who probably expected that a reward would be offered for its return, enabling him to make a little money by the operation. He deposited it in a stable, and his pal stole it from him. But it finally came into the possession of the police and it was carried home.

WE are desired to direct attention to the advertisement in another column addressed to the Board of Managers of the American Institute.

Aniline Inks--Interesting Experiments.

The beauty and variety of aniline dyes has, for a long time, induced manufacturers to use them for the making of inks. Formerly, red inks were prepared from cochineal and ammonia, and blue inks from Prussian blue and oxalic acid; but an exceedingly cheap red ink may be made by simply dissolving a little gum in a very diluted solution of aniline red. This ink may be immediately used, and the solution must not be too strong, or the complementary color (green) will appear. Violet and blue inks, with and without a greenish tint, are now much used. The so-called *bleu soluble* is readily available for making them. It is prepared like red ink, and the same is the case with the "patent violet." Aniline dyes may also be employed for the preparation of sympathetic inks, which formerly were very much in vogue. Letters written with aniline red will disappear when exposed to the vapors of ammonia, in which case we obtain the colorless rosaniline, which is scarcely or not at all visible. After some time, especially if warmed a little, the letters appear again in their original beauty. Nicholson's blue yields a still more beautiful sympathetic ink. To produce it the blue is dissolved in a solution of borax, to which a little gum is added. When used, this ink is scarcely perceptible, but when exposed to the vapor of muriatic or acetic acid, the characters appear in dark blue; but they disappear if exposed to the vapors of ammonia.

The following is an interesting experiment, and may be of interest to popular lecturers on chemistry: White flowers, made of paper, and white silk ribbons may be variously colored, without any one recognizing how it is done. It is a well known fact that if an aniline dye, in the state of a very fine powder, is spread over a sheet of paper, and the loose dust removed, there remain imperceptible particles, which, however, are sufficient, if dissolved, to intensely color the whole sheet. To this end it is only necessary to moisten the paper with strong alcohol, or with a solution of alcohol and acetic acid. This experiment may be carried out by making roses or other flowers from paper. White roses, if covered with fuchsin in the form of dust, when immersed in spirits of wine or other proper solvent, are immediately changed to beautiful red roses. Silken ribbons may be treated in a similar manner. By dropping a few grains of aniline dyes into wine glasses and adding a solvent, variously colored liquors may be obtained by means that few persons are able to detect. A white liquid may be colored red, and decolored by adding ammonia. In fact, many interesting experiments can be performed with these dyes.

The Freezing of Water.

Dr. G. Krebs has devised a very simple arrangement, by which it is possible to show to an audience that water may be cooled considerably below 0° C. without freezing. He takes a tube 18 centimeters long and 1 centimeter wide, made of thick glass, closed at one end and furnished with a bulb. After thoroughly cleansing by heating sulphuric acid in it for some time and rinsing repeatedly with distilled water, he draws out the upper end to a long point. This point is kept dipping in distilled water, which has been boiled for some time. Every time the bulb is heated and allowed to cool, a little water enters. This is repeated until the tube is full clear up to the point. Then the point is made to dip into purified mercury and heat is applied to the bottom of the tube until the water reaches only half way up in the bulb, when the point is quickly sealed up by melting.

Placed in a freezing mixture, say of water and nitrate of ammonia, side by side with water in an open tube, it can be taken out and handled after the latter is frozen, without being congealed by the agitation. After the water in the open tube is completely frozen, that in the closed tube will freeze suddenly, if it is strongly shaken up and down once.

Experiments on Certain Points of the Physiology of the Pneumo-Gastric Nerves.

MM. Legros and Onimus, says *Les Mondes*, have studied the influence upon the movements of the heart, in warm and cold blooded animals, caused by excitement of the pneumogastric nerves, according to the intensity and especially with reference to the number of excitations given at a time.

The number of necessary excitations in order to lead to the stoppage of the heart varies considerably in the two kinds of animals. While from 15 to 20 intermittances per second are necessary in the case of a warm blooded animal, two or three are sufficient for one of cold blood, especially in a state of hibernation. With the latter, less excitement is necessary to arrest the action of the heart, in proportion as the animal is weakened. With a warm blooded animal, whatever may be the intensity of the excitements or the number of intermittances, the complete cessation of the heart's motion has never been attained in less than from fifteen to thirty seconds. After the motion has ceased, there supervene, in spite of the continuance of the excitation, contractions, few it is true but strong and progressively augmenting in number.

A DISPATCH from Tripoli (Syria) announces the arrival in that city of several engineers sent from Constantinople by M. Pressel to construct the railroad proposed by Midhat Pasha. This line will connect the Mediterranean and the Persian Gulf. It will pass by Palmyra, cross the Euphrates, Mesopotamia, the Tigris, and will terminate in Bagdad, where it will meet the road, already begun, from the Persian Gulf.

AT the Imperial Arsenal at Constantinople, an iron-clad war vessel is ready for launching. This is the first ship of this kind that has ever been constructed in Turkey after Turkish plans with Turkish material and by native workmen.

SCIENTIFIC AND PRACTICAL INFORMATION.

NITROGEN GAS.

This neutral, lazy gas is little used, excepting where an experiment requires to be performed in an atmosphere free from oxygen, as in making amorphous or red phosphorus; and even here carbonic acid gas will work as well and is more easily prepared. For lecture room experiments, to show the properties of nitrogen, it is generally obtained from the air by burning phosphorus under a bell jar of air. A neater method, and one that furnishes it in a steady current, is by heating nitrite of potassium. Take a strong solution of caustic potassa, and pass into it a current of nitrous acid, generated from starch and nitric acid. When the solution has become strongly acid, stop the current of nitrous gas and neutralize the solution with potassa. This solution of nitrite of potassium will keep well until needed. When about to generate the nitrogen gas, place one volume of this solution in a retort fitted with a tubulated receiver and a delivery tube leading into the pneumatic trough. Also place in the receiver three volumes of a saturated solution of chloride of ammonium. Heat gently to about 125° F. The decomposition is as follows: $KNO_2 + NH_4Cl = KCl + 2H_2O + 2N$. The chloride of potassium remains in the retort, the water is caught in the receiver, and the nitrogen is given off from the delivery tube.

SOME EXPERIMENTS WITH PERMANGANATE OF POTASH.

When a hot concentrated solution of permanganate of potash is dropped carefully into a test tube containing a small quantity of glycerin, a very violent chemical action takes place; a portion of the glycerin is carbonized and thrown out of the test tube. Oxalic and formic acids are also produced. With ordinary alcohol, permanganate of potash produces a violent reaction, as has been frequently explained in scientific journals.

Oil of aniline is violently decomposed by a hot solution of permanganate of potash, but the resulting vile-smelling compounds have not yet been studied.

SEPARATING WOOL FROM COTTON IN MIXED FABRICS.

Two cases may naturally arise: First, where the rags used are in great part cotton, and it is desired to destroy the woolen fibers in order to use the cotton for paper stock. Second, where the wool predominates, so that it is more profitable to destroy the vegetable fiber and preserve the wool.

1. The wool remaining after the mechanical separation of the rags is mostly destroyed by the alkali wherein the cotton is boiled before bleaching it. If it were attempted to dissolve out all the wool with alkali, it would be too expensive and would not pay. In this case what is known as Ward's method is employed. The rags are subjected to the action of superheated steam under a pressure of 3 to 5 atmospheres. At this temperature, the wool is converted into a black friable substance, which is easily separated by mechanical means as a dry powder. This powder is an excellent fertilizer, containing 73 per cent organic matter, and from 10 to 12 per cent nitrogen.

To destroy the vegetable fiber and preserve the wool, several methods may be used. The rags may be soaked with water containing 5 to 10 per cent sulphuric or hydrochloric acid, slightly pressed out, and then dried on the floor of a room heated to 190° or 212° F. for some hours. As the water evaporates, the acid becomes more concentrated and converts the cellulose into sugar and a gummy substance. Kopp considers the following the most rational and cheapest method: The rags are put in a bath of 100 parts acid and from 300 to 500 parts water, then taken out and allowed to drain, and are slightly pressed out, then dried slowly in a room in a current of air at a temperature of from 160 to 195° F. for many hours. When the wool is of very good quality, instead of using sulphuric or hydrochloric acid, oxalic acid or chloride of aluminum is used. These substances destroy vegetable fibers without perceptibly attacking the wool.

CHLORALUM.

Upon examining various disinfecting preparations of the Chloralum Company, in London, Professor Fleck, of Dresden, found that it compares with the following ordinarily used and less expensive deodorizers and disinfectants:

	Parts putrefying matter.
Bleaching powder or chloride of lime disinfects.....	100·00
Burnt lime "	84·6
Alum "	80·4
Sulphate of iron "	76·7
Chloralum "	74·0
Chloride of magnesium "	57·1

The chloralum is prepared by treating ferruginous clay with crude muriatic acid, and decanting the liquor, which constitutes the disinfectant. The residue is sold as "Chloralum Powder." The author discovered in the latter 0·72 per cent chloride of arsenic, 0·55 chloride of lead, 0·37 chloride of copper; but the preparation in the liquid form yielded less lead and copper. The author warns the public against the use of these antiseptics, or whatever they may be called, for ulcers or for use as a gargle in diphtheria or sore throat, for which purposes they have been recommended. The translator would remark that the so called "Bromo-Chloralum" of American manufacturers is a different and perfectly non-poisonous preparation, it being a concentrated solution of aluminum chloride and bromide, while the English chloralum consists principally of chloride of aluminum.

ARTIFICIAL SKINS FOR SAUSAGES.

In Würtemburg there has been started a new industry, which consists in the manufacture of skins of parchment paper for sausages. This artificial product is considerably cheaper than the natural one; it is not subject to fermentation, and is distinguished by its cleanliness. It is made by means of machines, in the thickness of ordinary writing paper, and samples may be obtained by writing to Carl Brandegger, at Ellwangen, and enclosing the amount of the postage.

BOAT LOWERING APPARATUS.

A correspondent, R. B. F., of Mass., says: "In your No. 20, page 315, there is a description of a boat lowering apparatus, by E. J. Hill, Pimlico, England, whereby the ends of a boat are held by tackles and "slip hooks;" so that, on touching the water, the boat is released at once. If the water be smooth, this is all very well; but if it be rough, there will be great danger of the forward end being released first. I have seen this slip hook or one like it at the Navy Yard here."

List of Naval Subjects.

The council of the Institution of Naval Architects, London, have prepared the following list of subjects, which they desire to submit to the members and associates of the Institution, and others interested in shipbuilding, as questions on which they will be glad to receive communications for the annual general meeting in April (2d to 5th), 1873. It is requested that all such communications may be forwarded to the secretary of the Institution not later than 28th February, 1873:

1. The construction of vessels for coast defence.
2. The effect on naval construction of torpedoes, or other modes of submarine attack.
3. On the results of the best modern practice in ocean steam navigation, with reference to the latest modern improvements—such as surface condensation, superheating, compound engines, and the like; also the value of each of these taken separately, and especially the results of any actual experiments to test this point.
4. On the friction developed in marine steam engines of different forms; and on the difference between the gross indicated horse power developed in the cylinder and the net effective horse power available for the propulsion of the ship after working the air pump, slide valves, and other moving parts of the engine.
5. On economy of fuel in marine engines, with detailed results.
6. On marine boilers, their rate of combustion, and the proportioning of their various parts.
7. Information as to the deterioration of marine boilers supplied with water from surface condensers and the remedies for this.
8. Description of any improvements in the details of construction of marine engines.
9. On methods for starting, stopping, and reversing marine steam engines of high power.
10. Details of any experiments tending to throw light upon the theory of the steam engine.
11. On the life and cost of maintenance of merchant steam ships.
12. The design and construction of yachts.
13. On legislative interference with the construction, stowage, and equipment of ships.
14. The effect on shipbuilding of Lloyd's rules, the Liverpool rules, and the rules of other similar societies for the classification of ships; and on ships not classed.
15. On methods for the proper strengthening of ships of extreme proportions, and on the precautions necessary to insure their safety at sea.
16. On the straining effects of engines of high power on the structures of ships, and the arrangements necessary to obviate them.
17. On the present state of knowledge on the strength of materials as applied to shipbuilding, with especial reference to the use of steel.
18. Description of any vessel actually built, or in course of building, exhibiting great novelty in its principles of construction.
19. The preservation of a ship's internal structure from the effects of bilge water, leakage from cargoes, etc.
20. On the masting and rigging of ships, and on iron and steel masts and yards.
21. On ships' boats, and on apparatus for lowering and disengaging them.
22. On machines for economizing labor in the construction of ships.
23. On the use of machinery for economizing labor on board ship, whether merchant ships or ships of war, and whether for loading or manœuvring.
24. On the best method of clearing vessels of water in the event of a leak, and on any novel form of ship's pump.
25. On the means of accurately measuring the speed of ships.
26. On instruments for measuring and recording the rolling of ships, both as to time and extent of roll.
27. Actual measurements or records of sea waves; their hight, length, periodic time, and speed of advance; or their profiles.
28. On the measure and amount of resistance opposed to a ship's progress by the water through which it moves.
29. Exact information (either experimental or theoretical) on the efficiency of propellers.
30. On the ventilation of ships by natural and forced drafts, with details of any system in actual operation.
31. On the economic value of form and proportion both in merchant vessels and in ships of war.
32. On floating structures for special purposes—such as docks, lighters, tank vessels, light ships, telegraph ships, and others.

THE cotton crop of the United States for the present year has been favorable. The total product for the year is 3,500,000 bales of 465 lbs. each

Value of Scientific Study.

Professor Jenkin, of Edinburgh University, on recently assuming the duties of the Chair of Engineering, founded by the late Sir David Baxter, made an admirable address to his class on the above subject, from which we take the following:

The originality which suggests novel enterprises—the common sense which judges the soundness of an undertaking—the experience which specifies the quality of every material required, and the manner in which old well known details are to be carried out—the business habits and sagacity which guide men in the superintendence of work and workmen—the clear head which understands obligations imposed by a contract, and which can write a document having a definite meaning—still more the glorious faculty of invention, by which a man creates, as it were, a new thing, and gives new power into the hands of his fellows—these qualities or faculties are all useful to the engineer in the highest degree, and neither I nor my colleagues can give them. The old self-made, unscientific engineers possessed them, and in virtue of them became what they were and are. Unscientific untaught men, who have these qualities, will still become engineers in spite of scientific rivals. All this I willingly concede; yet I claim that scientific teaching will help most those men who would do most without it, and that it will render useful even an inferior class of men, who without it would be helpless and useless. Originality is not damped but guided by science; common sense suffers no wrong at the hand of knowledge; experience is not weakened by the power of calculation; education does not debar men from a knowledge of the world; the clearest head is strengthened by scholastic training; and the inventor is guarded from countless disappointments by obtaining the power of calculating results without, in every case, testing his suggestions by actual and costly experiment. In a word, scientific knowledge makes the great man greater, adding to his powers, and it guards the weaker brethren from many follies.

Discovery of New Fossils.

Professor O. C. Marsh records the discovery of remains in the eocene of Wyoming which clearly indicate several representatives of the lower *quadrumana*. Although these fossils differ widely from all known forms of the above group, their more important characters show that they should be placed with them. The genera *Lemnotherium Thinolestes* and *Telmatolestes* especially have the principal parts of the skeleton much as in some of the lemurs, the correspondence in many of the large bones being very close. The anterior part of the lower jaws is similar to that of the marmosets, but the angle is more produced downward and much inflected. Some of the species apparently have forty teeth.

The large carnivore, recently discovered by Professor Marsh, is of a genus quite distinct from *L. ferox*. The canines and premolars of the lower jaw somewhat resemble those in the hyena, but there are only two incisors in each ramus. The remains indicate an animal about as large as a lion. The genus they represent may be called *Oreocyon*, and the type species, *Oreocyon latidens*. An interesting addition to the reptilian fauna of the cretaceous shale of Kansas is a very small saurian, which differs widely from any hitherto discovered. The only remains at present known are two lower jaws, nearly perfect, and with many of the teeth in good preservation. The jaws resemble in general form those of the mosasauroid reptiles, but, aside from their diminutive size, present several features which no other species of the group has been observed to possess. The specimen clearly indicates a new genus which may be called *Colonosaurus*, and the species may be named *Colonosaurus Mudgei*, after the discoverer, Professor B. F. Mudge.

Few Guns and Poor Powder.

Would it not be more advisable for Congress, instead of appropriating half a million dollars to pay for the pleasure trips of a commissioner and a score of assistants to the Vienna Exposition, or to assist a body of manufacturers who need no such aid to forward their goods to European countries, to devote such money to protecting our harbors so that the iron clad vessels of foreign nations would be prevented from steaming up to our very wharves? The ordnance officers of the army state that our sea coast fortifications are armed with but 317 fifteen inch guns, all told; that the powder in the magazines was all made during the war and is of small grain, besides being damaged by age for use in these great guns, and that there are only on hand eighty projectiles for every fifteen inch gun, of which number only ten are solid shot.

Practical School for Weaving.

The organ of the German wool industry publishes the programme of the above school, situated in Grünberg, Silesia. In this institute the following branches are taught: Shaft (or treadle) weaving, and weaving with the Jacquard loom in all its details, the weaving of woolen shawls, the weaving of velvet, plush, and carpets, the preparation of mordants and dyes, and chemistry as applied to dyeing. The pupils are practically instructed in executing patterns in colors, in designing, warping, in operating with the reading and stamping machine, and in weaving after known and self-invented patterns. They are made acquainted with the drawing and designing of the patterns in simple and compound forms, with the construction of the different machines, and other branches too numerous to be mentioned here.

A PATENT, granted not long ago to a Mr. Keep for a stove, contains no less than sixty-two different claims for improved parts. Some of them are exceedingly small points.

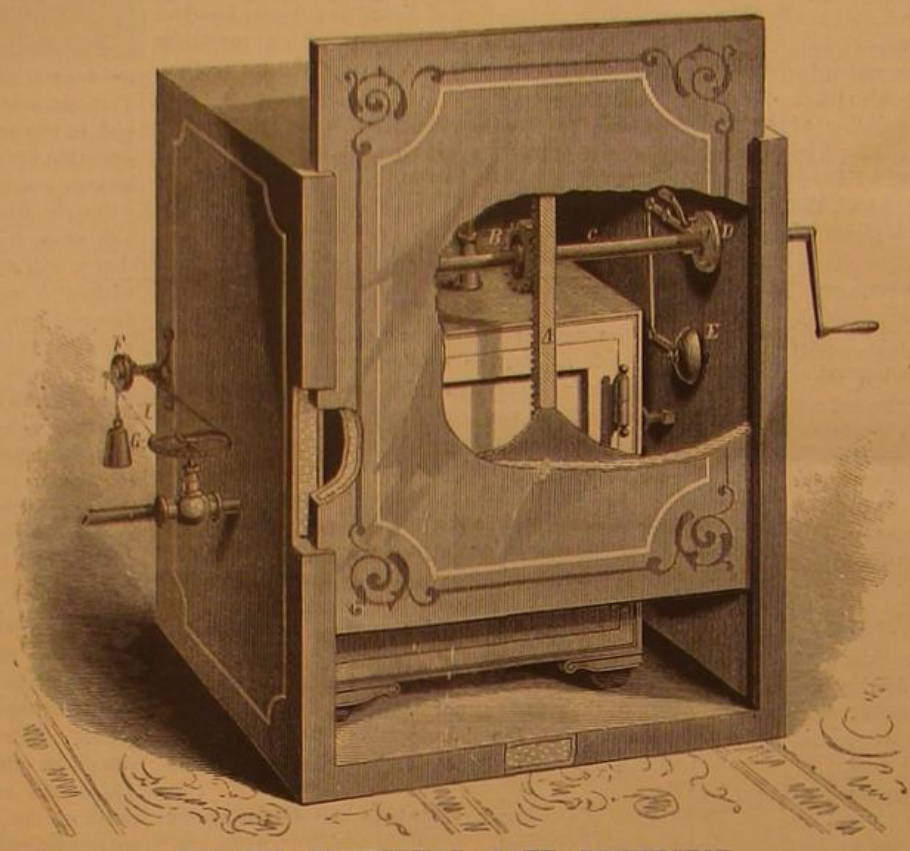
IMPROVED SAFE PROTECTOR.

Our engraving represents a new portable safe protector designed to render ordinary fireproof safes more secure by enclosing them in an iron case, made with double walls, the hollow space between being filled with water. A continuous supply of the latter is maintained by connecting the protector to a suitable reservoir, situated in the upper part of the building, or to the ordinary water mains. The details of construction as represented in the illustration are as follows: The rectangular case is composed as above stated with double sides, top and bottom. The door is made to slide up and down in grooves and is all hollow; and, by suitable connection to the supply, is filled with water. The safe, which may be of any desired variety, is shown through the broken away portion of the door, and is firmly held in position by jack screws set up between it and the inside of the case.

The mechanism for opening the door consists of the rack A, attached on the inner side, in which works the pinion B, on the shaft C. This shaft is held in bearings in the sides of the case and is turned by means of the crank shown. The outside end on which the handle fits projects in a recess so that it is flush with the exterior of the wall and may be of any peculiar or contorted shape so as to render an ordinary handle inapplicable. On the shaft just inside of the casing is a disk, D, on which are a number of pins, which, when the shaft is rotated, strike in succession and so raise a lever which is suitably connected with the gong, E, causing the latter to sound and thus act as an alarm.

At the left of the drawing is represented the supply pipe and valve, in a groove on the rim of the wheel of which is wound a small chain which passes over the pulley F, and sustains the weight G. As it is designed that, when in ordinary use, the casing shall not be filled with water, this apparatus is an ingenious means of admitting a supply automatically whenever necessity arises. The weight is sufficiently heavy to turn the wheel and so open the valve, but is prevented from so doing by the piece of common string H. In case of fire, however, this cord is at once consumed and the weight, falling, causes a constant supply of water to be admitted. Suitable vents may be provided to relieve the steam pressure due to intense heat. The water cannot rise to a temperature beyond 212° Fah, and as this is necessarily far below that which the interior safe is capable of withstanding, the protective qualities of the latter are greatly enhanced. The portability of this device will render it superior to the similar method lately suggested, and in some localities practiced, of placing the safe in a permanent brick vault made with water connections.

Patented October 1, 1872. For further information relative to the sale of the entire right, etc., address the inventor, Mr. James W. Brook, Lynchburgh, Va.



BROOK'S EFFECTUAL SAFE PROTECTOR.

About Walking.

A gentleman who lately made a pedestrian tour, from Portland, Oregon, to San Francisco—some eleven hundred miles—gives the following particulars relative to the experiences of his party:

Before starting, I was strongly urged to wear shoes ("English walking shoes") and my own prejudices were in their favor, but careful deliberation told me of the fearful dust to be encountered, following, as we would have to, most of the way, a thoroughly traveled road that had not seen rain for months, and also of the necessity of having to take boots or shoes off many times each day to bathe the feet. This decided me in favor of high top boots, the wisdom of which I had no occasion afterward to doubt. The pants were also protected from the dust by being worn inside of them. The feet can be saved much irritation and many blisters by the use of insoles (boots or shoes having been made large enough to admit them). The greater friction between an easy fitting boot and the foot is at the fore part of the front foot. Every time the heel raises, the relative position of the foot and the sole of the boot must change, causing great friction, as the entire weight of the body is upon the foot at the time of change between foot and boot. An insole, if a trifle shorter than the boot, will take much of this friction from the foot, as it must then take place, to a great extent, between the insole and sole of the boot. A second insole will relieve the foot still more. They will also furnish the additional advantage of relieving the feet when much swollen, by taking them out. No matter how toughened the feet become, they will blister very readily if rapid walking is persisted in, say for three or four hours, while, at a pace that is not unduly exhausting the system, they will not feel the slightest discomfort.

We practiced bathing feet, hands, and heads very often, say from three to six times a day, when water was found, and when we were tired and exhausted it would have a very exhilarating effect.

Rapid walking, "spurts," at the rate of four miles an hour, of two or three hours duration, or long marches, say twelve miles or more, without a halt, is very exhausting. If indulged in, in the early part of the day, it will incapacitate one for the balance of the day, or if at the close of the day, its effects will be felt the following day. The same will apply to ascending high hills or mountains. Movements in such instances should be sufficiently moderate to avoid getting into a "pud" or perspiration, more than when moderately walking on the level.

The Graham crackers, upon which we principally existed, were baked hard and dry like sea biscuit, and we found it necessary to moisten and soften them before eating, and we resorted to the use of boiling hot water, breaking the crackers into it, and allowing them to absorb all the water they would. The hot water seemed so grateful to us that we soon fell into the way of taking it freely, and were often astonished at the quantity we consumed. Its use did away with much of our thirst while walking, and was beneficent in all of its effects. I venture the assertion that there is a virtue in the use of hot water, where great exertion is to be endured, that is not generally understood. By hot water I mean water that has been made to boil and then taken as hot as it can be borne; tepid water is unpalatable.

In our preparations, it was proposed that we carry sun umbrellas. I did not second the proposition, believing their use would not compensate the trouble of carrying them; I yielded, however, and subsequent experience convinced me of their great value to us. Our estimate was that we could perform one fourth more with than without them, whenever the temperature was above 90°.

PUTT'S WASH BOILER.

The steam clothes washer herewith illustrated consists of an outer boiler, A, and an inner boiler, B, securely soldered together at their upper edges. The boiler, B, as shown

Fig. 1

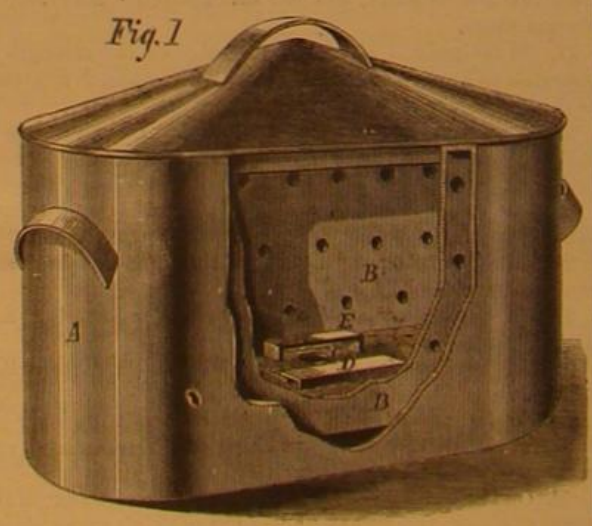
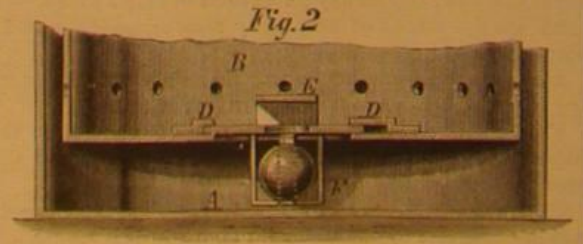


Fig. 2



through the broken away portion in Fig. 1, is constructed smaller in size than the boiler, A, so that a suitable space is left between the two. The inner receptacle is perforated with a number of holes, which gradually increase in size, those nearest the top being the largest. Through the middle of the bottom is made an aperture, which is covered by the plate, C, shown more clearly in section in Fig. 2. This plate is held in strips, D D, one of which is wider than the other, so that the plate may be applied and removed by slipping its edge so far beneath the wider strip that its other edge may be inserted and withdrawn past the edge of the narrower strip. The piece, E, is used to cover an orifice in the plate, C, so as to prevent the same becoming clogged by the clothes, and also serves as a handle. Attached to the lower side of the plate, and surrounding the abovementioned aperture therein, is a slotted tube or tubular frame, F, in which is placed a ball, which is retained from falling out by wire or other suitable means. Lastly, the apparatus is closed by a cover fitting tightly into the mouth of the boiler, B.

In using the device, the plate, C, with its attachments, is removed, and a quantity of soap and water is placed in the bottom of the boiler, A. The plate is then fixed in position, the clothes put in, and the apparatus set over the fire. As the water becomes heated, the steam raises the ball, which thus closes the bottom orifice. The water and steam are then forced up between the walls, thence through the perforations in the sides of the inner boiler, and so pass laterally and at the same time, entering through holes above the clothes, percolate through the garments. This invention has the merits of both ingenuity and simplicity, and will doubtless prove a useful convenience in the laundry.

Patented through the Scientific American Patent Agency, Nov. 19, 1872. For further particulars address Mr. W. C. Putt, Ludlow, Champaign Co., Ill.

Man Engines.

For the purpose of lifting the miners out of deep mines without the use of rope and kibble, man engines were invented 40 years ago by Bergmaster Dörrell, of Clausthal, in the Upper Harz, when he used two pump rods, which, side by side, went up and down a shaft, and fixed to them small platforms and handles at all those points of the rods which came opposite after every stroke. So, by simply changing his stand after each stroke, from one rod to the other, a man would be lifted up to the surface without any exertion. This ingenious system, says a correspondent of *Engineering*, was soon imitated in other parts of Germany, Belgium, France, and England, and generally special machinery was designed to drive these man engines. At the deep silver lead mines of Przibram, in Bohemia, since 1854, in the Maria shaft, a direct acting man engine, with two steam cylinders and cataract reversing gear, has been employed, both rods being connected by chains which run over pulleys; the great wear and tear of the latter, however, the great pressure of steam required, the inequality of the engine stroke when differently loaded, and other inconveniences, caused this direct acting engine to be abandoned and replaced by another indirect acting man engine in the Anna shaft. This latter was constructed so as to transmit the up and down motion from a rotating crank by two pump crosses—by-the-bye, exactly the same principle which was originally employed by the inventor. This system is now quite successful at Przibram, and a small condensing steam engine, working expansively, is quite sufficient to work it with the greatest safety and regularity, a brake attached to the flywheel controlling the engine with certainty, whenever required. The engine reaches a depth of 400 fathoms, and 3,000 men go up and down it daily, in about 9 hours (3 hours for each shift); it makes four to five strokes per minute of 10 feet each, requires 6·2 to 6·9 lbs. of coal per hour, and per effective horse power, and costs from 2s. to 2s. 3d. per horse power in 24 hours. Quite recently the old engine in the Maria shaft has been also replaced by a similar one, only the stroke of the rods has been increased to 12 feet.

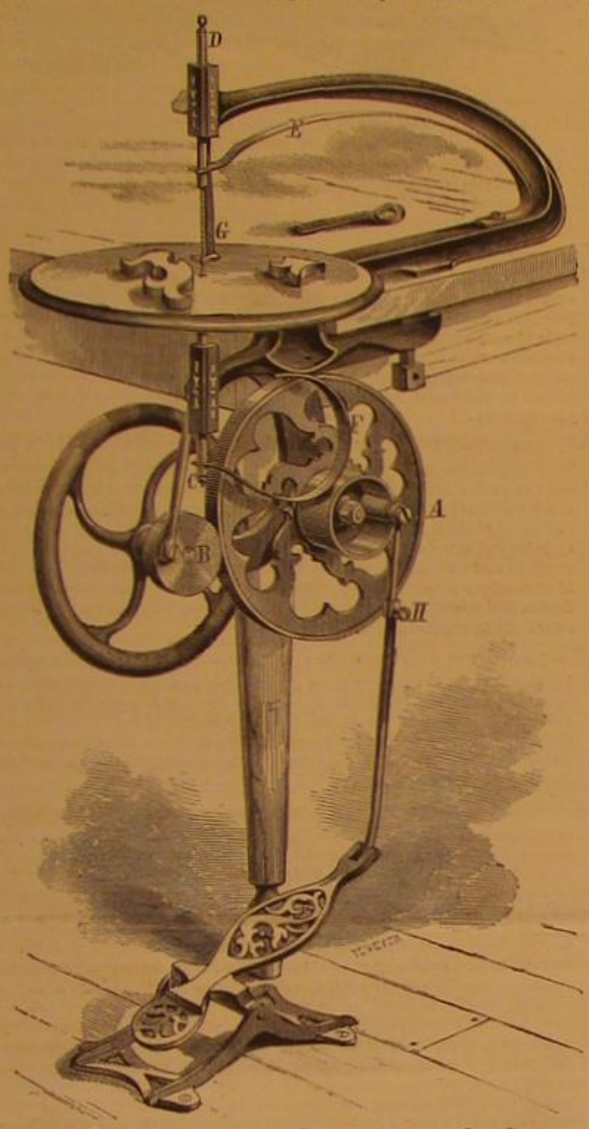
Centrifugal Drying Machine.

MM. J. Decondin and Co., of Paris, have, according to the *Engineer*, invented a new type of centrifugal machine, which presents certain advantages. The employment of such machines has, as is well known, been largely extended in dyeing operations, in sugar factories, and generally in all industries where it is desired to express liquids from solids. They consist of cylinders pierced with holes to receive the material from which more or less moisture is to be extracted. The cylinders revolve at very high speeds on vertical shafts, and the centrifugal force drives out the liquid. The machines in general use are open to objection, on account of the trouble they give the workmen from mechanism placed above the cylinder. In the apparatus of MM. Decondin this objection is removed. The following particulars relating to its constrution are extracted from the *Annales Industrielles*: The cylinder carries in its center a vertical tube, closed at the upper end, the level of which corresponds with the top of the cylinder. This tube rests at the end on a fixed axis, upon which the whole revolves. The cylinder is thus placed in a condition of stable equilibrium. A pinion, fastened to the central axis, is connected to the bottom of the cylinder, and movement is communicated to this pinion through a pair of horizontal toothed wheels, of a vertical shaft, some bevelled gearing, and driven by hand or off a pulley. The price of the apparatus, including cover, etc., varies from £10 to £32.

REMARKS.—The above is one of many examples of the adoption of American improvements in Europe. The idea of removing the mechanism from above the machine, out of the way of workmen, suspending and driving the dryer from below, was patented in this country several years ago, and dryers working in this manner have long been in operation here.—EDS.

AMATEUR'S JIG SAW.

We illustrate herewith an ingenious form of jig saw, designed especially for amateur use. It is portable and readily attached to a carpenter's bench or an ordinary table, by means of the screw clamp, as shown. The cast iron arm terminates in the guide, D, in which works the spindle to which the upper end of the saw is attached in the ordinary adjustable manner, its lower extremity being similarly held in the guide underneath the table. A constant tension of the blade is maintained by the bent springs, E and F. Motive power is communicated from the treadle, which may be attached, at any convenient point on the floor, to a rod which forms a sleeve for a smaller rod, which is connected with the crank of the large wheel, A. The object of making the rod in two portions is that it may be adjusted to suit any hight of table and afterward held in position by the set screw at H.



Around the circumference of the wheel, A, is placed a covering of leather, by the friction of which the pulley, B, and the fly wheel connected therewith are actuated. By means of the pitman, as shown, motion is transmitted to the saw. G is an adjustable metal foot designed for holding the work in place while being operated upon.

The machine is both simple and durable in construction, and, as a means of developing a mechanical taste in the young, will prove both a useful and instructive gift. It will readily cut out brackets, book racks, and other ornamental articles, and thus may be used for profit as well as for amusement.

Patented through the Scientific American Patent Agency, July 23, 1872. For sale of rights, agencies, and for other particulars, address the inventor, Mr. Samuel N. Trump, or Mr. C. N. Trump, machinist, Port Chester, N. Y.

GOVERNMENT TELEGRAPHY.

The *Telegraphic Journal* is the name of a new monthly periodical lately established in London, of which the first number is now before us. It is printed in magazine form, and contains much valuable matter relating to telegraphy. In England, as our readers are probably aware, the telegraphs are now owned and worked by the government. A bill is now before Congress intended to effect the same thing in this country. It is therefore interesting to know how the plan of government telegraphy works, practically, in Great Britain. On this subject our new cotemporary, the *Telegraphic Journal*, says that, in theory, it is good to have the government own the telegraphs, but in practice it is bad. It takes a longer time to send messages than formerly. The man who expects, in England, to send a message fifty miles by telegraph quicker than he can send it by railway, is generally disappointed.

Labor Strikes in England.

Recent telegrams from England bring the news of the strike of five hundred of the stokers employed by the London gas companies. This is but a continuation of the uprisings which are disturbing the industries of Great Britain and which evidence the unsettled state of the labor question in that country. Policemen, and employees of the civil service and of the post office have in turn attempted to obtain increased wages by organized resistance, and now the stokers have followed their example, to the great inconvenience of a large portion of the inhabitants of London. The city has been at night in a state of partial darkness, and several of the theaters were compelled to omit their performances. Large numbers of the disaffected workmen have held meetings and processions, and many have been arrested and imprisoned under charges of conspiracy.

The probabilities are that this, as was the case with the preceding strikes, will result in the defeat of the laborers, but which ever way the conflict ends, it is plainly evident that a readjustment of the system of work and wages in England is fast becoming a necessity which that country can ill afford to neglect.

Facts concerning Bees.

When the queen bee is forcibly taken away from the hive, says the *American Bee Journal*, the bees which are near her at the time do not appear sensible of her absence, and the labors of the hive are carried on as usual for a time. It is seldom before the lapse of an hour that the working bees begin to manifest any symptoms of uneasiness. They are then observed to quit the larvæ which they had been feeding, and to run about in great agitation to and fro; and on meeting with such of their companions as are not yet aware of the disaster which has befallen them, they communicate the intelligence by crossing their antennæ and striking lightly with them. The bees which receive the news become in their turn agitated, and spread the alarm further. All the inhabitants now rush forward, eagerly seeking their lost queen. But, finding search useless, they appear to become resigned to their misfortune, the tumult subsides, and if there are worker eggs or young larvæ in the cells, preparations are made to supply the loss by raising a new queen, and the usual labors of the hive are resumed.

For feeding bees: Take at the rate of five pounds of refined or white sugar, two gallons of soft water, one tablespoonful of salt, ten grains of cream tartar; put all together, bring to a boil, skim and, when cold, add eight ounces pulverized slippery elm bark, or fine oat meal, stir it well, then feed in the hive. During the summer, use but four pounds of sugar.

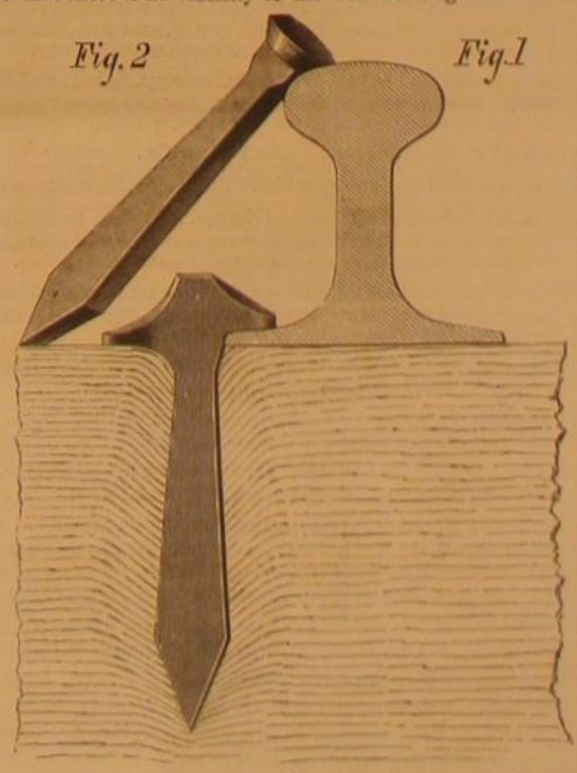
Italian bees gather much larger stores of honey than the black bees. Dzerzon, the great German apiarian, after many years experience, says that the profits of his apiary have been doubled since their introduction. They are also much more peaceable than the black bees.

Artificial Volcanoes.

M. Hochsteller has made, at Vienna, an experiment which imitates on a small scale the eruption of volcanoes. It is based on the property, possessed by sulphur when melted under the vapor of water having a pressure of three atmospheres, to absorb a certain quantity of the water, which afterwards escapes in the form of vapors during the cooling. In operating on a quintal of sulphur, a superficial crust formed, an opening being made in which, pieces of sulphur emerged, accompanied with explosions and puffs of vapor. At the end of an hour it formed a cone, having a diameter of from 30 to 50 centimeters at the base and about 8 centimeters in hight, exactly resembling the volcanic cone resulting from the successive accumulations of lava streams.

IMPROVED RAILROAD SPIKE.

The invention herewith presented furnishes two improved forms of railway spikes, one for holding the rail to the tie, and the other for bolting down the chair. The engraving shows the construction of the device so clearly that but little explanation is necessary. The shape of the head of the rail spike, Fig. 1, is such as to afford a large holding surface, while the lower portion, being gradually widened, is well adapted to clinch in the wood, bending the fiber downward so that there is no liability of the bolt working loose. The



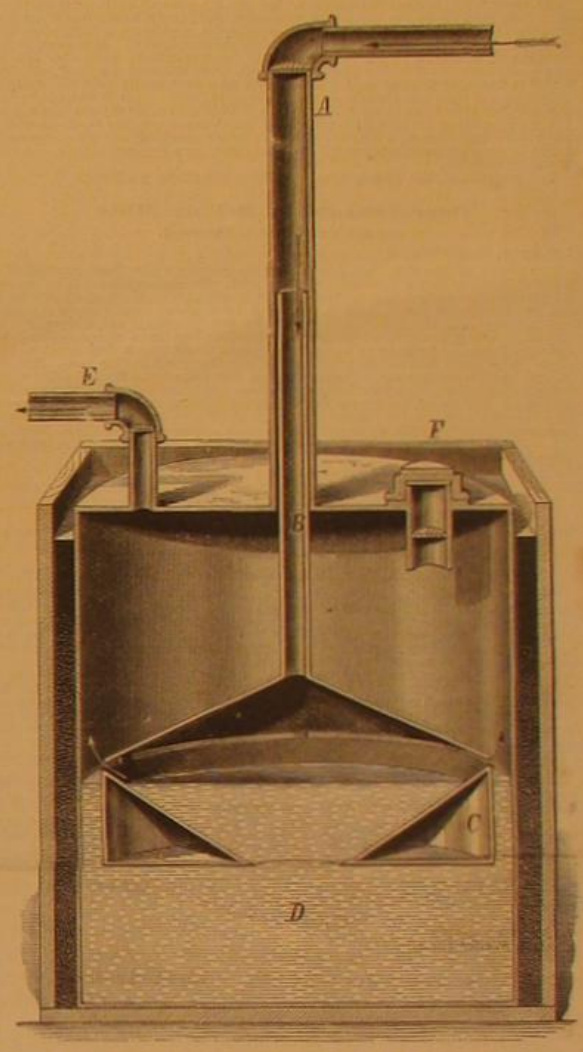
chair spike, Fig. 2, is made with a round head, and, being otherwise constructed on a similar principle to that above described, it possesses the same advantages. The practical utility of the invention is plainly evident, and as its expense is necessarily no greater, it will doubtless be preferred to the straight and less effective spike now in use.

Patented Nov. 12, 1872. For further information address Henry Stibbs, 25 North Paca street, Baltimore, Md.

DAYTON'S GAS CARBURETTER.

This invention, illustrated in section in our engraving, is one of the best forms yet devised for carburetting ordinary street gas, and thus causing an economy in its use, both by increasing the illuminating power and largely diminishing the rate of consumption. The apparatus, the simplicity of the construction of which is clearly indicated in the engraving, affords a means of combining the gas, as supplied in the mains, with the vapor of a low distillation of petroleum, a heavy product, and not the light gasolene ordinarily employed in air gas machines.

Entering in the direction of the arrow, and passing down the tube, A, the gas flows through the interior pipe, B, which fits loosely in the larger tube; thence it descends into the conical deflector, by which it is brought in contact with the vapors arising from the hydrocarbon. The liquid, D, is poured into the receptacle through the opening at F, and supports a



peculiarly shaped float, C, which is attached to the deflector. It is evident that, as the level of the distilled product is lowered, the float descends, carrying with it the deflector and pipe, B, so that every portion of the liquid will be completely utilized. The gas, after being enriched with the vapors, arises in the direction of the arrows, between deflector and float, into the body of the apparatus, and finally makes its exit by the tube, E.

It will be noticed that the gas does not pass through the hydrocarbon, but is deflected so near to its surface as to become thoroughly impregnated. That this method is practically successful, repeated tests have well demonstrated. Experiments conducted in our presence, using the same burner, and comparing the light obtained by street gas with the same after passing it through the machine, indicated not only a plainly increased light, but the meter showed a direct saving of some forty per cent in the quantity of gas burned. As the cost of the material used is quite small, the system must necessarily insure a great economy. The inventor states that he has determined by actual practice that two barrels of the liquid will supply twenty burners for one year, and that forty-five gallons produces 10,000 feet of excellent gas. The apparatus can, of course, be made of any size, to hold either a small amount or several barrels; it is well protected by casing and by safety gauze at every outlet.

In order to determine exact data relative to the increase of light obtained, Professor Henry Wurtz, of this city, a well known expert in such matters, communicates to us the following results of experiments: He considers the invention both simple and cheap in construction, and in his report states that the tests were made on the gas of the New York Gas Light Company, the value of which, as supplied in the city mains at 12 o'clock meridian, was found to be 17·55 sperm candles for five feet burned per hour. The device above described converted the same gas to a power of 33 candles for the same volume per hour.

Patented Oct. 8, 1872. For further particulars address the inventor, Mr. H. G. Dayton, Maysville, Ky.

THERE are, at present, three submarine telegraph cables between America and Europe. A new cable is soon to be laid by the French company, and still another by the Great Western Telegraph Company, making five in all. The total amount invested in all these cables will be thirty millions of dollars.

PATENT OFFICE DECISIONS.

Improvement in Stove Pipe Elbows.

LEGGETT, *Commissioner:*

The applicant seeks a patent on his device as a new article of manufacture. He takes a stove pipe elbow, after it has been finished, and dips it into a vat of molten solder.

The references show that buckets, water pipes, etc., were before made and prepared in exactly the same manner as applicant's device is prepared. It is preposterous to suppose that the mere application of this coating metal to an article so analogous as a sheet metal stove pipe possesses any element of novelty or indicates any exercise of the inventive faculty. One man discovers that he can take a water pipe, dip it into molten solder, and thereby coat it and protect it from corrosion. He makes application and obtains a patent for the same. Another man makes a stove pipe, coats it in the same manner and by the same process, and claims a patent for the same. If this second can be granted, then there is no reason why fifty thousand patents may not be granted for coating in the same manner fifty thousand different articles of manufacture. This simple aspect of the case is sufficient to answer it without further examination.

It was never the design of the patent law to grant a separate patent on every possible application of a process. To do so would be a fraud upon inventors and the public alike.

The decision of the Examiners-in-Chief, rejecting the application, is affirmed.

Perforated Sheet Metal Pipe.

APPEAL OF HALL AND HALL.

LEGGETT, *Commissioner:*

Applicants claim "a perforated sheet metal pipe, constructed substantially as and for the purpose described." This pipe is to be used, in connection with manufacturing establishments, for the purpose of extinguishing fires. It is extended along the ceiling of a factory, and water, being forced into it by suitable apparatus with which it is connected, makes its exit through the perforations, and is distributed beneath like rain or spray. This general device is old, as shown by the references. If the applicants were the first to produce sheet metal water pipes, or if they were the first to make smooth holes in them, or if they had discovered a new process of making smooth holes, they would have good ground for a patent. As it is they have no ground, for they have made no invention. They have, doubtless, been misled by supposing that, in the process of manufacturing, the stage at which they make their holes, whether before or after forming the pipe, has anything to do with conferring upon the pipe itself, as a finished article, the element of novelty.

The decision of the Board, rejecting the application, is affirmed.

Improvements in Rolling Mills.

APPEAL OF JOSEPH L. PENNOCK.

LEGGETT, *Commissioner:*

The object of applicant's invention is to convey a pile from the bed of a heating furnace to the rolls of a rolling mill. He accomplishes it by means of power-driven hauling mechanism, which withdraws the heated pile from the furnace and deposits it on a platform of a crane that swings it round and delivers it to the rolls. It is shown by the Examiner and illustrated in applicant's argument that similar mechanism has been employed to drag the pile from the furnace on to a platform of a truck which delivers it to the rolls. Applicant has substituted a crane for the truck in this case. But, as is well known, cranes are in common use for conveying heated piles to be forged and rolled. In substituting the crane applicant has effected a saving, and in the details of his device has exhibited invention. It is not, however, of a very comprehensive character, in view of the references, and I think does not justify a claim so broad as the one under consideration. It is, in my opinion, fully comprehended in the second claim, which has been allowed.

The decision of the Board is affirmed.

DECISIONS OF THE COURTS.

United States Circuit Court, District of New Jersey.

WELLS *vs.* GILL *et al.* SAME *vs.* YATES *et al.*

Wells' Patent for Manufacturing Hat Bodies.

This was a motion for a provisional injunction in a suit in equity brought by Eliza Wells, administratrix of the estate of Henry A. Wells, deceased, against John Gill and George H. Gill, for an alleged infringement of letters patent for a machine for making hat bodies, the original patent having been granted Henry A. Wells, April 25, 1846, and the reissue, under which the suit was brought, bearing date May 19, 1868.

The main question involved, besides that of infringement, was the effect to be given to a judgment in favor of the patent previously rendered in the trial of an action at law in the Circuit Court for the Southern District of New York; it appeared that such judgment had been taken up by a writ of error to the Supreme Court of the United States, and that the cause was still pending before that tribunal.

The motion was heard by Mr. Justice Strong, of the Supreme Court, and his honor, Judge Nixon.

In connection with the above there was argued a similar motion in the suit of *Eliza Wells, administratrix, &c.*, vs. *Yates, Wharton & Yocom;* the questions involved in the two motions being the same.

The opinion of the Court was delivered by Mr. Justice Strong, holding that the complainant is entitled to an injunction. But, in view of the fact that the judgment in the Circuit Court of New York may be reversed, an injunction should be withheld if the defendants give security for the payment of the profits they may derive from the use of the invention, and for the damages their use may cause to the complainant. Bond to be given in the penal sum of $20,000.

The same order in the case of *Wells* vs. *Yates* et al.

E. N. Dickerson for complainant.

Soule & French for defendants.

Supreme Court of the United States.

THE GORHAM MANUFACTURING COMPANY, appellant, *vs.* GEORGE C. WHITE.

Design Patents.

Appeal from the Circuit Court of the United States for the Southern District of New York.

The complainants are the owners of a patent, granted on the 16th day of July, 1861, to John Gorham, Gorham Thurber, and Lewis Dexter, Jr., for a new design for the handles of table spoons and forks, and their bill charges that the patent has been infringed by the defendant. The validity of the patent is not denied, nor is it controverted that the defendant has sold spoons and forks which had upon them designs bearing some resemblance to the design described in the complainants' patent. But it is contended that none of the designs on these articles thus sold are substantially the same as the design covered by the patent, and that they are all independent of any thing secured to Gorham, Thurber, and Dexter, the patentees.

Mr. Justice STRONG delivered the opinion of the Court, holding as follows:—

The acts of Congress, which authorize the grant of a patent for designs, contemplate not so much utility as appearance; and the thing invented or produced for which a patent is given is that which gives a peculiar or distinctive appearance to the manufacture or article to which it is applied.

It is the appearance to the eye that constitutes mainly, if not entirely, the contribution to the public which the law deems worthy of recompense, and identity of appearance or sameness of effect upon the eye is the main test of substantial identity of design.

It is not essential to identity of design that the appearance should be the same to the eye of an expert. If, in the eye of an ordinary observer, giving such attention as a purchaser usually gives, two designs are substantially the same, if the resemblance is such as to deceive such an observer, and sufficient to induce him to purchase one supposing it to be the other, the one first patented is infringed by the other.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges with much pleasure, the receipt of original papers and contributions upon the following subjects:

On an Improved Conservatory. By F. W. P.

On Instinctive Marriage. By W. T. R.

On the Darwinian Theory. By M. R.

On the Wheel Question. By J. A. B., and by J. B. J.

On A Means of Saving Life in Case of Disasters at Sea. By F. H.

On a Geometrical Problem. By O. W. G.; also by M. F., and by G. B. L.

On Self Propelling Fire Engines. By F. G. W.

On the Injury of Trees by Lightning. By F. S. R.

On a Recent Boiler Explosion in Ohio. By J. A. W.

On a New Method of Feeding Canals. By B.

On Human Antiquity. By D. K.

On Insensibility. By E. H. R.

On Perpetual Motion. By I.

On the August Meteoric Display. By J. B.

On the Separation of Ramie. By M.

On Terrestrial Heat. By W. L. W.

To Investors.—We are selling at par and interest, and recommend to careful investors, the First Mortgage Seven Thirty Gold Bonds of the Northern Pacific Railroad Co. The special attention of investors is called to the ample land security on which these bonds rest, in addition to the usual guaranty of a first mortgage on the road, its equipments and earnings. The lands of the company thus far sold have realized $5.66 per acre. The grant averages about 25,000 acres per mile of road. JAY COOKE & CO.

Facts for the Ladies.—Mrs. G. A. Blanchard, Raymondville, N. Y., has used her Wheeler & Wilson Lock-Stitch Machine in tailoring since 1865, and it is as good as new; has done the sewing for a family of seven persons, attended to her household duties, and earned $200 a year; says that any one owning a Wheeler & Wilson Lock-Stitch Machine can earn a respectable living. See the new Improvements and Woods' Lock-Stitch Ripper.

Business and Personal.

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Scale in Boilers. I will Remove and prevent Scale in any Steam Boiler, or make no charge. Send for circular. Geo. W. Lord, Philadelphia, Pa.

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A Valuable Patent for Sale or worked on royalty, is perfect and simple in its construction—will give entire satisfaction on first sight. Address J. M., Leggett's Hotel, 48 Chatham Street, New York City.

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Absolutely the best protection against Fire—Babcock Extinguisher. F. W. Farwell, Secretary, 407 Broadway, New York.

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Williamson's Road Steamer and Steam Plow, with Rubber Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1809.

Belting as is Belting—Best Philadelphia Oak Tanned. C. W Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

Boynton's Lightning Saws. The genuine $500 challenge Will cut five times as fast as an ax. A six foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

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Gatling guns, that fire 400 shots per minute, with a range of over 1,000 yards, and which weigh only 125 pounds, are now being made at Colt's Armory, Hartford, Conn.

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The Berryman Heater and Regulator for Steam Boilers—No one using Steam Boilers can afford to be without them. I. B. Davis & Co.

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 $1·50 a line, under the head of "Business and Personal."

ALL references to back numbers must be by volume and page.

R. and A. say:—Is it possible to bring such an intense degree of heat upon a leaden pipe, say ¾ inch, that the heat would melt the pipe provided a continuous stream of water runs through the pipe? Is it possible to melt a pipe at all under those conditions? Answer: Yes. It is possible to melt a lead pipe under the circumstances you mention. One method of doing so would be to girdle the pipe with a platinum wire, heated to white heat by galvanic battery. It would quickly melt the pipe through.

W. B. asks:—At how many strokes per minute would it be most economical to run an engine the cylinder of which is fourteen inches and the piston stroke thirty inches? I am running it at 60 strokes per minute without a cut-off. I have plenty of steam, but do not get power enough at 60 strokes. Answer: Your engine, if of 14 inches diameter of cylinder and 30 inches stroke of piston, well made and well taken care of, ought to run without difficulty up to a speed of 80 revolutions a minute. If as carefully proportioned as the Allen engine, it would work well at double that speed, but it is improbable that you will succeed in going above our figure, just given.

S. says:—I am a fireman on a locomotive, and while running I notice that the indicator on the steam gage points to one hundred and twenty. While the engine is at rest and the boiler cold, the indicator points to ten; what is the actual steam pressure? Answer: We cannot tell you. The only way to determine it is to test your gage by comparison with a standard. Probably your pressure is between 110 and 120 when indicating the latter figure. Test it if you would be safe.

S. G. S. says:—How can I cheaply and simply generate a gas so irritating as not to be borne by air breathing animals? Answer: The gases generated by the burning of tobacco will perhaps answer your purpose. Florists use the weed to destroy insects on plants.

C. H. G., of N. Y., says:—We have just completed a reservoir to supply our city with water, which has about 250 feet fall. The water is pumped from the river, to the top of College Hill where the reservoir is located, by powerful engines, so that we shall have a plentiful supply for years to come. When the project was first proposed, it was mentioned as an inducement that those requiring a small amount of power (there are quite a number here) could use it more economically by various water motors than they could steam power. Other cities were quoted as an example. But now when we have water in plenty, all are afraid to try, some saying that it will cost too much, others that we have not water enough, and all hang back waiting for somebody to make a start. I wish to ask: What diameter would a turbine wheel require with 250 feet fall, and how many gallons water would it use per hour, to run two small back geared foot lathes, having 4 foot beds and 12 inch swing, used for light work, and how much would such a wheel cost? From this standard, the probable cost of any requisite power can be obtained. Answer: The smallest and cheapest wheel that you can find in the market will drive your two lathes of 12 inch swing. They will require less than a quarter horse power, and your wheel should use less than 300 gallons of water an hour under such a great head. Write to any good wheel builder.

J. M. F. says:—I enclose a "magical fish;" please explain why it moves when placed on the hand. The motion is not from heat, as it will not move when placed over a warm iron, nor does it move when placed on other parts of the body, say the leg. Are you correct in your answer to F. H. N., page, 346, in reference to the report of two guns being heard farther than one? Suppose one man could throw a stone 100 yards. Then place 50 men there, and let them throw. No stone would go over 100 yards, but there would be many more stones in the air. Is it not so with regard to sound? The report of 50 guns would be much more intense within a given circle, but would it be a greater circle than if made by one gun? Answer: It is the warmth with moisture from the hand that causes the thin membrane to expand and contract and thus to wriggle. Your illustration of the throwing of stones does not apply to the throwing of sounds. In the case of the stones each individual exerts his strength on a separate body. But when a number of persons join in simultaneously making sound, they exert their united strength to move the same body, namely, the air; and it necessarily follows that they will unitedly cause the air to vibrate for a greater distance than could a single individual.

J. N. writes as follows:—There is a discussion going on in our shop on the subject of friction, and Morin's experiments have been quoted in support of the theory that friction is proportionable to pressure and independent of the extent of the bearing surfaces when they are of the same quality and not in any way injured. Will you inform us if Morin's experiments were carried far enough, and if they are to be depended on as being reliable? Answer: Morin's experiments are generally considered standard and perfectly reliable. The only difficulty in applying known laws of friction to actual examples arises from the uncertainty of our determination of the limits of pressure which may injure or change the character of rubbing surfaces.

S. M. H., who states that he is a machinist, suggests that street cars may be driven by compressed air, to be carried within suitable cylinders, placed upon the car. Also that canal boats may be propelled by means of traction engines running on the track instead of horses. Both of these ideas are very old, have been frequently and successfully tried and have been repeatedly described in the SCIENTIFIC AMERICAN.

E. O. J. says:—In answer to G. P., who wishes to know the fastest time on record made on any railroad in this country or in England, I would say that in June, 1855, the locomotive Hamilton Davis, on the New York Central Railroad, with six cars, ran fourteen miles in eleven minutes, seven seconds. This is on record.

To J. S. E., query 7, page 298.—From the center of gravity of any triangle let fall perpendiculars on the sides of the triangle. In each of the three quatrilaterals thus formed, one at each angle, inscribe circles, which will be the circles required. (See "To inscribe a semicircle in a right angled triangle," in any geometry).—R., of Mass.

Recent American and Foreign Patents.

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

STAVE EQUALIZER.—Elijah P. Spaulding, of Murfreesborough, Tenn.—A pair of circular saws, preferably mounted on the same arbor, are placed as far apart as the required length of the staves to be cut. A pair of disks mounted on a horizontal shaft, parallel with the shaft in front of it, work between the saws by lapping them back to a place where the attendant who supplies them to the carrier may take them away. The table is capable of swinging up and down to adjust it to the said carrier for having the right inclination to deliver the staves properly, and it may be fastened at any required inclination. Preferably, there will be two pins in each disk, so that they take two staves at each revolution. If the staves are to be sawn off square at the ends, the two disks will be of the same size; but if they are to be beveled for tapered casks, one disk will be larger than the other, so as to present the staves obliquely, and the difference in the size of the two disks will vary as the taper of the cask varies. When the disks are of different sizes, their faces will be correspondingly beveled. Interchangeable disks of the different kinds required will be used for adapting the machine to cut the staves to any required bevel.

WARPING MILL.—John W. Fries, of Salem, N. C.—This invention has for its object to so arrange the heck of a warping mill that the yarn wound upon the warp cylinder will not become entangled while being dyed or prepared after its removal from the mill. The invention consists in applying to the hook a vibratory motion, whereby the threads are laid diagonally, so that the threads of the same layers will not be quite parallel and those of overlying thicknesses will cross each other and not be parallel, thus preventing their becoming entangled.

ROTATING READING TABLE.—Thomas Cartwright, of New York city.—This invention has for its object to furnish an improved rotating reading table or book support for attachment to circular and octagonal tables that are supported upon a pedestal, and it consists in the rotating arm, adjustable rod, and gas pipe provided with plugs or stopcocks at its ends, stationary or jointed gas burners, and an adjustable book rest, in combination with each other and the pedestal of a table.

HAND CORN SHELLER.—Julius O. Fraizer, of Worthington, Ind.—This invention has for its object to furnish an improved hand corn sheller. The base of the sheller is a board, plank, or block, six inches, more or less, in length and breadth, and one inch, more or less, in thickness. To the ends of a U-shaped steel spring, the middle part of which is bolted to the base, are bolted two semi-tubular jaws, having teeth formed upon their inner or concave sides, so that when the ear is forced through the space between the said jaws, the teeth may remove the kernels from the cob, the said jaws being held forward upon the ear by the elasticity of the spring, which elasticity also enables the jaws to adjust themselves to and operate effectively upon ears of different sizes.

WOOD SCREW.—John S. Armstrong, of St. John, Canada.—This invention consists in a screw provided with a nick widening from the center toward the circumference, to allow the edge of driver to be pressed up and wedged tightly near the center.

COTTON PLANTER.—Henry A. Ridley, Jacksonport, Ark.—This invention has for its object to furnish an improved seed planter, designed especially for planting cotton seed. To the rear end of the beam is attached the body of the planter, which is made somewhat in the shape of the hull of a ship, to adapt it to press open the furrow to receive the seed. Just in front of the body is attached a plow, to open the furrow. Suitable mechanism gives a faster or slower feed as desired, and also keeps the seed stirred up so that it will not clog, and so that it will pass out freely.

WASHING FLUID.—Martha A. Sanderson, Fremont, Mich.—The object of this invention is to provide efficient means for lessening the labor of washing clothes, and it consists in a fluid composed of alcohol, camphor gum, aqua ammonia; and a second mixture of hot rain water, sal-nitre, borax and saleratus. When the above two mixtures have stood twelve hours, they are mixed together with rain water in a glass or stone vessel, and kept tightly corked for use.

RUDDER.—Richard H. Thomas, Kid's Grove, near Stoke-on-Trent, England.—This invention consists of a rudder of two blades, arranged side by side, one on each side of the axis, and distant from each other so as to allow a solid flow of water between them, being connected at top by a horizontal bar or disk to the axis or shaft. They are also connected in like manner at the bottom to a pivot stepped in the projecting end of the keel, and also divided at or near the middle vertically, and similarly connected by disks or bars to a journal fitted in a block in which the projecting end of the propeller shaft is also journaled, so as to strengthen the rudder and support the propeller shaft.

APPARATUS FOR CHARGING BLAST FURNACES.—William A. Miles, Salisbury, Conn.—This invention relates to improvements in the mechanism for charging blast furnaces, and more particularly to the charger for which the United States letters patent No. 130,652 were granted, the 20th day of August, 1872. The present invention consists, principally, in making the sliding bottom plates of the charger inclined on their upper faces, and also in making the stationary upper and lower guides of these plates, or either of them, hollow to admit water or air circulation, and prevent the heat of the furnace from burning them. Finally, the invention consists in the use of friction rollers above and below the sliding plates to facilitate their movement.

RAILROAD RAIL JOINTS.—John McLean Staughton, Riverton, Ky.—This invention has for its object to furnish an improved rail joint, which shall be so constructed as to hold the ends of the adjacent rails level, so that one cannot rise above the other, so that the two ends cannot sink down at an angle with the body of the rails, and which will give the joint greater strength and equal flexibility with the other parts of the rails. It consists in the fish plates made with the fish belly curve upon the middle part of their lower edges, and in the adjacent ends of the rails having their flanges cut away for a less distance than the length of the fish plates.

NAIL MACHINE.—Henry Reese, Baltimore, Md.—The invention consists in drawing the end of a heated rod into a round pointed blank between two surfaces that move in reverse directions and with the same velocity; in then shaping said blank with dies; and in a peculiar mode of applying the brushes, shockspring and raised edges on the drawing faces.

HOSE PROTECTOR.—Isaac P. Maxwell, Baltimore, Md.—The invention consists in forming a hose jumper in three readily detachable sections.

STAVE JOINTER AND CROZING MACHINE.—John McGrew, Ravenswood, West Va.—The invention consists in arranging one or more pairs of angle shaped knives to reciprocate over a bearing roll upon which the hoop is feed intermittently, for the purpose of notching the hoop and allowing it to take the bulge necessary in barrels. Secondly, the invention consists in a peculiar mode of intermittently moving the roll, feeding forward the hoop, and then holding it while the said notches are cut.

COMBINED LADDER AND SCAFFOLD.—Robert L. Upchurch, Pana, Ill.—The invention consists in constructing an article adapted to use by painters, carpenters, and others as a scaffold, and to be employed at the sides of walls and corners to serve as an ordinary step ladder when folded, and as a fruit ladder when reversed.

TURBINE REACTION WATER WHEEL.—John McGrew, Ravenswood, West Va.—The invention consists in combining with the inner chute of a turbine wheel a series or peculiarly constructed buckets that by their relation to the discharge apertures utilize all the pressure of the water. Secondly, it consists also in providing the chute ring with a vertical circular flange by which great steadiness and uniformity of motion is secured to the wheel. Thirdly, it consists also in placing a gate on the inside of the chute and adjusting it by a reciprocating slide on the outside, whereby the quantity of water admitted may be nicely and easily graduated.

KNIFE SCOURER.—Frank O. Harvey, Kansas City, Mo.—The invention consists in making a knife scourer of a trough, a stationary pad block, and a hinged and handled pad block; whereby the labor of scouring is sensibly lessened, while the rapidity of its performance is greatly increased.

PIPE MOLDING MACHINE.—Dennis Long, Louisville, Ky.—The invention consists in the application to molding machines of a movable table resting on a foundation plate and provided with one or more seats for the flasks and patterns; in the peculiar form of pattern, which is enlarged at both ends as compared with the turned off intermediate portion; and in the construction of movable seats for the end of pattern and flask. The lower ends of pattern exercise a pressure upon the sides of mold as it is withdrawn, which compacts and condenses the sand.

SPARK ARRESTER AND SMOKE CONSUMER FOR PASSENGER LOCOMOTIVES.—Wm. Martien, Baltimore, Md.—The invention consists in arresting the smoke, sparks, and cinders at the top of smoke stack and forcing them by an air draft from front of locomotive down a tube, and into a chamber where the cinders are stopped, while the smoke is carried around and emptied into fire box.

SPARK ARRESTER AND SMOKE CONSUMER FOR FREIGHT LOCOMOTIVES.—Wm. Martien, Baltimore, Md.—The invention relates to that special class of locomotives which are used for freight cars, and consists in combining with a hooded smoke stack a bibranched pipe through which are forced the cinders, sparks and smoke, the two former into cinder boxes prepared to receive them and the latter into the fire box. It also consists in utilizing the cinders to create friction on the track by transferring them to sand box wherefrom they are distributed, upon the track and in front of drive wheels, at the will of the engineer.

DRIVING GLOVE.—Edwin V. Whittaker, Gloversville, N. Y.—The invention relates to a new article of manufacture, which is to be used in driving or riding horses or other animals, and which consists of a mitt having the four fingers covered in pairs so that one of the reins will pass as usual between said pairs, while two fingers being in each pocket or envelope will coöperate in keeping one another warm. It also consists in the pattern which is preferably employed for cutting out said mitt.

AUTOMATIC FEEDING LAMP.—Dr. Samuel K. Jackson, Norfolk, Va.—The invention consists in automatically maintaining the desired oil level in a beacon lamp by means of hydrostatic pressure applied so as to take advantage of the different specific gravities of oil and water, and so as to cause the water to feed itself and take up the space gradually vacated by the oil. This lamp furnishes a continuous light by night and day for a long period without requiring any attendant to trim or replenish it, and supplies a want which has been long felt by the commercial public. It would seem that this invention must greatly facilitate transit through our bays and harbors since safety will be equally secured for navigation by day or by night and even with comparatively inexpert mariners. The pilotage also, which has hitherto been regarded as such an onerous burden upon certain classes of vessels, it is calculated, will be sensibly lessened.

BUTTON.—Spencer B. Lane, Waterbury, Conn.—The invention consists in forming the perforated head of a button with lips and the shank with a bifurcation, by which they may be connected. The upper end of the shank is forked, to enter with its prongs two apertures in the head of the button or stud. These apertures are formed in said head by punching, but so that no material is removed; consequently, the material between the apertures is turned up to form two lips. After the prongs of the shank are passed through the holes of the head, said prongs are bent apart and clinched upon the button, the pressure upon them also bending the lips over the prongs. The lips serve thus to hold the prongs down upon the head and steady the entire connection of parts.

WASHING MACHINE.—Edmund E. Flint, Tonawanda, N. Y.—This invention relates to a washing machine. The suds box of the washing machine is of semi-cylindrical shape, of wood or other material, and supported on standards. The rubber is segmental, the rubbing surface being formed by diamond shaped slats or rods. This rubber is attached to the lower ends of vertical slotted bars, whose upper ends are connected by a transverse handle. A shaft serves as the pivot of the rubber when the same is vibrated. A roller bottom is put within the suds box beneath the rubber. In operation the rubber is vibrated by hand, and moves over the roller bottom, the articles to be cleaned being between the rollers and slats. A wash board fastened to the top of the rubber can be used for hand washing by placing the rubber against one end of the suds box.

PITMAN CONNECTION FOR HARVESTERS.—William Ferris, Pleasant Plain, Ohio.—This invention has for its object to furnish an improved device for connecting the sickle bar and pitman in reapers and mowers, taking up the play beneath the knife bar and pitman, enabling the wear to be conveniently taken up, and which will greatly diminish the wear and lessen the draft of the machine. It consists in the tapering hole formed through the eye of the sickle bar and the branched ends of the pitman, having a screw thread cut in the said hole in one or both of said branches and the wooden pin, to form a connection between the sickle bar and pitman of a harvester or mower.

FLY TRAP.—Addison M. Chapel and James G. Hubbard, Pittsfield, Mass.—This invention has for its object to furnish an improved fly trap. It consists of a cylinder caused to revolve by clockwork mechanism, and which is covered with fly bait. On alighting thereon, the flies are carried into a semi-circular cavity, from which they are by suitable means prevented from escaping. A scraper brushes them off the cylinder into a passage through which they emerge into the cage.

INDIA INK SLAB.—Julius Speyer, Terre Haute, Ind.—This invention has for its object to furnish an improved slab, designed chiefly for the use of draftsmen in grinding India ink sticks, and for holding the liquid ink and preserving it from evaporation. It consists in forming a grinding surface and an ink well in the upper side of the slab or block, and a chamber in the under side of the same, in which the stick may be deposited when not in use.

BOTTLE PACKER.—Robert T. Penick, St. Joseph, Mo.—This invention has for its object to furnish an improved device for packing bottles and packages of bottles in sawdust, short shavings, rice husks, etc., and which shall correctly and uniformly regulate the space between the bottles, and between the bottles and the sides of the box in which the bottles are to be packed.

[OFFICIAL.]

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APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending, for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the day hereinafter mentioned:

22,885.—HARVESTER.—W. K. Miller. January 22, 1873.

23,097.—MACHINE FOR CROZING BARRELS, ETC.—H. Littlejohn. Feb. 12, 1873.

23,105.—CONSTRUCTION OF STEAM VESSELS.—J. Montgomery. Feb. 12, 1873.

EXTENSIONS GRANTED.

15,905.—BREECH LOADING FIRE ARM.—G. W. Morse.

22,213.—RAILROAD CAR BRAKE.—A. L. Whipple.

DISCLAIMER.

15,905.—BREECH LOADING GUN.—G. W. Morse, Washington, D. C.

DESIGNS PATENTED.

6,269.—BILLIARD TABLE.—O. D. Benjamin, Toledo, Ohio.

6,270.—NURSING BOTTLE.—M. S. Burr, Boston, Mass.

6,271.—COOKING STOVE.—E. Bussey, Troy, N. Y.

6,272.—PRINTING TYPE.—J. M. Conner, New York city.

6,273.—BROOM.—G. F. Gale, Philadelphia, Pa.

6,274.—IRON FENCE.—C. F. and J. M. Hankey, Danville, Ill.

6,275.—SODA WATER APPARATUS.—G. F. Meacham, Newton, Mass.

6,276.—TWINE HOLDER.—E. J. Steele, New Haven, Conn.

6,277.—FIRE SET HOLDER.—E. J. Steele, New Haven, Conn.

6,278.—BILLIARD TABLE.—J. Syrcher, Buffalo, N. Y.

6,279.—BELL STAND FOR HARNESS.—A. E. Taylor, New Britain, Conn.

6,280.—CORAL BOOK STAND.—S. L. Westerfield, New York city.

TRADE MARKS REGISTERED.

1,066.—SUGAR CURED HAMS.—Backman & Wilson, Cincinnatti, Ohio.

1,067.—COTTON GIN.—W. G. Clemons, Columbus, Ga.

1,068.—STOVES AND STOVE TRIMMINGS.—Culter & Proctor, Peoria, Ill.

1,069.—VELVET RIBBONS.—Giron Frères, St. Etienne, France.

1,070.—BACK SEAMED BOOTS.—I. Hall, Boston, Mass.

1,071.—LEATHER.—E. Larrabee & Sons, Baltimore, Md.

1,072.—ESSENTIAL OILS, ETC.—C. H. Phillips, New York city.

1,073.—ANNATTO.—L. E. Ransom, New York city.

1,074.—SAWS.—Wheeler, Madden & Clemson, Middletown, N. Y.

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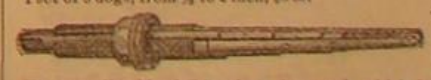

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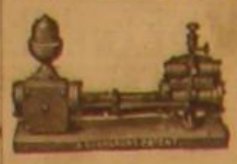

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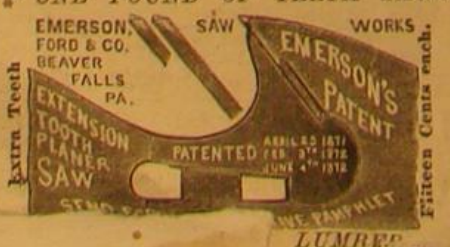

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