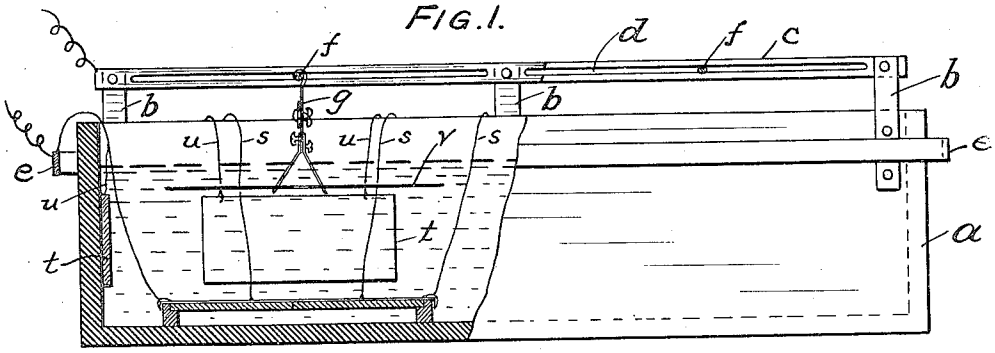
R. M. WEEKS.

APPARATUS FOR ELECTRICAL ETCHING.

APPLICATION FILED APR. 2, 1921.

1,427,876. Patented Sept. 5, 1922

FIG. 1.



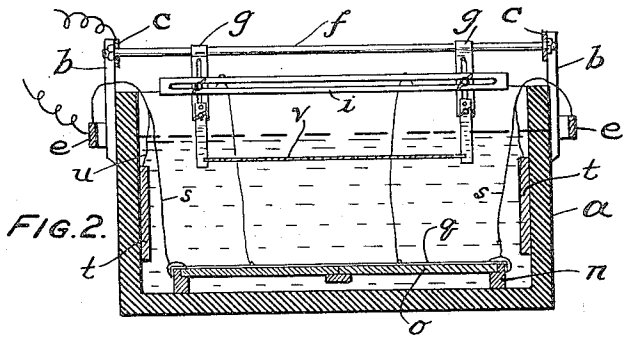


FIG. 2.

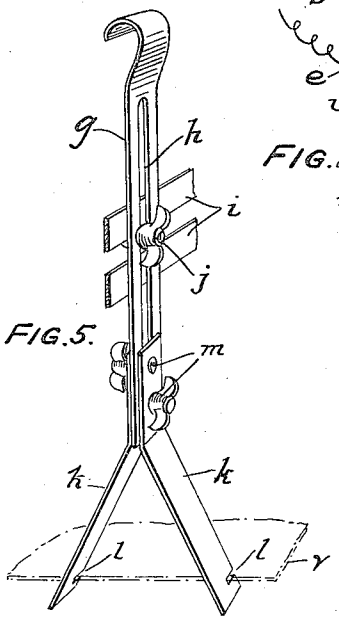


FIG. 5.

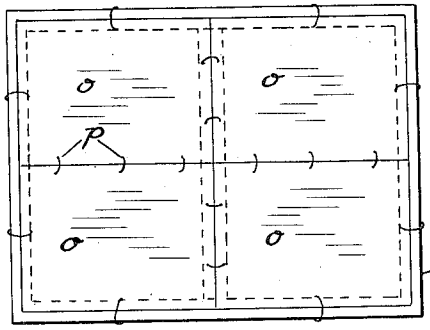


FIG. 3.

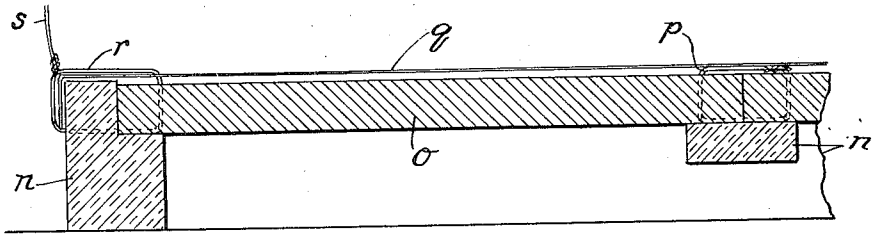


FIG. 4.

WITNESS:

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Patented Sept. 5, 1922. 1,427,876

UNITED STATES PATENT OFFICE.

RAYMOND M. WEEKS, OF NARBERTH, PENNSYLVANIA, ASSIGNOR TO WEEKS PHOTO-ENGRAVING COMPANY, INC., OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

APPARATUS FOR ELECTRICAL ETCHING.

Application filed April 2, 1921. Serial No. 457,935.

To all whom it may concern:

Be it known that I, RAYMOND M. WEEKS, a citizen of the United States, residing at Narberth, county of Montgomery, and State of Pennsylvania, have invented a new and useful Improvement in Apparatus for Electrical Etching, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to apparatus for use in electrical etching and more especially to novel construction of the cathode and novel means of supporting and forming electrical connection with the anode, or plate to be etched.

In the process of electrical etching, many plates when etched are found to be spotty, the spotted portions being found to have been only slightly etched as compared to the clean portions of the plate.

I have found that the spotted condition of the plate is caused by the collection of bubbles of hydrogen gas at points on the face of the plate during the etching process, especially when the plate is supported face downward directly over the cathode, which is the most effective arrangement. The bubbles of hydrogen gas tend to insulate the portions of the plate against which they rest and prevent the etching action of the electric current, with the result that when the etching of the plate is completed the portions protected by the bubbles are imperfectly etched and the plate has a spotty appearance.

The hydrogen gas is liberated at the cathode, and especially at carbon cathodes, by electrolysis of the water in the electrolytic solution, and bubbles through the electrolyte. Such bubbles as come in contact with the plate adhere to it and tend to insulate the portions to which they adhere.

The primary objects of my invention are to provide a cathode of such a character that the liberation of hydrogen gas will be reduced to a minimum, and to provide means, for suspending the plate to be etched, of such a character that it will be substantially indestructible by the electrolytic solution and at the same time adapted to effect the suspension of the plate in the most advantageous position for uniform etching.

A further object of my invention is to provide a cathode of such a character that it may be combined with carbon, which effects a rapid action, and when so combined will prevent the hydrogen liberated at the carbon from acting to insulate the plate.

I will now describe my invention in detail with reference to the accompanying drawings, in which I have shown a preferred embodiment thereof, and in which—

Fig. 1 is a side elevation, partly cut away, of an electrical etching apparatus embodying my invention.

Fig. 2 is a cross-sectional view of the subject of Figure 1.

Fig. 3 is a plan view of a detail of the cathode construction.

Fig. 4 is a cross-sectional view, partly cut away, of the complete cathode.

Fig. 5 is a perspective view of the plate suspending device.

a is a tank of any suitable construction for containing liquid electrolyte to the opposite sides of which are secured supports *b* to which are secured bus bars *c*, *c* provided with longitudinally extending slots *d*, *d*. The bus bars *c* are suitably connected to the positive pole of a source of electric current. Extending about the tank adjacent its upper edge is a bus bar *e*, which is suitably connected to the negative pole of the source of current.

A rod *f* extends between the bus bars *c*, *c*, its ends extending through slots *d*, and is adjustably secured thereto by means of nuts threaded on its ends. Hangers *g* provided with vertical slots *h* are suspended from rod *f* and secured together by a slotted bar *i* which is adjustably secured to the hangers by means of bolts and wing nuts *j*. Forked plate supporters *k*, formed out of silver and having aligning plate receiving notches *l* in the edges of the arms, are adjustably secured by means of bolts and wing nuts *m* to the hangers *g*. The rod *f*, hangers *g*, and bar *i* are made of any suitable conducting material, as copper, and lead the current from the bus bars *c*, *c* to the plate supporters *k* from which it passes to the plate *v*, which in the etching process becomes the anode.

Resting on the bottom of the tank *a* is a

rabbeted frame n which may be of wood and in which is supported carbon plates o which are electrically connected by means of loops of silver wire p. Extending over the frame and spaced above the carbon plate, as shown in Figure 4, is a silver plate q, the edges of which are turned over the edges of the frame. The silver plate q is electrically connected to the carbon plates o by means of loops of silver wire r, to which are connected silver lead wires s which are connected to the bus bar e. The silver plate and carbon plates, all in electrical connection, serve as a cathode in the etching process.

If it be desired, for the purpose of speeding up the etching process, carbon plates t may be suspended within the tank along its side. Such plates are connected by means of silver leads u to the bus bar e.

In operation, the plate v, to be etched, is supported, horizontally face downward, in the tank, which has been previously charged with electrolyte, by the engagement of opposite edges in the slots l in the arms of the forked plate supporters k, as shown in Figs. 1, 2 and 5. The current when turned on passes from the plate through the electrolyte to the cathode and in its passage effects the etching of the plate. Practically no hydrogen is liberated on the silver plate q and the hydrogen liberated on the carbon plates o forms into bubbles which rise in the space above the carbon plates and adhere to the underside of the silver plate, which prevents them from rising and adhering to the plate being etched. The hydrogen bubbles may be dissipated or escape at the sides of the silver plate, but in the latter case they will rise to the surface of the electrolyte at the edges of the tank clear of the plate v.

I have found that the silver plates alone will serve as an effective cathode and their use results in minimizing the liberation of hydrogen. The carbon plates o are non-essential, but serve to accelerate the etching process, and when they are used the silver plate performs the function of serving to shield the plate being etched from the hydrogen bubbles. The carbon plates t, it will be understood, are also non-essential, their function being to further speed up the etching; their utility being greatest in the etching of large plates.

I have also found that by the use of silver in the construction of the cathode plate, supporters and leads immersed in the electrolyte, that they are practically indestructible as no etching action takes place on them and they are unaffected by the electrolyte.

Having now fully described my invention, what I claim and desire to protect by Letters Patent is:

1. Apparatus for electrical etching comprising an electrolytic bath, means for the support therein of a plate to be etched, said plate being in electrical connection with the positive pole of a source of current and forming an anode, and a cathode composed of a material resistant to action by the electrolyte and which will minimize the formation of hydrogen gas.

2. Apparatus for electrical etching comprising an electrolytic bath, means to support therein a plate to be etched, said plate being in electrical connection with the positive pole of a source of current and forming an anode, and a silver plate in electrical connection with the negative pole of the source of current and forming a cathode.

3. Apparatus for electrical etching comprising an electrolytic bath, means for the support therein of a plate to be etched, said plate being in electrical connection with the positive pole of a source of current and forming an anode, and a cathode comprising a carbon plate and a silver plate spaced from and overlying said carbon plate, said plates being electrically connected to each other and to the negative pole of the source of current.

4. Apparatus for electrical etching comprising an electrolytic bath, means for the support therein of a plate to be etched, said plate being in electrical connection with the positive pole of a source of current and forming an anode, and a cathode comprising a frame in which are supported a series of carbon plates and a silver plate spaced above and overlying said carbon plates, said plates being electrically connected to each other and to a source of current.

5. Apparatus for electrical etching comprising an electrolytic bath, means for the support therein of a plate to be etched, said plate being in electrical connection with the positive pole of a source of current and forming an anode, and a cathode comprising a carbon plate and means forming a shield spaced from and overlying said carbon plate, said carbon plate being in electrical connection with a source of current.

6. Apparatus for electrical etching comprising an electrolytic bath, means for the support therein of a plate to be etched, said plate being in electrical connection with the positive pole of a source of current and forming an anode, and a cathode comprising a conductor in electrical connection with a source of electric current and means overlying said conductor adapted to trap gas formed thereat.

7. Apparatus for electrical etching comprising an electrolytic bath, means for the support of a plate horizontally face downward therein, said plate being in electrical connection with a source of current and forming an anode, a cathode horizontally disposed in said bath beneath said plate, and

means disposed between said cathode and said plate adapted to shield the face of said plate from gas formed at said cathode.

8. Apparatus for electrical etching comprising an electrolytic bath, means to support a plate to be etched horizontally therein, a cathode horizontally disposed beneath said plate, and a supplementary cathode suspended vertically adjacent the sides of said bath.

9. Apparatus for electrical etching comprising an electrolytic bath, means to support a plate to be etched horizontally therein, a cathode horizontally disposed beneath said plate, a supplementary cathode suspended vertically adjacent the sides of said bath, and means interposed between said first mentioned cathode and said plate adapted to shield said plate from gas formed at said cathode.

10. Apparatus for electrical etching comprising an electrolytic bath, a cathode submerged in said bath, and means for supporting a plate therein comprising a suspension device and a bifurcated electrode adapted to engage the edge of a plate.

11. Apparatus for electrical etching comprising an electrolytic bath, a cathode submerged in said bath, and means for supporting a plate therein comprising a suspension device and a bifurcated electrode the arms of which are provided with aligning notches adapted for the reception of the edge of a plate.

12. Apparatus for electrical etching comprising an electrolytic bath, a cathode submerged in said bath, and means for supporting a plate therein comprising a suspension device and an electrode provided with aligning notches for the reception of the edge of a plate, said electrode being etch-resistant and resistant to the action of the electrolyte.

13. Apparatus for electrical etching comprising an electrolytic bath, a cathode submerged in said bath, means for supporting a plate therein and a silver electrode in contact with the plate.

14. Apparatus for electrical etching comprising an electrolytic bath, a cathode submerged in said bath, and means for supporting a plate therein comprising a suspension device and a bifurcated electrode the arms of which diverge and are provided with plate receiving notches adjacent their free ends.

15. Apparatus for electrical etching comprising an electrolytic bath, a cathode submerged in said bath, and means for supporting a plate therein comprising a suspension device of conductive material and a pair of bifurcated electrodes, adjustable vertically and horizontally, the arms of said electrodes being provided with aligning plate receiving notches for the reception of opposite edges of a plate.

16. Apparatus for electrical etching comprising an electrolytic bath, means for supporting a plate to be etched in said bath, a cathode submerged in said bath, and means affording electrical connection with said plate and said cathode, said means being etch-resistant and resistant to action by the electrolyte.

17. Apparatus for electrical etching comprising an electrolytic bath, means for the support therein of a plate to be etched, said plate being in electrical connection with the positive pole of a source of current and forming an anode, and a cathode in electrical connection with the negative pole of a source of current, submerged in said bath, said plate and said cathode being so positioned that their opposing faces will lie in planes substantially parallel one to the other.

18. Apparatus for electrical etching comprising an electrolytic bath, means for supporting a plate to be etched in said bath, a cathode submerged in said bath, and means affording electrical connection with said plate, said means being etch-resistant and resistant to action by the electrolyte.

In testimony of which invention, I have hereunto set my hand, at Philadelphia, Pa., on this first day of April, 1921.

RAYMOND M. WEEKS.