# UNITED STATES PATENT OFFICE.

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## ELECTROLYTE FOR ELECTROPLATING.

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*To all whom it may concern:*

Be it known that I, OTTO MEYER, a citizen of the United States, residing at Richmond, in the county of Henrico and State of Virginia, have invented certain new and useful Improvements in Electrolytes for Electroplating; 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.

This invention relates to improvements in electrolytes for electroplating, and the object in view is the simplifying and facilitating of the carrying out of electroplating processes.

In the carrying out of electroplating processes heretofore by the employment of an aqueous bath the evolution of hydrogen at the cathode has always been the most disturbing element because the hydrogen has a tendency to make the deposited metal porous, or even spongy. To overcome this obstacle and to obtain a bright metal at the cathode various improved baths are used. All of them have a more or less complicated composition, which must be kept up by regeneration, and also the current density per square foot of cathode surface must be carefully regulated. Frequently the temperature of the bath must be kept within certain limits.

In carrying out my invention, I employ an electrolyte comprising a solution of a chlorid of a metal in alcohol, the alcohol being either commercial ethylalcohol, or methylalcohol, or denatured alcohol.

One way of preparing an electrolyte is the dissolving of a chlorid of a metal to be plated in the alcohol, and this may be considered the normal or preferred way of the preparation of the electrolyte, as it is the underlying principle of the present invention to restrict the evolution of hydrogen by restricting the percentage of water in the electrolyte to that small amount of water which exists in commercial alcohol, say about five per cent. But even a few per cent. more will make little or no practical difference, and therefore a second way of preparing the electrolyte is possible and consists of adding one or several per cent. of pure, concentrated hydrochloric acid to commercial alcohol and starting electrolysis, using the plating metal as an anode. Chlorid of the plating metal is thus formed in the bath, and the process is carried out by the use of the plating metal itself as the anode without a chlorid of metal being in the first instance dissolved in the alcohol. In this way, alcohol, with the addition of a small amount of pure hydrochloric acid, forms directly, while cold and without further additions, an excellent electrolyte for a number of metals, although not for all metals. Gold, copper, nickel, cobalt, tin, and iron can be deposited in this way to advantage, and in a dense, bright and metallic form.

It is obvious from the foregoing that whether the chlorid of metal is dissolved directly in alcohol in the first instance, or is produced at the anode in the electrolyte, the resultant electrolyte comprising a chlorid of a metal and alcohol is comprehended by the present invention.

From two and one-half to three volts is required for overcoming the resistance of the bath and carrying out the present improved electroplating process by the use of the electrolyte as above described.

When compared with the present well-known aqueous baths, the readiness with which the present improved electrolyte may be produced and used will be more fully appreciated. The aqueous baths which are at present commonly used have a complicated composition which must be kept up by regeneration, and the current densities per square foot of surface to be plated must be strictly maintained. In the present invention it is not necessary to adhere strictly to certain current densities. No heating of the bath is required.

The present improved method or process cannot be used for silver and lead. It might be used for platinum and zinc, but in the case of these two last mentioned metals, I should prefer the improved aqueous baths. As far as platinum is concerned the anode does not dissolve and the addition of platinum chlorid must be kept up. Also the platinum deposited is darker than can be obtained otherwise. As to zinc, the same results, or perhaps even better, can be obtained with cheap aqueous solutions.

As the present improved electrolyte is of similar nature for all metals used, the present method offers a variety of ways of depositing different metals as alloys with each other, or above each other, or side by side in the same bath. This can be done by the addition of new chlorids, or it can be done

entirely by suitable manipulation of the anodes and by stopping or starting circulation in the electrolyte. Certain anodes may be moved, or lifted partially, or removed entirely from the bath, and by bringing a rod of a different metal as anode close to a certain point of the cathode, it is possible to deposit a different metal on this part of the cathode, while at other places other metals are deposited. In this way copper and zinc may be deposited simultaneously and so also copper and brass; and zinc, nickel, copper and tin may form a variety of colors on the same cathode.

I have been unable to deposit aluminum by itself, according to the present improved method or process. However, when other metals are deposited, aluminum in the electrolyte will make its appearance at the cathode, and in this case it either changes the looks or character of the deposit, or it appears in films or patches of aluminum metal. These patches have a tendency to be blackish, but show the color of aluminum when polished.

Another advantage of the present improved electrolyte for electroplating the same is found in connection with plating upon aluminum, as it has been heretofore practically impossible to electroplate aluminum in the same way as other metals are electrotyped, and various spceial methods have been proposed to plate aluminum with other metals. With my improved method, aluminum may be plated upon like any other metal, and in the same way. It is only necessary, when starting, to reverse the poles for a few minutes, thus making the aluminum cathode for a few minutes the anode, and then the poles are reversed again and the plating is carried on in the usual manner. The theory of this form of plating on the aluminum is as follows:—Aluminum is always covered with a thin film of an oxid. When the surface is scraped, or the metal is cut with a knife, the film forms itself immediately, if the aluminum is in air or in water. This film prevents the electro deposited metal from adhering to the aluminum. In making the aluminum for a few minutes the anode, I dissolve this film, and it does not form again in alcohol, and therefore when the aluminum becomes the cathode again, the electro deposited metal strikes upon real, bare aluminum and adheres to it.

What I claim is,—

1. An electro-plating bath, comprising a solution of a chlorid of a plating metal in alcohol.

2. An electro-plating bath comprising a solution of chlorid of a plurality of plating metals in alcohol.

3. In an electrolyte, a solution of chlorid of copper in alcohol.

4. In an electrolyte, a solution of chlorid of copper and a chlorid of another metal in alcohol.

5. In an electrolyte, a solution of chlorid of copper and chlorids of other metals in alcohol.

In testimony whereof I affix my signature in presence of two witnesses.

OTTO MEYER.

Witnesses:
E. V. FARINHOLT,
C. C. RUSSELL.