UNITED STATES PATENT OFFICE.

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PREPARATION OF IRON OR STEEL FOR LEAD AND TIN COATING.

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To all whom it may concern:

Be it known that I, JAMES H. MADDY, a citizen of the United States, residing at 610 West 116 Street, New York, county of New York, and State of New York, have invented certain new and useful Improvements in Preparation of Iron or Steel for Lead and Tin Coating, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The present invention relates to a means of preparing ferric articles to receive a coating of lead, and tin or their alloys deposited thereon from a molten bath of metal, the lead being usually preferable.

It is known that lead is most resistant to corrosion from atmospheric influences, furnace fumes, or acids, and such a coating is therefore most desirable for protecting ferric articles from such influences.

The means which have been heretofore devised for securing a coating of lead on iron or steel articles have often failed to produce a perfectly continuous adhesive coating, but forms a coating more or less porous, resulting in an imperfect protection for the article.

The object of the present invention is to form an adherent non-porous coating of lead, and to provide for the preparation and coating of the article in a short space of time.

My invention includes the formation of three metallic films successively upon the article, first, a film of copper, second, a film of mercury deposited upon the copper, and third, a film of lead or other protective metal deposited upon the mercury.

Each of these films forms a certain barrier against the penetration of water or air through the external coating of lead.

The article is first thoroughly cleansed and then subjected to the three baths which forms a series of combined films upon its surface.

The following prescriptions are used in practicing the invention, and it will be understood that the chemicals may be used in the proportions named or their equivalent. The copper sulphate solution contains 10% of copper sulphate, 10% of ammonium sulphate, .5% of mercuric chloride, and 2% of sulphuric acid and deposits a thin firm coating of copper on the article.

The presence of mercuric chloride in the copper sulphate bath produces two very striking results, first, it greatly hastens the precipitation of the copper upon the article, so that fifteen seconds immersion is sufficient to produce the thin copper coating desired; and, secondly, it greatly hardens the deposited copper and causes such an adhesion of the same that the deposit is not disturbed by ordinary handling. The articles coated with copper are then subjected to a mercuric zinc chlorid bath.

The composition of the mercuric bath is 2½% of mercuric chloride, 2½% of ammonium chloride, 10% of zinc chloride, and 5% of hydrochloric acid. These ingredients are mixed with the required amount of water.

The immersion of the copper coated article in this mercuric chloride bath for fifteen to thirty seconds suffices to cover the copper coating with a film of metallic mercury. When such mercury coated articles are immersed in the molten lead, the film of metallic mercury serves as a binder and attaches the lead securely and permanently to the article.

The deposit of metallic mercury forms a continuous film when applied over copper, and it thus serves as a continuous support for the lead and makes the adhesion of the lead coating practically perfect.

All the operations required to practice this invention are of such a simple nature, that ordinarily intelligent labor can be employed to carry on the operation commercially; the only apparatus needed being the tanks for the copper sulphate bath and the mercuric chloride bath; and the invention thus furnishes a process of a simple and inexpensive character.

It is found that the coating of the articles with copper and mercury film by the baths described herein, can be effected in much less time than by other ordinary processes, and the present invention thus offers a great advantage in coating iron or steel articles at high speed, as the several steps of the process operate in from fifteen to thirty seconds, and the entire preparation of the article for immersion in the molten bath occupies little more than one minute.

Wire may therefore be run continuously through the copper depositing bath, through the mercuric chloride bath, and through the

tank of molten metal, and the lead coating effectively attached to the wire so as to preserve it from corrosion.

The deposition of copper is very cheaply and rapidly effected by the copper sulphate bath containing a proportion of mercuric chloride; as it is found that the prescribed method secures a much more rapid deposition of copper than other chemical solutions or an electro-plating process, and secures as hard a deposit as by any other any means.

My several improvements in the chemical baths by which the articles are fitted to receive an adhesive lead coating includes first the dipping of the article into a copper sulphate bath which results in a firm and adherent coating of copper, which has not been possible to secure with other copper sulphate solutions which produce a non-adherent and spongy deposit; and secondly, the use of mercuric chloride and zinc chloride as the basis of a mercury zinc bath, instead of the chemicals heretofore used.

My invention furnishes a more effective and perfect coating than those referred to, for the reason that in the process of coating there are deposited three metallic films upon the article each having an important bearing upon the result.

They are, first, the film of copper, second, the film of mercury, and third, the film of lead or other protective metal.

It will be understood that the processes described and claimed herein are not only applicable to the coating of iron and steel with lead or tin, but with zinc or any other metal commonly used as a protective coating for iron or steel articles.

I am aware that articles have been coated with copper by various processes, with the object of permanently protecting the surface of the article by such copper coating; but I am not aware that articles of iron or steel have been coated with copper and subsequently with a film of mercury as a preparation for coating the articles with lead and analogous metal.

Having thus set forth the nature of the invention what is claimed herein is:

1. The process of protecting iron or steel articles with an unbroken coating of protective metal, which consists in applying three metallic films successively to the articles, first, a film of copper, second, a film of mercury, and finally an unbroken film of protective metal.

2. The process of coating ferric articles with lead or its alloys, which consists in the following steps: first, coating the surface of the article with a thin film of copper, second, immersing the copper coated article in a solution of mercuric zinc chloride and forming a thin film of mercury upon the article, and third, dipping the mercury coated article in a molten bath of protective metal and coating the article therewith.

3. The process of coating ferric articles with lead and tin or their alloys, which consists in the following steps: first, immersing the article in a bath containing copper sulphate, ammonium sulphate, mercuric chloride, and sulphuric acid in the proportions substantially described, and precipitating a coating of copper upon the article; second, immersing the copper coated article in a bath containing mercuric chloride, ammonium chloride, zinc chloride, and hydrochloric acid in the proportions substantially as described, and forming a film of mercury upon the article, and third, dipping the mercury coated article in a molten bath of metal and coating the article therewith.

In testimony whereof I have hereunto set my hand.

JAMES H. MADDY.