of the pin and then slowly rolling it along the table. Let the furthest end of the table represent the anchorage on the the other side, and another pin the other shore, and he will find, when the spool arrives at that end, that two lengths of thread have been laid. These traveling wheels cross every eight minutes, and lay five tuns of wire per day.

There are to be but two cables to this bridge, one on each side. Each cable is to be composed of seven strands, and each strand of seven hundred and forty of these one-eighth inch wires. Every strand is laid from shore to shore, fastened in its own shoes, one on each side, and each shoe is then sunk into its bed or socket, and thus firmly connected with the anchorage. The traveling wheels having laid these seven hundred and forty wires on each side, and all of those having been secured, they are bound about the entire length with wires, at intervals of nine inches. The men who do this work travel along the strand on a sliding platform from shore to shore, forcing the wires together tightly in a round shape, by means of powerful leverage, and then binding. Then follow the men with oil and paint.

ADJUSTING THE SHOES.

The strand having been thus completed, the shoes are let forward to their sockets in the anchorage connections, and the strand thus allowed to slowly fall to its place from shore to pier, from pier to pier across the river, and then again from pier to shore. In doing this, tremendously powerful tackle is brought into use on both sides—ropes of iron one and a half inches thick, any number of them, and a system of blocks and pulleys of heavy iron, done up in huge proportions. Four strands have been completed on either side—eight in all.

Each cable will be twelve and a half inches in diameter, composed of seven strands, each strand of seven hundred and forty wires, each individual wire having a strength of one thousand seven hundred pounds.

THE SADDLES.

The piers or towers hold these cables at the requisite altitude, with their massive heads. On the tops of these towers, embedded in the rocks, are plates of cast iron, on which are fixed the saddles, two on each one for each cable. The saddle weighs 14,000 and the plates 17,000 pounds. Through a groove of the saddle runs the cable, and between the saddle and its plate are small iron rollers which allow of the moving of the plate a very slight space, in case of an extraordinary necessity. These saddles are to be covered with the thirty feet high ornamental turrets before mentioned.

THE SUSPENDERS.

Around a model of the cable, or a section of it, may be noticed an iron strap, four inches wide by one-half inch thick. Attached to this, where it is brought together, is a conical socket into which the end of the suspender is to be fastened by being spread and covered with lead. The suspender is a wire rope one and one-eighth inches thick, by which the bridgeway is connected with the cable and suspended therefrom. Every five feet, on each side, there is to be one of these powerful suspenders. In the very middle of the bridge, solid one and three-quarter-inch iron rods will take the place of the wire ropes. When the strands shall have been all finished they will be brought together, seven on each side, to form the cables; the straps will be shrunk on, red hot, and the suspender connections made. There will be six hundred and forty-eight of these straps, sockets and suspenders in the structure. The suspenders and connections are made at the Wire Works of Mr. Roebling, Trenton, New Jersey.

THE BRIDGEWAY.

The construction of this portion of the improvement will be but a trifle in comparison with the stone and wire work. The total length including approaches from Front street, Cincinnati, and Second street, Covington, will be 2,252 feet; length of main span from center to center of towers, 1,057 feet; to each land suspension, 281 feet; width of bridge in the clear, 36 feet; hight above low water, 100 feet; (and here the reader will have recalled to recollection the fight in the Legislature and Council, three or four years since, over the proposition by the company to have this reduced from one hundred and twenty to one hundred feet, and in which the company was finally successful, notwithstanding the immense opposition.) There will be five hundred thousand feet of lumber in the bridgeway, all of which will be thoroughly soaked in tar in tanks on the Covington side, where the planing mill is located. The wrought-iron floor beams, the length of two of which makes the width of the bridge, are nineteen feet by five inches, and there will be two joined in one, in every five feet of the bridge—one to each suspender. The weight is twenty pounds per foot. These were made at the Buffalo Union Iron Works. Two iron trusses, ten feet high, will separate the foot roadways, one on each side, from the carriage ways; and flat-iron tracks, of accommodating width, will be laid for wheels to run upon. The wrought-iron girders, thirty feet long and twelve inches wide, will run the entire length, under the middle of the bridge. Ornamental iron railings will protect the foot passages on either side

NEW INVENTIONS.

Oyster Cracker.—This invention relates to an ingenious implement, especially intended for the cracking or breaking of oysters and other shell fish, etc.—although it can be applied to the cracking of nuts,—whereby the oysters can be cracked and opened in much less time than with the knife now commonly used for such purposes, and without the least spattering of the mud over the clothes or about the room. This implement consists of a fixed and a movable jaw, the latter being arranged and operated through the means of a lever handle, in such a manner, that, if the end of the oyster which is to be cracked or broken or a nut, be first placed between the two jaws, the movable jaw can be brought down upon the oyster or nut, as the case may be, with sufficient pressure to break or crack it, as desired. W. P. Lyon, Portchester, N. Y., is the inventor.

Axle Box Cover.—Hundreds of tuns of covers are annually lost on the railroads of this country, oil wasted, and brasses worn out, from the lack of a simple and economical means of adjustment. The first cost of an ordinary axle box is greatly enhanced by the labor required to produce a perfect joint between the cover and the outer surface of the box. The box is necessarily ridged along the parting from the variable manner in which flasks unite. The peculiarity of this invention is the use of an over flanged cover, fitting against a seat on the inner surface of the box. The core of the box after being pasted together, is blackwashed and smoothed on the surface intended for the seat. By this means a perfect seat is always insured, and the box is ready to be placed on an axle without filing or chipping. The cover, which is entered and removed in a similar manner to a hand-hold plate, has cast in its center a standing bolt, square for a short distance, beyond which a thread is cut to the end of the bolt. Over the square part of the bolt fits a cast iron bridge, and on the thread a bulb-handled nut. When both of these are in place, the point is burred, thus preventing the possibility of loss. The bulb handle counteracts any tendency to rotation by its weight. Even if rotation were possible, the cover could in no case be lost; it would always drop inside of the box. No wrench is required when oiling, or renewal of brass are necessary. The saving in first cost of a cover fitted on this plan over the ordinary arrangement of two bolts and lugs is more than one-half. The box is in successful operation on different roads. William S. Auchincloss, New York City, is the inventor.

Purifying Animal Coal.—In refining sugar, where animal coal or bone-black is used in the process, it is customary after the sirup or liquor has been filtered through the mass of coal, to reburn the coal in order to destroy the impurities collected in it from the liquor, and thus prepare it for being used again for filtering. But before the said coal can be used again, the dust and impurities found therein, and such as are produced in the process of combustion, should be removed, because if they are allowed to remain great danger results to the sugar. The devices and means used hitherto for removing the dust and other impurities from animal coal have not been inefficient because they have not sufficed to remove the impurities and foreign substances therein after reburning. This invention consists in a novel construction of apparatus for treating the reburnt coal by the use of which dust and other impurities are efficiently removed, and the same collected in a receiver so as not to be allowed to float through the atmosphere. Heretofore great complaints have been made by families residing in the vicinity of sugar refineries against the clouds of dust which often fill the air and settle upon the grounds and upon articles exposed in the air, thereby inflicting much loss and inconvenience upon laundresses and others. These complaints have threatened to effect the removal of sugar refineries from inhabited to uninhabited places, and their removal to such places would result in increased cost of carriage and labor, and in diminishing facilities for business. This invention does away with these complaints by removing their cause. Thomas H. Quick, 118 King street, New York City, is the inventor.

Button.—This invention consists in the arrangement of a pointed stud with a suitable shaped or curved groove, in combination with a pin or key projecting from the inner surface of the hollow shank of a button, with a suitable spring secured to the exterior or interior of said shank or to the exterior of a pointed stud, in such a manner that by means of the pointed stud the material to which the button is to be attached can be readily pierced, and by introducing said stud into the shank, and slightly turning it, the key is made to catch in the recess of the groove in the stud, and the button is securely held; by a slight compression of the spring the stud can be released and the button detached whenever it may be desirable. John M. Johnson, New York City (Box 4, Station F), is the inventor, and the patent was issued April 17, 1866.

Pantograph Machine.—This invention relates to pantographic engraving machines, and consists in certain novel devices and combinations whereby the machine is made capable of producing copies of the same size as the pattern; also of producing copies either smaller or larger than the pattern, but preserving the relative proportions; also of producing copies with any selected part of the outlines out of proportion; also of producing a series of parallel lines by means of a ruler which is made to advance over the pattern by the action of a pawl and ratchet. One of said novel devices is a transparent tracer, consisting of a glass with a dot on its surface, to be used instead of a metallic tracer. One advantage of such a tracer is seen in tracing from a paper sketch where a metallic tracer will obscure a portion of the line to be followed. Edmund Oldham, Brooklyn, N. Y., is the inventor.

Discharge Spout for Bottles, etc.—This device is intended for application to all kinds of apothecaries' bottles, graduates, etc., also to many household articles, such as cans, jugs, measures, etc. One of its ends is to be inserted in the head of the bottle, and this is the receiving end; the other is the discharging end, and it is tapered off so as to form a spout that will conduct the liquid from the bottle without any liability of the same being spilled. As further security against the above contingency, the spout is encircled with a continuous inclined trough arranged so that it will conduct back into the bottle any liquid which might run over upon the outside of the spout. A cap may be used for closing the spout, and in such case no other corking or stopping of the bottle will be necessary. Dr. L. B. Myers, of Elmore, Ohio, is the inventor, and the patent was issued on April 3, 1866.

Portable Fence.—This invention relates to a novel construction of a fence, especially intended for farm and garden uses, and it consists in constructing the fence in separate sections or parts in such a manner, and in so connecting them together, or to suitable posts, that the fence will accommodate or in other words, adjust itself to any irregularities in the surface of the ground which is to be fenced in by it, that is, whether more or less inclined or hilly; the peculiar manner of hanging or connecting the several sections of the fence to the posts, enabling them to turn or set at any desired angle or direction with regard to each other, according to the necessities or circumstances of the case. John Thompson, Williamsburgh, N. Y., is the inventor.

Machinery for the Treatment of Ores.—In this machine the ore is passed in through a constantly descending and continuous series of operations whose object is to pulverize and desulphurize the ores and thus extract the precious metal by amalgamation, by means of the fumes of mercury, and me-

chanical trituration. The successive devices consist of a stamping mill, a series of crushing rollers; a roasting furnace in which the ores are treated with alkali, a cold water tank, an amalgamator, an arastra and a second amalgamator. The fumes are condensed in a chamber and the water supply for that and other parts of the apparatus is derived from elevated tanks. For rights in said patent address the inventor, John A. Hitchings, 99 Bond street, Cleveland, Ohio.

A New Photographic Washing Apparatus.

The importance of having photographic prints thoroughly washed can never be too strongly insisted on. A breach of this duty proves disastrous not only to the permanency of the picture, but in many cases to the reputation of the photographer, and incidentally to our art-science itself. So much does it effect the photographer that it would not be difficult to point out instances in which once flourishing businesses have dwindled down to a serious extent through the bad reputation attached to the permanency of the prints issued. There are, indeed, few possessors of well-stocked albums who are not alive to this fact, that the otherwise high reputation attached to the name on the back of a photograph does not necessarily afford a proof that his photograph will resist the ravages of time for even a very limited number of years.

The majority of cases of photographic fading may be traced to the hyposulphite of soda, which, by so intimately associating itself with the fibers of the paper, is difficult of removal, and which, if not perfectly removed, induces an action by virtue of which the print eventually becomes destroyed. To remove the hyposulphite of soda in the most perfect manner, and in the shortest time possible, is to insure to photographs a longer tenure of existence than they otherwise would have held; and any means by which these requirements can be met, are entitled to the greatest consideration.

Availing ourselves of an invitation from Colonel Stuart Wortley to visit Rosslyn House, to see a new form of washing apparatus, we went and saw it in action. It proved to be an instrument invented and patented by Mr. John E. Grisdale.

Before entering upon a minute description of this washing machine, we may state that it is capable of washing a full charge of prints in twenty minutes, and that so perfectly that at the end of this time some ordinary tests for hyposulphite of soda fail to indicate its presence. But we shall allow its inventor to describe the washing apparatus in his own language. "My invention," he says, "relates to a peculiar construction and arrangement of centrifugal machinery or apparatus for washing photographic prints, and consists, according to one arrangement, in the employment of a peculiarly-constructed revolving drum in combination with a trough, in which such drum is partially immersed. The prints to be washed are taken from the water in which they have been placed on their removal from the fixing or other bath, and are packed in one or more piles, which piles are placed round the circumference of the drum, each pile being composed of alternate prints and sheets of wire gauze or other open or reticulated fabric, so that no two prints shall be in contact with each other. These piles are held in their places on the drum by means of open frames or gratings, which bear against the opposite surfaces of each pile, and are secured to the arms of the drum by screws or otherwise, the whole or a portion of such frames or gratings forming part of the drum itself. Or, according to another arrangement, the piles above described may be laid flat upon a disk, which is made to revolve either vertically or horizontally in a trough or cistern, provision being made in the horizontal arrangement for allowing the piles to be brought in or out of contact with the water as required; or in lieu of the photographic prints being disposed in the form of piles or packs round a drum or revolving disk, they may be laid separately and individually round the surface of a drum, a webbing of open or reticulated fabric being wound on such drum simultaneously with the placing of the prints thereon, so as to interpose a thickness of the fabric between each succeeding layer of prints. The process of washing consists in alternately driving out the moisture from the prints by the centrifugal action of the revolving drum or disk, and saturating the prints again. During the first part of the process, the prints are not immersed, but when the second part of the process, namely, the saturation, is to be effected, the trough or cistern is to be supplied with water, or the prints may be brought down into the water, and caused to revolve therein and thoroughly saturated, when the water may be run off from the trough again, or the drum or disk elevated, and the moisture expelled by centrifugal force as before."

The instrument is neat and compact, and immediately strikes any intelligent observer by the efficiency of its action; for, by an amount of manual labor capable of being performed by a child, the drum is rotated with extreme rapidity, and the freshly-supplied water is forced through every pore of the prints, the consequence being the elimination of every trace of hyposulphite of soda in a very brief space of time.—*British Journal of Photography.*

HOW TO MAKE COFFEE.

BY PROFESSOR CHARLES A. SEELY.

In the capacity of *paterfamilias* and chemist I have made occasional descents into the kitchen, and so have become interested and somewhat skilled in affairs which to most men are profound mysteries. These visits have been profitable, for in consequence of them practical changes have been brought about, which, in the course of a year, will effect the saving of a handsome amount in time and money, and, what is of more consequence, they have furnished material for serious reflection. The preparation of food, though one of the most ancient of the useful arts, and perhaps the art of arts, as Prof. Blot would have it, is yet very far from being perfected. It is only in the nineteenth century that science and inventive genius have been zealously employed for its improvement; with what effect they have been so employed almost any person who can look back from the shady side of forty can tell. What changes in forty years! The dear old chimney corner, the pot hooks, the bake kettle, the brick oven, the Yankee baker exist only among the fairy remembrances of childhood. What will come in the next forty years! But I reluctantly dismiss these thoughts to fulfill the promise which the title of this article indicates.

The virtue of coffee consists in its volatile aroma and its fixed extractive matter. The happy combination of these with hot water is the problem for the coffee maker. This happy combination, in my opinion, when realized in perfection, implies that all the aroma and all the extractive matter of the ground coffee be got into the hot water, and retained there. It seems to me that no argument is required to show that any aroma which escapes into the air, or any extractive matter left in the grounds is so much virtue wasted. Now, to get at the same time the whole of these constituents of coffee has seemed very difficult. If boiling water be filtered through ground coffee—this is the French plan—the aroma is promptly extracted, and very little else, for the fixed matter needs more coaxing. If the ground coffee be boiled a long time in water—the Turkish and more common American plan—the aroma escapes with the steam. The French waste the extractive matter; the Turks, the aroma. The plan which secures one of the ingredients allows the other to escape.

Baron Liebig has investigated this subject, and those who have read his interesting paper published in the Scientific American a short time since, will perceive that so far I have only repeated his ideas. He proposes to avoid the difficulties in the case in this way:—He boils three-fourths of the ground coffee, and thus secures all the extractive matter from that; the other fourth he adds after the boiling, and secures the aroma from that. I know that Liebig's coffee is excellent, for I have made it; but I respectfully submit that it is not the perfect coffee, it is not the happy combination, which we are seeking for. Liebig loses aroma from three-fourths of his coffee, and extractive matter from one-fourth.

I now propose a plan which on reflection and after a considerable experience I find to be nearer perfection. My coffee making is a continuous process, and may be carried on for a life time. It takes two days to get well started, but after that there is a daily routine. To begin, I take rather more than the usual amount of coffee, and pour on it hot water when it is ready to be used; in other words, I make French coffee. The grounds from this operation I leave to soak in the pot till the next day, when I begin coffee making by pouring hot water on these grounds, which hot water I use according to the French plan in making coffee from fresh ground coffee. The process is now in full operation, and every time coffee is wanted the manipulations of the second morning are repeated. I thus extract all the soluble and useful matter of roasted coffee, and waste nothing.

To put the art in the most practical form, I have found it necessary to modify the coffee pot. Perhaps the simplest apparatus is the most ordinary pot provided with two strainers. The strainers are of cup form, and fit into each other and into the top of the pot. For use I set a strainer on the top of the pot, and into the strainer I place fresh ground coffee; over this I use the second strainer, containing the grounds of the last operation. Now hot water is poured into the upper strainer, and percolates down into the pot, carrying with it all the goodness remaining in the grounds, and the aroma and much of the extractive of the fresh ground coffee. When the water has passed down, I throw away the now useless contents of the upper strainer, and upset the contents of the lower strainer into the pot. Delicious coffee is now ready to be served to the appreciative household.

I have now unwittingly made this article so long that I am obliged to omit the scientific considerations and arguments, pro and con, which I have thought over for the occasion, and a discussion of the question from an economical point of view, wherein I was prepared to show the millions of dollars per annum that an adoption of my process might save to the world. I dismiss the subject with reluctance.

Note.—The above is the first of a series of articles which I propose to write for the Scientific American. The subjects of these will cover a very wide range, and in the end, perhaps, I shall have been in *rapport* with all classes of readers.

Preparing Casts for Electrotyping.

An excellent method has been published by Dr. Heeren, of Hanover, for preparing the conducting surfaces of casts, whether of gutta-percha, wax, or gypsum, from which electrotypes are to be taken. The surface is well moistened with a nearly concentrated solution of nitrate of silver in alcohol by means of a soft brush. An aqueous solution cannot be employed, because it does not readily moisten fine lines or narrow interstices, and easily runs together into little drops. When the entire surface has been wetted, the excess of the alcoholic solution is wiped away with a drier brush. The cast is now at once, before the silver liquid dries, exposed to the action of sulphureted hydrogen; if the object be small, it need merely be suspended for a few moments in a vessel filled with gas. If its dimensions, however, be so great that it cannot be readily moved, a stream of this gas should be made to play upon it from an india-rubber tube. The surface becomes covered with a thin film of sulphide of silver, the alcohol quickly evaporates, and in a few minutes the cast is dry and ready for immersion in the electrotyping bath. The sulphide of silver is an excellent conductor of electricity, being not inferior to graphite, and is therefore admirably fitted for this purpose; an alcoholic solution of acetate of copper can also be used, but the resulting sulphide does not conduct as well as that of silver. Various kinds of fruit, and the bodies of soft and delicate animals, can be easily electrotyped by this process.

A Great Meteor.—The most remarkable addition that has ever been made to the collection of meteorites in the British Museum accrued to it in the past year by the arrival from Melbourne of the great mass of meteoric iron found at Cranbourne, near that city, and known in the colony as the "Bruce Meteorite." It was purchased by Mr. Bruce, with a view to his presenting it to the British Museum. Through a misunderstanding the museum at Melbourne had a promise of half of it; the trustees of the British Museum, therefore, acquired and sent to the Melbourne Museum the mass of the meteorite iron, weighing 3,000 lbs., that was sent to the exhibition of 1862, and which had been found close to the great meteorite, and the latter was then forwarded entire to London. Its weight is rather more than 3½ tuns. It is, consequently, by far the largest meteoric mass of any collection in the world.