

UNITED STATES PATENT OFFICE.

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PROCESS FOR COMBINING A PERMEATING METALLIC PROTECTIVE WITH THE SURFACES OF FERRIC ARTICLES.

990,443.

Specification of Letters Patent. Patented Apr. 25, 1911.

No Drawing.

Application filed January 7, 1911. Serial No. 601,433.

To all whom it may concern:

Be it known that I, HERMAN J. LOHMANN, a citizen of the United States, residing at 90 Monticello avenue, in Jersey City, county of Hudson, and State of New Jersey, have invented certain new and useful Improvements in Processes for Combining a Permeating Metallic Protective with the Surfaces of Ferric Articles, fully described and represented in the following specification.

This invention relates to an improved process for permanently uniting a coating of lead, zinc, tin, or any alloy of these metals, with articles of iron or steel, when dipped into a bath of the molten protective metal.

Experience has shown that so-called "galvanized" articles having a zinc coating are more or less permeable to the atmosphere, and the lack of actual union with the surface of the iron permits the corrosion of the iron under the coating, and the final displacement of the coating, leaving the iron without any protection. For brevity, iron and steel articles are termed "ferric" herein. Zinc and lead are more suitable than zinc alone as a protective metal, as lead resists corrosion much more powerfully than zinc; but ferric articles have a repulsion rather than a chemical affinity for zinc and lead, and an intimate union of such metals with a ferric article has not heretofore been effected by any cheap and convenient process applicable to ferric articles of all kinds and sizes.

The invention, therefore, refers particularly to the protecting of ferric articles by applying to the surface any metal of the "lead group", and which for the present purpose may be understood to include zinc, lead and tin. I have, however, discovered a preparatory treatment for ferric articles which causes a coating of lead, zinc or tin; or an alloy of any of those metals to adhere permanently on ferric articles, and penetrate the same sufficiently to protect the article from corrosion if the protective metal be entirely removed by wear or abrasion. Such preparatory treatment consists in first depositing upon the surface of the article a salt of mercury which metal subsequently

forms an amalgam with the iron, and has a chemical affinity for both the ferric article and the protective metal.

The metal in the mercury salt may be precipitated therefrom by heat and thus form an amalgam with the substance of the iron before it is dipped in a melted alloy, or it may be dipped in the melted alloy so slowly that the heat of the molten bath may produce the necessary decomposition of the mercury salt and precipitate the mercury; which amalgamates with the iron and makes it attractive to the zinc or lead.

The molten bath is preferably heated to a temperature of 950 degrees Fah. and when the ferric article thus prepared is immersed in the molten bath for about three minutes, or until it attains the temperature of the bath, the iron attracts the protective metal into close union with itself and when removed and cooled is found to have a permeation of the molten metal into its pores so that no line of demarcation exists between the protective metal and article.

If the protective metal be removed by wear or abrasion, the article still retains within its substance below its surface the permeating protective metal which prevents its corrosion. The mercury is vaporized in the metal bath and mingles with the metals of the bath performing an important function in alloying them together so that the lead which is sixty per cent. heavier than zinc is prevented from settling to the bottom of the bath.

For commercial uses, I prefer a protective metal formed of ten parts by weight of lead to ten parts of zinc and one of tin, as this alloy possesses such flexibility that sheet-metal and slender articles coated thereby can be bent without straining or cracking the protective metal. The preparatory treatment is effected by an acid liquor prepared in the proportion of five gallons of hydrochloric acid, one-half pound of mercury bichlorid, and one-half pound of ammonium chlorid. The acid serves to remove oxid and impurities from the surface of the ferric articles, the mercury bi-chlorid produces the attracting element for the protective metal when immersed in a bath of the same, and the ammonium chlorid acts merely as a

catalyzer in promoting the action of the other elements, but such catalyzer is not essential.

The articles are immersed in the liquor preferably for three minutes, unless they are very rusty and require a longer cleaning effect of the acid, and when taken out are dried and then exhibit a deposit upon their surface of mercury and the metallic salts of the bath. They are then heated to precipitate the mercury from the salts upon the article, and are immersed while hot in the molten bath of protective metal, which is prepared by melting and mixing together the several ingredients, as lead, zinc, or tin.

This process of protecting ferric articles produces a very unusual union of the protective metal with the substance of the article, as tests show that the article has the protective metal permeating its substance adjacent its surface, and a coating of the protective metal upon the surface of the article in integral union with such permeating metal; which union destroys any line of demarcation between the article and the protective metal, and when tested by removing the external coating mechanically, particles of the iron itself have been torn off with the coating.

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

1. The process of preparing ferric articles for coating and permeation by a metal of

the "lead group," or lead-zinc alloys in a molten state, which consists in depositing a salt of mercury upon the surface of the article before immersion in the bath of melted metal.

2. The process of preparing ferric articles for coating and permeation by lead-zinc alloys in a molten state, which consists in immersing the article in a liquor of cleaning-acid mixed with a salt of mercury.

3. The process of preparing ferric articles for coating and permeation by lead-zinc alloys in a molten state, which consists in immersing the article in a liquor of cleaning-acid mixed with a salt of mercury and a catalyzer, as ammonium chlorid.

4. The process of coating and permeating ferric articles by lead-zinc alloys, which consists in first making the article chemically clean, second, depositing a salt of mercury upon the surface of the article, third, heating the article sufficiently to decompose the salt and precipitate the mercury upon the article, and finally immersing the prepared article in the melted alloy.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

HERMAN J. LOHMANN. [L. S.]

Witnesses:

J. H. MADDY,

THOMAS S. CRANE.