

## UNITED STATES PATENT OFFICE

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## METHOD OF ELECTRODEPOSITION OF ZINC

No Drawing.

Application filed August 27, 1928. Serial No. 302,444.

This invention relates to an improved method of electrodeposition of zinc and has for its purpose the production of zinc deposits of a new type, characterized by extreme purity and high ductility. It also provides a means for reducing the power consumption per unit of zinc deposited.

In the ordinary process of electrolytic zinc production, it is customary to employ anodes of pure lead and to add to the solution a small amount of glue to improve the character of the deposit. The zinc metal so obtained, however, is always contaminated to a greater or less degree with lead derived from the anode and the deposited metal is brittle and relatively difficult to work mechanically. According to the present invention, I employ an anode consisting mainly of lead but having alloyed with it a certain proportion of a metal or metals standing below lead in the electro-chemical scale, such as silver, arsenic, bismuth, etc. I further add to the solution a small proportion of an inorganic colloid such as silicic acid. It is frequently desirable to couple with the inorganic colloid the addition of an organic colloid not precipitated by zinc sulphate solution, such as gum arabic or agar jelly. Under these conditions the zinc deposit obtained is much purer than by the ordinary method and at the same time the deposits are of exceptionally good quality, being very smooth, malleable, and ductile. It has been found possible to produce, directly from the cathode deposits, zinc foil only one-sixteen thousandths of an inch in thickness, and the metal may be rolled out indefinitely without annealing.

In carrying this invention into effect, I employ an anode consisting mainly of lead but containing a small percentage, say 1%, of silver, bismuth, or arsenic. Other metals or combinations of metals electro-negative to lead may be employed although my preference is for those mentioned, in the order named. To the electrolyte I add a solution of silicic acid or sodium silicate in the proportion of about one to five pounds of soluble silica per ton of zinc deposited. To insure a smooth deposit, and more especially if impurities are likely to be present in the

electrolyte, the addition of a similar quantity of gum arabic, or of one quarter the amount of agar, is beneficial. The electrolysis is preferably conducted under conditions described in prior patents of the present applicant, namely, in the presence of a large proportion of acid and at a high current density. Other conditions of electrolysis may, however, be employed.

It will be found that the zinc deposited under the above conditions carries only about one-tenth as much lead as does electrolytic zinc made in the usual way. Moreover, the deposited metal, both in the form of cathode and after melting, is remarkably ductile and malleable and may be put through severe mechanical operations such as drawing, spinning, and stamping, to an extent to which it is impossible to subject ordinary zinc with success.

It will be found further, that under the above conditions the power required for electrolysis is substantially reduced as compared with ordinary practice, because not only is the current efficiency exceptionally high, but the terminal voltage is lower than when using the ordinary conditions.

The metal obtained is also of special value in the plating of thin zinc deposits on other metals as, for example, in the production of galvanized iron and steel. Owing to the high purity of the metal, the resistance to corrosion is greater and the adhesion of the zinc to the underlying metal is much stronger than when made by the ordinary method.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In the electro-deposition of zinc, the method of producing zinc deposits of great purity and ductility which consists in using an anode composed of an alloy of lead with a small proportion of a metal electro-negative to lead, and carrying out the electrolysis in the presence of silicic acid.

2. In the electro-deposition of zinc, the method of producing zinc deposits of great purity and ductility which consists in using an anode composed of an alloy of lead and

silver, and carrying out the electrolysis in the presence of silicic acid.

3. In the electro-deposition of zinc, the method of producing zinc deposits of great purity and ductility which consists in using an anode composed of an alloy of lead with a small proportion of metal electro-negative to lead and carrying out the electrolysis in the presence of silicic acid and gum arabic.

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