W. E. BAILEY.

ART OF ELECTROLYSIS.

APPLICATION FILED NOV. 7, 1921.

1,416,929. Patented May 23, 1922.

Fig. 1.

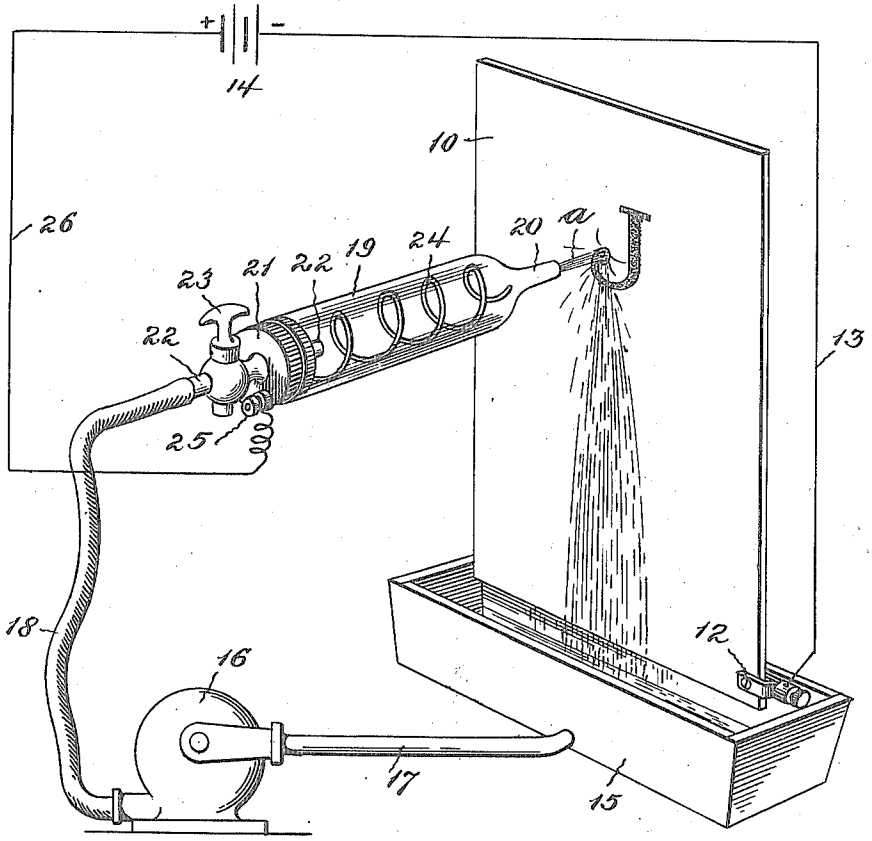


Fig. 2.

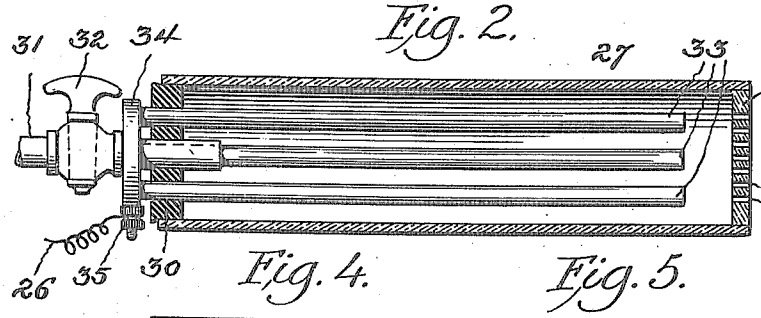


Fig. 3.

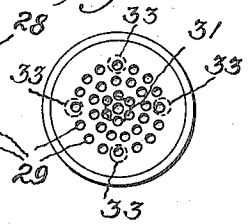


Fig. 4.

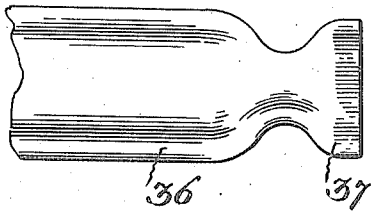
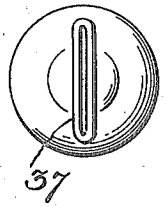


Fig. 5.



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ART OF ELECTROLYSIS.

1,416,929. Specification of Letters Patent. Patented May 23, 1922.

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To all whom it may concern:

Be it known that I, WILLIAM E. BAILEY, a citizen of the United States, residing at Washington, District of Columbia, have invented certain new and useful Improvements in the Art of Electrolysis; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

My invention relates to the art of electrolysis and generically consists in passing an electrolyte past an electrode, and projecting it in a jet or jets onto an electrode surface of opposite polarity. It also consists in spot plating by passing an electrolyte under jet forming pressure past an anode, forming a jet or jets and causing the jet or jets to impinge onto a cathode surface, thereby depositing at and closely adjacent to the point of impingement of said jet or jets, the metal of the electrolyte.

The hand tool or implement through which the electrolyte is projected in a jet may be of insulating material in which instance an electrode acting as anode will be contained in the tool and connected to the positive pole of the source of current. Obviously this anode might, if desired, be of the metal of the electrolyte, in order to maintain the metal content of the electrolyte. Insoluble electrodes may also be used if desired.

In case the hand tool is made of metal then the tool itself may be connected to the positive pole of the current source and becomes the anode. The exigencies of the work at hand and the convenience of the operator will determine what type of hand tool is best suited for the operation.

The object on which deposition is to take place is made the cathode and the depositing current is conducted through the continuous jet from the anode to the cathode, the point of impingement being the place where deposition takes place or in close proximity thereto, so much so that with a fine jet a metal of one color can be deposited on a metal of another color in fine lines as in written or printed characters. Preferably, but not necessarily the cathode should be inclined or vertical to permit the surplus electrolyte to run off and not stand on the cathode surface being spot plated. The cathode may even be placed flat if the pump supplying the electrolyte to the hand tool produces a sufficiently powerful jet to pass through the electrolyte standing on the surface of the cathode.

The surplus electrolyte flowing away from the point of impingement on the cathode and running over other portions of cathode surface will not deposit on the cathode other than at points of impingement of the jet. This discovery is of great importance in certain arts, as it enables spot plating either by a single jet or a series of jets as from a rose head.

For example, when the plating over a considerable surface of an article has worn off or comes off from some defect in the original plating operation, then a series of jets may be directed against the surface to be repaired.

In the same way, if a railroad line be engraved on a copper map plate and subsequently there is a re-location of the whole or part of the road, it is desirable to change the location on the plate and erase the original showing. Heretofore this has not been done, and a new plate had to be engraved. By my process I deposit copper in the engraved line, build up the surface above the plate surface, then scrape down flush and polish.

Also articles in place may be plated or repaired in this manner, such as parts in place on an automobile, rails or plates of a vessel, metal parts on machinery, wood, etc., which can not readily be removed to a plating bath.

In order that my invention may be clearly understood, I shall describe the same with reference to the annexed drawings, in which like parts are similarly designated.

Figure 1 is a perspective view of one of many forms of apparatus for carrying out the method herein described;

Fig. 2 is a longitudinal section of another form of implement;

Fig. 3 is an end view thereof;

Fig. 4 illustrates a modification of the jet forming portion of the implement shown in Fig. 1;

Fig. 5 is an end view thereof.

Referring to Figure 1, the cathode composed of metal or having an electrically conductive surface, has attached thereto at some

point, means such as a clamp 12 or equivalent electrical conductor for connecting wire 13 from the negative pole of the source of current 14.

The cathode 10 is temporarily supported over a trough or tank 15 into which the electrolyte drains from the cathode surface. A pump indicated at 16 withdraws the electrolyte from receptacle 15 by pipe 17, delivers it through a flexible tube or pipe 18 of rubber, or other suitable material, to the electro-plating implement. The implement here shown is adapted to project a single round jet of electrolyte and comprises a receptacle 19 of insulating material as a glass tube of large diameter having a jet forming nozzle or extension 20 at one end. The other end of said glass tube 19 is closed by a stopper 21, of insulating material, as rubber.

Through the stopper passes a glass tube 22 provided with a valve or stop cock 23, by which the flow of electrolyte and force of the jet can be controlled. The rubber tube 18 is connected to the glass tube 22. Within the implement 19 is an anode 24, a coil of wire for example, of copper, one end of which passes through the stopper and is provided with a terminal 25 to which a wire 26 from the positive pole of the source of current is connected.

The operation is as follows: The electrolyte as copper sulphate is pumped into and through the implement past the anode onto the cathode 10 to be electroplated, in a continuous jet as a and the electrolyte then runs off the cathode into the trough to return into the liquid circuit.

I have discovered that plating will occur only at the point of impingement of the jet upon the cathode, the electrolyte running over other portions of the cathode leaving no deposit except in those cases where chemical deposition is expected to take place as in the case of a solution of a silver salt electrolyte depositing silver on copper or brass, in which case the surface around the spot to be repaired must be protected by an insulating coating.

The implement shown in Figs. 2 and 3 is of the same type but is intended for larger surfaces. In this instance the large tube 27 may be made of fibre with a plug 28 at one end having a large number of perforations 29 resembling a rose-head and producing a large number of continuous independent jets of electrolyte. The stopper 30 of rubber is provided with a central tube, 31, and stop cock 32. Passing through the stopper are anode rods 33 screw threaded, soldered or otherwise electrically connected to a metal yoke 34 of brass, copper or nickel and provided with a binding post 35.

Figs. 4 and 5 illustrate a modification of the implement shown in Fig. 1, where the implement 36 of glass has a flattened nozzle 37 to produce a jet forming orifice in the form of a long slot of small width. Other forms of orifices are used in accordance with the requirement of the work.

My invention is susceptible of manifold uses: for example, to erase engraved lines from engraved plates; to repair the plating where the original plating has flaked or peeled, especially on large objects that would require large plating tanks for replating; for the original plating of or for repairing of large objects in place, for jewelers' or sheet metal workers' use, etc., in fact in connection with any work where repairing or spot plating can be used.

In case a pump is not at hand, the pressure on the electrolyte can be obtained by gravity by allowing it to flow from an elevated tank, or by other means, such as by compressed air.

In repairing or plating scaled or flaked electro-plated surfaces, after scraping the loose plating off around the spot to be plated, it may be advisable to thin the edges of the original plating around the spot. This thinning can readily be done by reversing the electrical connections so that the article will be connected as anode and the electrode in the implement be connected as cathode in which case the appropriate electrolyte removes the original plating around the edges of the original plating at the spot to be repaired and makes them thin so that when the electrical connections are reversed and the spot is plated, these edges do not show a ridge after the work is finished. By this means it of course follows that when the object, upon which the jet of electrolyte is directed, is serving as an anode, there will be an etching effect at the point or spot where the jet contacts with the object.

In this manner the work may be quickly and readily cleaned and prepared for electro-deposition.

If the container 19 or 27 is made of electrically conductive material it may be filled with granulated metal to act as anode or with scraps of metal of any shape.

I claim:

1. In the art of electrolysis, the method which comprises passing an electrolyte past an electrode connected to one pole of a source of current, forming a jet of said electrolyte and causing the jet to impinge on an article forming another electrode connected to the other pole of said source of current, thereby causing electrolytic action at and closely adjacent to the point of impingement of such jet.

2. In the art of electrolysis, the method which comprises passing an electrolyte past an anode, forming a jet of the electrolyte and causing said jet to impinge on a cathode thereby depositing metal on the cathode.

3. In the art of electrolysis, the method which comprises pumping a solution of a metal to be deposited past an anode contained in an anode chamber and causing a jet of said electrolyte to impinge on a cathode and thereby deposit metal of the electrolyte on the cathode at the place of impingement.

4. In the art of electrolysis, the method which comprises forcing an electrolyte through an anode contained in a chamber having a jet discharge orifice and causing said jet to impinge on a cathode.

5. In the art of electrolysis, the method, which comprises passing an electrolyte under jet forming pressure through an anode-containing-chamber and a plurality of jet forming orifices onto a cathode.

6. In the art of electrolysis the method which comprises pumping a solution of a plating metal through a chamber containing an anode of the plating metal and a jet forming orifice in said chamber, causing the jet to impinge on a cathode and returning the electrolyte into the cycle of operations.

7. In the art of electrolysis the method which comprises forcing a solution of a plating metal through a chamber in contact with the same metal as that of the plating solution and forming a jet thereof, directing the jet against the object to be plated as cathode, collecting the electrolyte running off the cathode surface and returning it into the liquid cycle through the anode chamber.

8. A method of spot electroplating an article which comprises passing an electric current through one or more jets of electrolyte impinging against the article which serves as a cathode, thereby building up an electrodeposit at the points of electrolyte jet impingement.

9. A spot plating implement comprising an anode chamber having a jet forming orifice at one end and an inlet tube for electrolyte under pressure.

10. A spot plating implement comprising a chamber of insulating material having a jet discharge, a closure for said chamber having an anode supported therein and a tube passing through said closure to supply electrolyte under pressure to said chamber.

11. A spot plating implement comprising an electrode chamber having a discharge orifice, a closure for said chamber, an electrode mounted on said closure to extend therein, a supply tube through the closure for electrolyte under pressure and means to control the flow of electrolyte through said chamber.

12. In a device for carrying out the process described, means for impinging a jet or jets of electrolyte against a conducting surface, said means comprising a vessel adapted to receive electrolyte and provided with one or more orifices of desired shape through which the electrolyte is projected, said vessel being also adapted to receive one or more conductors to serve as electrodes.

In testimony that I claim the foregoing as my invention, I have signed my name.

WILLIAM E. BAILEY.