UNITED STATES PATENT OFFICE.

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METAL-COATED IRON OR STEEL ARTICLE.

1,186,217. Specification of Letters Patent. Patented June 6, 1916.

No Drawing. Application filed August 4, 1915. Serial No. 43,528.

To all whom it may concern:

Be it known that we, CLARENCE MARK and CLAYTON MARK, Jr., citizens of the United States, residing at Evanston, county of Cook, and State of Illinois, have jointly invented a new and Improved Metal-Coated Iron or Steel Article, of which the following is a specification.

Our invention consists in a protective coating for iron and steel, and is comprised of lead, tin and zinc, or other combinations of metals in such proportions that when they are alloyed they are slightly electro-positive to iron. It has been found that where a coating is applied, such as lead, tin or copper, which is electro-negative to iron, it is almost impossible to secure a perfect coating, that is, one free from small holes, etc. In such a coating wherever an imperfection occurs galvanic action is set up between the coating and the exposed iron, so that the iron is corroded, and, after a time, the corrosion will eat under the coating and will cause a separation between the coating and the iron.

The object of our invention is to provide an alloy or coating of such a character that it will not be electro-negative to iron, since in such a case a battery action is initiated between the coating and the iron at the expense of the iron. We have found it very desirable to use an alloy composed of materials such as lead, tin and zinc, which can be applied to the metal to be protected at a temperature, for instance, between 650° and 850° F. Typical examples of such an alloy are as follows:

Lead	97.20	94.45	90.54	87.	79.
Tin	2.	3.74	7.5	10.	16.
Zinc	.80	1.81	1.96	3.	5.

These alloys contain in each instance approximately the stated amount of zinc at the saturation point when temperatures between 650° and 850° F. are used. When the temperature is increased more zinc may be added, or, when the percentage of tin is increased the higher is the percentage of zinc which is necessary to saturate the bath. We have found that such an alloy forms a heterogeneous coating on the surface of the article in which the matrix or base is comprised of lead and tin in which are mingled small crystals of zinc. It is desirable to use lead and tin for the purpose of giving the article protection against light acids, and to use the zinc to give it galvanic protection, and also to give a sufficient adhesion of the coating to the article.

As the zinc is increased the galvanic or electro-positive protection is increased, while the acid resisting quality of the alloy is decreased with the decrease in the lead and tin.

We have found that an alloy made in the manner and proportions above described is very resistant to weather and acid attack, since it is composed largely of metals electro-negative to iron, most of which are chemically inert to acid, normally found in weather conditions. We have also found that with steel sheets coated with the alloy as described, and which are immersed in a 24 per cent. solution of sulfuric acid for a period of twenty-four hours, at room temperatures, neither the sheet nor its coating deteriorates to an appreciable extent, and they are substantially unaffected by the treatment.

We prefer to apply our improved coating by the process described in our co-pending application No. 841,484, filed May 28, 1914, which has become a patent No. 1,155,317.

The terms and expressions which we have employed are used as terms of description and not of limitation, and we have no intention, in the use of such terms and expressions, of excluding any equivalent for the features shown and described, but recognize that various modifications are possible within the scope of the invention claimed.

What we claim is:

1. An iron or steel article having a coating applied in direct contact therewith, slightly electro-positive to iron, composed of lead, tin and zinc, the tin being present in percentages below 16., the zinc being present in percentages below 5. and the remainder being lead, the percentage of zinc being less than the percentage of tin.

2. An iron or steel article having a coating applied in direct contact therewith, slightly electro-positive to iron, composed of lead, tin and zinc, the tin being present

in percentages between 2. and 16., the zinc being present in percentages between .80 and 5., and the remainder being lead, the percentages of zinc being less than the percentage of tin.

3. An iron or steel article having a coating applied in direct contact therewith, slightly electro-positive to iron, containing approximately the following percentages of lead, tin and zinc: lead 94.45, tin 3.74 and zinc 1.81.

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