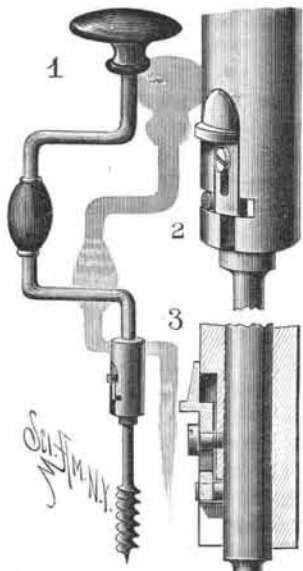


AN IMPROVED BIT BRACE.

A simple construction of bit stock and bit shank, in which the parts are not liable to displacement or breakage, is shown in the accompanying illustration, and has been patented by Messrs. George Gavin and Lawrence W. Cromer, of Eureka, Nevada. The socket of the bit stock has a cylindrical bore adapted to receive a similar cylindrical shaped bit shank, provided above its



GAVIN & CROMER'S BIT BRACE.

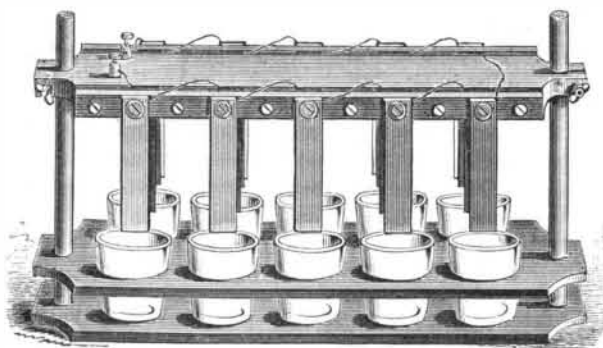
shoulder with a pin, which, when the bit shank is in position within the socket of the bit stock, engages either end, as desired, of the horizontal arm of a T-slot. A vertical groove is cut in the face of the bit stock above the T-slot, in which slides a bolt that is held in position by a set screw, this bolt securely holding the pin of the bit shank in either division of the T-slot, as plainly shown in Figs. 2 and 3. It is only necessary to employ the sliding bolt when the bit stock is attached to a ratchet brace, the bit stock being complete without the bolt for use with ordinary braces. This invention may also be applied with augers and auger handles, and for other purposes.

SIMPLE PLUNGE BATTERY.

The engraving represents an inexpensive and easily made plunge battery, which is very convenient for temporary use.

Twelve tumblers, arranged in two rows of six, are held in place by an apertured board supported a short distance above the base board by the round standards. To the standards is fitted a board which is split from the standards outward, and provided with two bolts with wing nuts, by which the board may be clamped at any desired height on the standards. To opposite edges of this movable board are clamped six plates of carbon, 1 1/4 inches wide, 1/2 inch thick, and 6 or 8 inches long. The upper ends of the carbon plates are heated and saturated with wax or paraffine, and a copper wire is interposed between the carbon plate and the edge of the board. The strips of wood by which the carbons are clamped are 3/8 inch thick. To these wooden strips are secured zinc plates of the same dimensions as the carbon plates, by means of ordinary wood screws passing through holes in the zinc into the wood. The wires connected with the carbon plates are bent over and inserted between the zinc plates and the wood, as shown in the engraving. That is, the carbon of one pair is connected with the zinc of the next pair in order, and so on throughout the series, and the terminal plates are connected with the binding posts.

The zincs are amalgamated, and the tumblers are nearly filled with a solution consisting of bichromate of potash dissolved in water to saturation, a quantity of sulphuric acid, equal in bulk to one-fifth of the bichromate solution, being slowly added.



SIMPLE PLUNGE BATTERY.

To maintain the amalgamation of the zincs, a small quantity of bisulphate of mercury is added to the bichromate solution, say 1/4 ounce to every quart of solution.

The tumblers should be as large as can be conveniently obtained. Those holding one pint are not too large.

The zincs and carbons may be connected up in different ways for different effects. For example, all of the carbons may be connected together and all of the zincs may be connected in the same way, thus securing a quantity current having the electromotive force of only a single cell; or all of the zincs on each side may be connected together, and all of the carbons may be connected in the same way, and the series of zincs on one side may be connected with the series of carbons on the other side, thus giving a current having the electromotive force of two cells and the quantity of six.

G. M. H.

The World's Largest Cities.

The following information is often inquired for, and, as it may be useful in many cases for reference, we have compiled a table of the largest cities of the world, with their populations as stated by the latest authorities. In the absence of any official census, the Chinese cities have simply to be estimated, and, of course, must be accepted as an approximation only. We have not given any city whose population is below 500,000, though there are many we could enumerate which closely approach that figure. It will be seen that in the thirty-five cities tabulated below there are 32,510,319 souls, or nearly the population of the British Isles, a fact which cannot be grasped in a moment by any ordinary intellect.

Aitichi, Japan	1,332,050
Bangkok, Siam	500,000
Brooklyn, N. Y.	771,000
Berlin, Prussia	1,122,330
Calcutta, India	766,298
Canton, China	1,500,000
Changchoofoo, China	1,000,000
Chicago, Ill.	715,000
Constantinople, Turkey	700,000
Foo-choo, China	630,000
Glasgow, Scotland	514,048
Hang-Chow-foo, China	600,000
Hang-Teheon, China	800,000
Hau-Kow, China	600,000
King-te-Chiang, China	500,000
Liverpool, England	573,000
London, England	3,955,819
Madrid, Spain	500,900
Moscow, Russia	611,974
New York, N. Y.	1,400,000
Paris, France	2,269,023
Pekalonga, Java	505,204
Pekin, China	800,000
Philadelphia, Pa.	850,000
St. Petersburg, Russia	768,964
Sartama, Japan	962,917
Sian, China	1,000,000
St. Louis, Mo.	500,000
Tat-Seen-Loo, China	500,000
Tien-Tsin, China	950,000
Tokio, Japan	987,887
Tschautchau-fu, China	1,000,000
Tsin-Tehoo, China	800,000
Vienna, Austria	726,105
Woo-chang, China	800,000

—*Pall Mall Gazette.*

Tariff Revision.

The revision that is sure to come is sure, also, to be made in one of these two ways: Either in the interests of protection and labor here on our own soil, or in that of foreign production and foreign labor. There can be no middle ground, any more than there can be service of two masters. There is a grand struggle going on for the possession of our markets between our own producers and our own labor on the one side and the foreign producer and laborer on the other—and he that is not for us is against us. When the citadel is assaulted, even indifference helps the enemy. The industries of this country and its labor in every calling and pursuit have no option left them, but are called upon, in an inevitable revision of the laws that have created and fostered them, to defend their markets here against foreign invasion.

There are those who talk much of the necessity to us of foreign markets, and are ready to surrender our own to secure them. Do not listen to such preaching. The nation which cannot command its own markets cannot command foreign markets, for those conditions of production which will enable a foreign producer to undersell us here will enable him to undersell us in distant markets, where cost of transportation must be added to cost of production here. Every mile of distance to market is a dead charge upon production, and every mile cut off is a direct addition to profit. Seek first and all the time the nearest market, and make it and all possible augmentation of it your own, and then, if ever, will be added the facilities and opportunities of trade and commerce the world over which are sure to come to that people whose highest attainment in production is the result of the greatest variety and development of their own industries. This is the sure and only way to the markets of the world consistent with health and prosperity at home.—*H. L. Dawes' address at the recent meeting of Amer. Paper Mfrs.' Assn., Saratoga.*

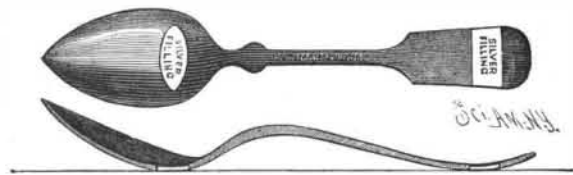
Fireproofing Solution.

For rendering fabrics, wood, and other inflammable objects fireproof, a writer in *La Nature* recommends borotungstate of soda, a salt which he states has never hitherto been employed for the purpose. It is made by dissolving boric acid in a hot solution of tungstate of soda. Objects impregnated with this solution are rendered incombustible. The solution gives off no deleterious gas, while ammoniacal salts, phosphate of ammonia, and salts of phosphorus render the air irrespirable.

Borotungstate of soda in solution is also said to possess valuable antiseptic properties, and has been used with the greatest success in diphtheria, for dressing wounds, and as a wash in cases where an antiseptic is needed. The solution has no odor, but its taste is bitter.

IMPROVEMENT IN MANUFACTURING PLATED WARE.

The invention herewith illustrated provides a method of manufacturing plated ware in which the parts most exposed to wear are filled with precious metal or alloy, as, for instance, the bottom of the bowl of a spoon or the back of the handle of a fork, these being the usual points of rest from which the plating on such articles generally wears off the quickest. In such goods, and all flat plated ware of a similar kind, a recess is made at these points of rest, or places of greatest wear, and this recess is filled, in the process of manufacture, with fine or coin silver, or other metal corresponding with that used in plating, so that, after the whole is plated, abrasions of these parts will not, as in the ordinary plated ware, expose the baser metal or alloy of which the article is mainly composed. The illustration shows



WARNER'S PART SILVER-FILLED SPOONS.

the method of inserting this silver filling in a standard style of silver-plated teaspoons.

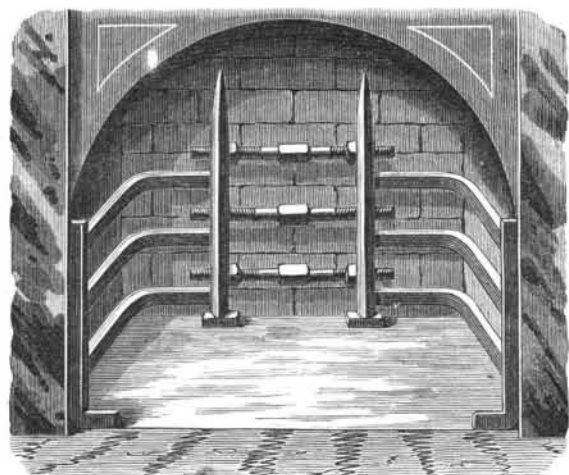
This invention has been patented by Mr. William A. Warner, of Syracuse, N. Y., and articles made after this method are now being manufactured by Messrs. Warner Brothers, of that place.

Removing Rust from Iron.

It frequently causes much trouble, indeed, in some cases defies all efforts, to free iron from ingrained rust, but according to a German paper the thorough cleansing of it may easily be effected by immersing the article in a nearly saturated solution of chloride of tin, even if much eaten into. The duration of the immersion will depend upon the thicker or thinner film of rust; in most cases, however, twelve to twenty-four hours will suffice. The solution of chloride of tin must not contain too great an excess of acid, otherwise it will attack the iron itself. After the articles have been removed from the bath they should first be washed in water and then with ammonia, and be dried as quickly as possible. Articles treated in this manner assume the appearance of dead silver.

AN IMPROVED FIRE-PLACE PROTECTOR.

A device designed to protect the brickwork of fire-places, preventing the fire from resting against the brick, and so constructed that the protector may be adjusted for use in fire-places of different size, is shown in the accompanying illustration, and has been patented by Mr. George W. Meharg, of Kennett, Dunklin County, Mo. To the two outer standards are connected rearwardly extending bars, bent at inner corners, and supported at their other ends by two other standards, in which are threaded apertures arranged to receive screws formed with right and left hand



MEHARG'S FIRE-PLACE PROTECTOR.

threads, and with central heads. In order that the exposed surface of the central standards may be as small as possible, they are made substantially triangular in cross section, the forward edge of the standards being the apex of the triangle, and jamb nuts are arranged on the screws to bind the parts in place when they are once properly adjusted.

Volcanic Silver.

Professor Mallet has analyzed a specimen of volcanic ash collected on the Pacific coast in Ecuador, 120 miles west of Cotopaxi. The ash fell on July 23, 1885, and formed a deposit to the depth of several inches. The interesting feature in the composition of the material was the presence of a small amount of silver, probably as silver chloride; several experiments showed that silver was present to the extent of 1 part in 83,600 of ash. This is the first time that silver has been identified in material ejected from a volcano.—*Proc. Roy. Soc.*