J. D. PHILLIPS & C. HAMBUECHEN.

APPARATUS FOR CLEANING METAL ARTICLES.

APPLICATION FILED JUNE 22, 1911.

1,035,633. Patented Aug. 13, 1912.

2 SHEETS—SHEET 1.

Fig. 2.

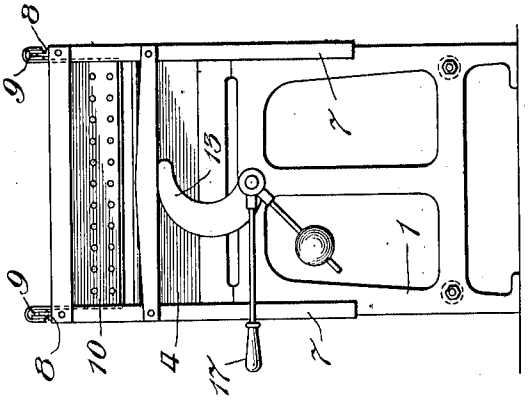
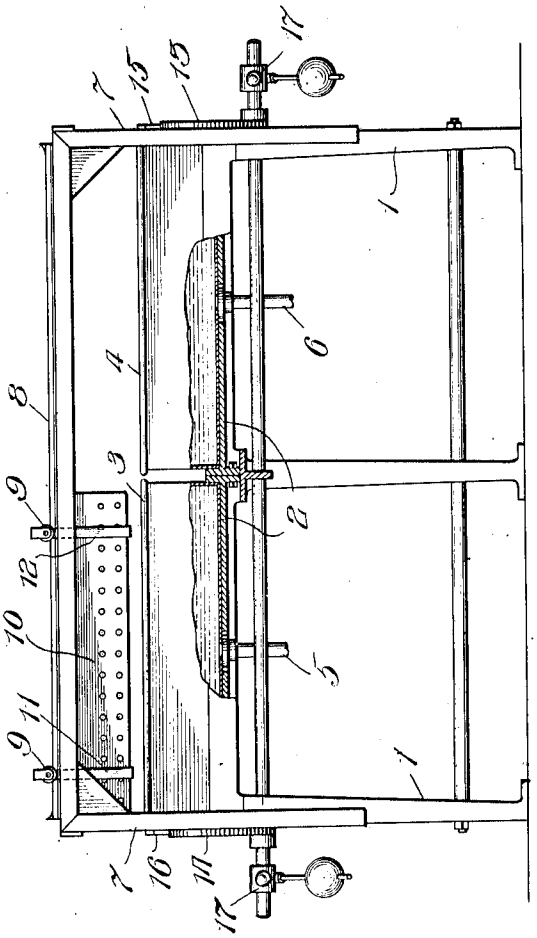


Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 3.

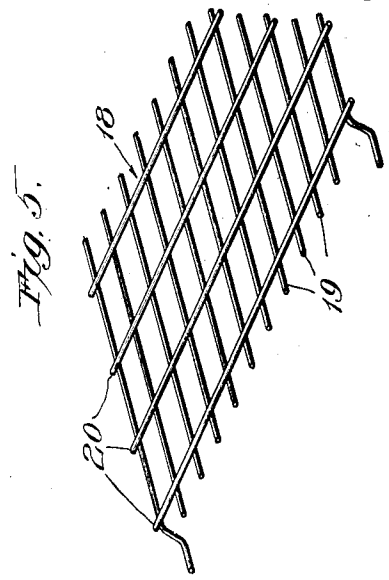


Fig. 5.

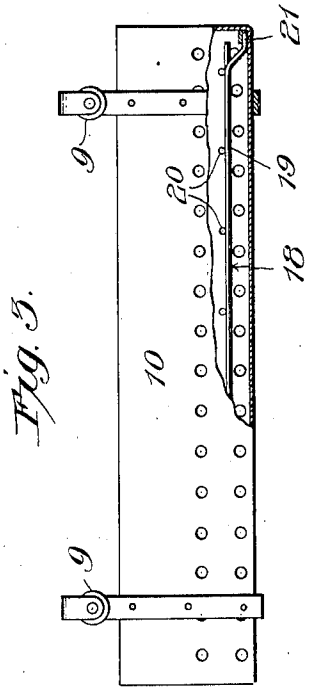
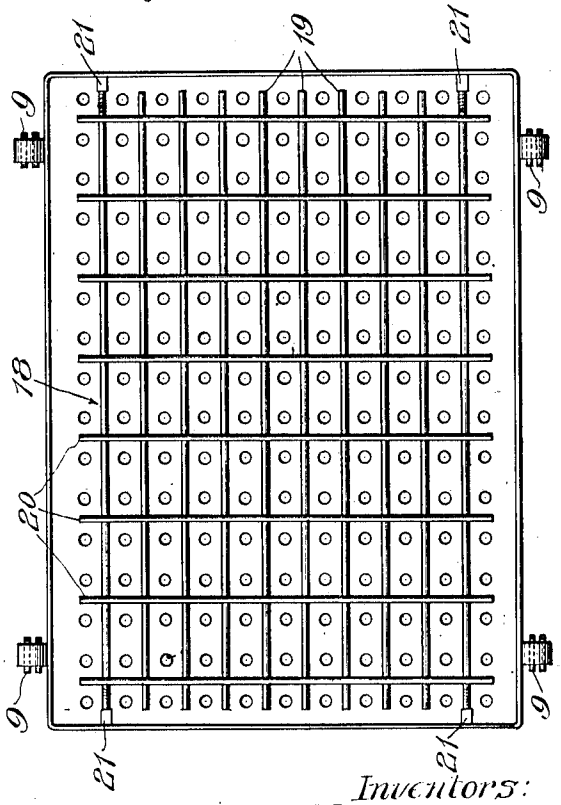


Fig. 4.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR CLEANING METAL ARTICLES.

1,035,633. Specification of Letters Patent. Patented Aug. 13, 1912.

Application filed June 22, 1911. Serial No. 634,748.

To all whom it may concern:

Be it known that we, JAMES D. PHILLIPS and CARL HAMBUECHEN, citizens of the United States, residing at Madison, in the county of Dane and State of Wisconsin, have invented certain new and useful Improvements in Apparatus for Cleaning Metal Articles, of which the following is a specification.

It is the object of the present invention to provide means for treating articles or surfaces of silver, gold, copper or other metals, to remove all tarnish and other foreign matter therefrom, and to cleanse and purify in such manner that the surfaces will become chemically clean and sanitary. The cleaning is effected by electrolytic action, and the subsequent cleansing and sterilizing are so conducted that the silver or other metal is not injured either by the cleaning electrolyte or by any other of the agencies used.

Various electrochemical methods for cleaning silver have heretofore been proposed, wherein the articles to be cleaned are immersed in a hot alkaline solution held in a tin lined vessel or in an aluminum dish or basket (see British Patent No. 7027 of 1905 to Ransford). With such an arrangement, the silver becomes the cathode of a voltaic couple, and the coating or tarnish is electrolytically reduced. But in practice, these methods are not satisfactory. The tin or aluminum becomes coated with a film or covering which prevents effective electrical contact with the article to be cleaned, thereby not only stopping the electro-chemical action but also exposing the silver to direct chemical attack by the electrolyte.

According to the present invention, the apparatus is so arranged and the several steps of the method are so conducted that the cleaning goes on continuously, without loss of efficiency and without danger to the silver. In particular, the silver, after it has once been cleaned is protected from the retarnishing action of the electrolyte with which the cleaning was effected. Effective electrical connection may be maintained between the electropositive or "cleaning" metal, such as zinc, and the silver or other article to be cleaned, for the entire time during which said articles are wet by the electrolyte, and the electrolytic action thereby maintained not only reduces the coating of tarnish on the articles but subsequently covers the cleaned surfaces with a thin coating of hydrogen which effectively shields the surfaces from any possible injurious attack of the electrolyte.

For a full understanding of the invention, reference may be had to the following detailed description, taken in connection with the accompanying drawings.

In the drawings Figure 1 is a side elevation of the complete apparatus with certain portions broken away; Fig. 2 is an end elevation of the same; Fig. 3 is a detail of the container wherein the cleaning operation is effected. Fig. 4 is a plan of the same and Fig. 5 is a perspective view of the grid whereby effective electrical connection is maintained at all times between the container and the articles to be cleaned.

The apparatus shown in the drawing comprises a stand having a plurality of cast iron legs 1 which carry a plurality of flat platforms 2. On these platforms rectangular receptacles 3 and 4 are mounted. Receptacle 3 may be made of tinned metal, of granite ware or of earthenware, and is used to hold the electrolyte or cleaning fluid. Receptacle 4 may be of similar material and contains clean water for washing or rinsing the silver after the tarnish has been removed therefrom. These receptacles are provided respectively with steam inlets 5 and 6 whereby they may be heated to any desired temperature and whereby their liquid contents may be continuously stirred or agitated. Supported above this stand and its receptacles is a table having four legs 7, each of which is formed of angle iron and each of which embraces a corner or leg of the stand and is adapted to slide up and down thereon. The top part of the table comprises a track or guideway 8 equipped with rollers 9 below which a perforated container 10 is swung in stirrups 11 and 12. This container is used to hold the silverware or other articles to be cleaned while they are undergoing treatment in the electrolyte. The container may be lowered into either of the receptacles 3 or 4 by lowering the entire table from which the container is slung. This may be effected by any suitable mechanism, as for instance by the cams 13 and 14 which engage respectively with the cross bars 15 and 16. The cams may be actuated by either of the handles 17.

The container 10 wherein the articles are held during the cleaning operation is of special construction as illustrated in Figs. 3, 4 and 5. It consists of a rectangular box preferably made of zinc, though if desired it may be made of aluminum or other metal strongly electropositive. The bottom of the receptacle is flat and the bottom and the sides are perforated. Within the container and raised or projecting above the flat bottom is a grid or framework 18 adapted to serve as the auxiliary metal in establishing effective electrical connection between the container and the articles to be cleaned during the time when the articles are exposed to the action of electrolyte. This grid preferably consists of a plurality of straight wires 19 which carry another set of wires 20 crosswise thereon and electrically welded thereto.

The entire structure has good electrical conductivity in every direction and may be regarded as integral throughout. The grid is heavily tinned so that it will present to the electrolyte a surface which is electronegative to the zinc or other metal of which the container is made. Other metals than tin may be used for this surface, but preferably it should be a metal like tin which is intermediate in solution tension between the cleaning metal and the metal to be cleaned. The entire grid is permanently soldered to the bottom of the container as at the corners 21.

The method whereby this apparatus is used is as follows: An alkaline solution is placed in receptacle 3 to serve as the electrolyte or cleaning fluid. A suitable solution may be made by dissolving one tablespoonful of baking soda (sodium bicarbonate) and one-half tablespoonful of common salt in every quart of water used. To secure quick dissolving of the salt in the water, the container 10 may be raised and lowered to serve as a mixer. Simultaneously heat may be applied at the steam jet 5. During this mixing operation the tinned wire grid is effectively cleaned through the galvanic action set up by the short circuited couple of which the zinc is anode and the grid is cathode. As soon as the grid is cleaned it becomes enveloped in a layer of hydrogen which so polarizes the couple as to prevent the further flow of current. The container 10 is lifted from the electrolyte and filled with articles to be cleaned, such as table silver or the like. These articles rest directly on the cleaned grid 18 and are therefore in good electrical connection with the zinc container. The container is then lowered into the heated alkaline electrolyte and allowed to remain there until the electrolytic action has completely cleaned the tarnished surfaces. Tarnish is ordinarily a sulfid or an oxid of the silver and acts like a depolarizer for the short circuited battery whereof the zinc is anode and the silver articles are cathode. Current flows from the zinc to the silver through the electrolyte thereby liberating hydrogen which combines with the oxid or the sulfid to form water or hydrogen-sulfid. This reaction continues until all the oxid or sulfid is reduced to metallic silver; thereafter the silver surfaces become coated with a thin layer of hydrogen bubbles and the current cases to flow. At the zinc electrode, a film or covering forms on the metal but this is so porous that it does not stop the electrolytic action and since the tinned grid is so arranged as to maintain at all times a good electrical connection between the zinc and the silver, the cleaning operation is in no way interfered with. Thus far in the cleaning operation, no silver has been removed from the surface and there has been, as described, merely an electrolytic reduction of the layer of tarnish with the production of pure silver in its place. This silver surface is exceedingly clean and very sensitive to injury. There still remains the problem of getting the articles out of the electrolyte and freed from all corrosive agencies before any retarnishing or recombining can take place. It happens that hydrogen sulfid, such as is produced by the reaction above described, is somewhat soluble in the sodium bicarbonate solution and may there be detected after the electrolyte has been in normal operation for a time. Also the bicarbonate solution when highly heated, as by a steam jet, has a tendency to liberate CO_2 and to break down into normal sodium carbonate, forming a solution which is a very good solvent for the hydrogen sulfid. It is consequently inevitable that when the apparatus herein described is used in ordinary kitchens and pantries, the electrolyte, after a certain use, will reach a condition chemically active with respect to silver and capable of tarnishing by mere contact. It is for this reason that the further steps of the method herein described must be carefully followed.

After the tarnish has been removed by immersion in the electrolyte as above described, the sulfid-charged electrolyte must be removed from the clean and sensitive surface with such rapidity and under such conditions that the silver is given no opportunity for retarnishing. A washing or rinsing operation, if suitably conducted, will effect this result. One effective method of cleansing consists in lifting the container out of the electrolyte, while it still holds the cleaned articles, and immediately plunging the container and its load into the receptacle 4 of heated wash water. Under the agitating action of the steam jet 6, this water washes off the last traces of the electrolyte and leaves the silver chemically clean

and sterile. During this entire operation of lifting the silverware out of the electrolyte and rinsing it off with hot water, the articles to be cleaned are retained in good electrical connection with the electropositive metal and the electrolytic action is thereby kept up and the silver enveloped in its layer of protective hydrogen for the entire time during which it is wet by the electrolyte. No retarnishing can take place, and the silver is left finally in a clean and sterile condition.

We claim:

1. Apparatus for cleaning tarnished metal articles comprising a perforate container which is electropositive to the articles to be cleaned, and a support for such articles within said container, said support comprising wires welded together to form a structure which is integral throughout, said structure having a soldered connection with said container, and also have a contact surface which is electronegative to the metal of said container.

2. Apparatus for cleaning tarnished metal articles comprising a perforate zinc container having a grid soldered thereto, said grid being integral throughout, and comprising wires welded together and having a tinned surface exposed for contact with the articles to be cleaned.

3. Apparatus for electrically cleaning tarnished metal articles comprising a perforate container composed of zinc, and having a flat bottom, said container being provided with a projecting wire grid soldered to said flat bottom and presenting a tinned surface to the electrolyte, said wire grid being integral throughout, and having its wires welded together and adapted to maintain good electrical connection between the articles to be cleaned and the container, so long as said articles are exposed to the action of the electrolyte.

4. In an apparatus for cleaning metal articles, the combination of a receptacle for holding an alkaline electrolyte, means for heating said electrolyte, a second receptacle for holding water, a perforate zinc container for holding articles to be cleaned, a tinned wire grid within said container and soldered to the bottom thereof, and means for lowering said container and its contents first into said electrolyte and then immediately into said heated water.

5. Apparatus for cleaning tarnished metal articles by electrolytic action, said apparatus comprising a perforate zinc container having a tinned wire grid soldered thereto, and means for continuously heating said container and its contents.

6. The combination of a perforate zinc container, a tinned wire grid soldered therein for supporting metal articles to be cleaned, a receptacle for holding an alkaline electrolyte, and mechanism for lowering said container into said receptacle to effect the cleaning of said articles and for withdrawing the container therefrom to drain off the electrolyte.

7. In a cleaning apparatus, a receptacle for holding an alkaline electrolyte, means for continuously heating said electrolyte, a perforate zinc container having a tinned wire grid soldered therein to support metal articles to be cleaned, and means for lowering said zinc container into said electrolyte and for withdrawing it therefrom.

8. In an apparatus for cleaning metal articles, the combination of a receptacle for holding an alkaline electrolyte, means for maintaining said electrolyte continuously heated, a second receptacle for holding heated water, a perforate zinc container having a tinned wire support for articles to be cleaned, and means for lowering said container first into said electrolyte and then immediately into said heated water.

9. In an apparatus for cleaning metal articles, the combination of a receptacle for holding a heated alkaline electrolyte, a zinc container for holding articles to be cleaned, said container having a flat perforate bottom, a tinned wire grid soldered to said perforate bottom and adapted to make electrical connection with the articles to be cleaned, mechanism for bringing said electrolyte into contact with said container to clean the articles carried thereby, and a washing bath for removing the last of said electrolyte while the articles to be cleaned still make contact with said wire grid.

10. In an apparatus for cleaning metal articles, the combination of a receptacle for holding an alkaline electrolyte, means for introducing steam into said electrolyte, a second receptacle for holding water, means for maintaining said water continuously heated, a zinc container for holding articles to be cleaned, said container having a flat bottom with perforations therein, a tinned grid within said container and soldered thereto, said grid comprising wires welded into a structure of good electrical conductivity and integral throughout, and means for lowering said container and its contents first into said electrolyte and then immediately into said heated water.

In witness whereof, we hereunto subscribe our names this 19th day of June, 1911.

JAMES D. PHILLIPS.
CARL HAMBUECHEN.

Witnesses:
A. O. OLMAN,
L. S. LUNDER.