UNITED STATES PATENT OFFICE.

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COMPOSITION FOR COATING ALUMINUM AND PROCESS OF MAKING SAME.

1,372,290. Specification of Letters Patent. Patented Mar. 22, 1921.

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To all whom it may concern:

Be it known that I, RICHARD HURLEY, a citizen of the United States, residing at Philadelphia, in the State of Pennsylvania, have invented a certain new and useful Improvement in Compositions for Coating Aluminum and Processes of Making Same, whereof the following is a specification.

My invention relates to a method and means for providing articles of aluminum with an adherent coating of copper. It is the object of my invention to provide aluminum with a coating of copper which may be used as the basis for coatings of other metals, for instance, gold, silver, and nickel, which may be applied by ordinary methods of plating, electrically and otherwise, as if the articles were of solid copper.

In practising my invention, the articles to be coated should first be cleaned, mechanically of chemically, and are then immersed in an aqueous solution which is preferably formed by mixing two aqueous solutions which are previously separately formed as follows:—

Solution A is formed by adding to six volumes of water, one volume of C. P. sulfuric acid; then adding sufficient copper sulfate to saturate the dilute sulfuric acid aforesaid; then adding sufficient zinc sulfate to saturate the mixture aforesaid. With the commercial materials, which I have employed, said acid solution will dissolve about sixteen times as much copper sulfate as zinc sulfate and the saturated solution should be decanted from any undissolved residue.

Solution B is formed by first making an aqueous solution of zinc sulfate. With the commercial materials which I have employed, one ounce of zinc sulfate is sufficient for eight ounces of water. To this I add iron sulfate in the proportion of one quarter ounce to each ounce of zinc sulfate.

The coating bath is made by mixing said solutions A and B in the proportions of one third of the former and two thirds of the latter. Upon immersing articles of aluminum in such a bath an adherent coating of metallic copper is deposited thereon, without the employment of an electric current; a coating as thick as ordinary copper electroplating being thus deposited in approximately three quarters of an hour. However, the deposition of the copper is accelerated by the employment of an electric current; but if deposited too rapidly the coating is spongy, friable and consequently worthless. However, under proper conditions the coating of copper alloys with and is inseparable from the aluminum, so that aluminum thus coated may be brazed or soldered like copper. For instance, with a current of eighteen amperes per square foot, such a coating may be deposited at the rate of one pound per square foot per day upon large smooth surfaces, but deposits upon rough or irregular surfaces should be effected at a slower rate to insure such a coating.

It may be observed that if zinc sulfate is omitted from the solutions above contemplated, metallic copper may be deposited from such solutions upon aluminum, but such a copper coating is spongy and flakes off if the aluminum be flexed. In other words, the zinc sulfate has the effect of rendering the coating dense and adherent. The iron sulfate has the effect of increasing the rapidity of deposition and the cohesion of the copper. However, the coating is rendered black if too much iron sulfate is contained in the bath. The acid aforesaid has the effect of increasing the rapidity of deposition of the copper, but if too much acid is included in the bath the coating is rendered spongy and friable.

The coating materials aforesaid may be reduced to solid form by evaporating the respective solutions, A and B, to dryness; the residue being crystals from which a plating bath may be formed by the addition of the proper volume of water.

I do not desire to limit myself to the precise details of procedure above described, as it is obvious that various modifications may be made therein without departing from the essential features of my invention as defined in the appended claims.

I claim:—

1. A composition for coating aluminum with copper, containing water, sulfuric acid, copper sulfate, zinc sulfate, and iron sulfate.

2. The process of forming a composition for coating aluminum with copper which consists in adding to six volumes of water one volume of sulfuric acid and saturating

the same first with copper sulfate and then with zinc sulfate; adding iron sulfate to an aqueous solution of zinc sulfate; and mixing said two solutions.

3. A composition for coating aluminum with copper formed by adding to six volumes of water one volume of sulfuric acid and saturating the same first with copper sulfate and then with zinc sulfate; adding iron sulfate to an aqueous solution of zinc sulfate; and mixing said two solutions in the proportions of one-third of the former to two-thirds of the latter.

4. The process of forming a composition for coating aluminum with copper which consists in adding to six volumes of water one volume of sulfuric acid, then saturating said mixture successively with copper sulfate and zinc sulfate; adding to an aqueous solution of zinc sulfate in the proportions of one ounce of said sulfate to eight ounces of water, iron sulfate in the proportion of one-quarter ounce to each ounce of zinc sulfate; then mixing said two solutions in the proportions of one-third of the former to two-thirds of the latter.

5. The process of forming a composition for coating aluminum with copper, which consists in saturating an aqueous solution of sulfuric acid successively with copper sulfate and zinc sulfate; adding iron sulfate to an aqueous solution of zinc sulfate; and mixing said two solutions.

6. An acid composition for coating aluminum with copper, containing copper sulfate, zinc sulfate, and iron sulfate.

7. An aqueous composition adapted for coating aluminum with copper, containing copper sulfate and iron sulfate.

In testimony whereof, I have hereunto signed my name at Philadelphia, Pennsylvania, this 25th day of April, 1913.

RICHARD HURLEY.

Witnesses:

ARTHUR E. PAIGE,

ETHEL M. IMSCHWEILER.