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UNITED STATES PATENT OFFICE

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PROCESS FOR COATING, IMPREGNATING, OR ALLOYING METALS AND OTHER MATERIALS WITH ALUMINUM AND ALUMINUM ALLOYS

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This invention relates to an improved process for impregnating metals and other suitable materials with aluminum and aluminum alloys, primarily for the purpose of rendering corrodible metals and other materials incorrodible when exposed to high temperatures.

It has been previously been proposed as a preliminary step to coating with aluminum or aluminum alloy, to coat iron, steel and other metals with tin, zinc, or an easily fusible metal and then to immerse the preliminary coated metal into a bath of molten aluminum or aluminum alloy with the object of superimposing a coating of aluminum or aluminum alloy on the surface of the foundation metal.

The object of the present invention is to obtain more readily a thorough and effective impregnation into the surface of the foundation material. A coating, as distinct from a modified surface of the foundation material due to impregnation, may or may not be formed as well above the impregnated surface. Generally speaking, for the purpose of protection against corrosion and the effects of high temperatures there is no advantage in having a distinct coating of aluminum since the thorough impregnation obtained according to this invention secures adequate protection and moreover the properties or characteristics of the foundation metal are substantially unaltered.

According to this invention an article or object of metal or other material suitable therefor, is given a coating of cadmium, whereupon the coated article or object is treated with aluminum or an alloy of aluminum.

The coating of cadmium is preferably made as thin as possible compatible with a sound envelope and may be effected by electrolytic deposition.

The treatment with aluminum or alloy thereof differs in accordance with the result desired.

By one method the article to which a coating as aforesaid has been given, is immersed in molten aluminum or aluminum alloy.

According to the basic metal treated the time of immersion and the temperature of the bath, the basic metal will become impregnated or alloyed with the aluminum or aluminum alloy, while there will be at the surface of the article a coating thereof.

When treating ferrous metals the bath temperature may be from 700° C. to 960° C. according to the type of finish required. When the result desired is obtained, it is withdrawn, any surplus metal removed, and the article allowed to cool naturally or in a non-oxidizing atmosphere, or may be quenched or treated such other manner as may be desired to obtain specific characteristics. Large articles may be pre-heated to prevent unnecessary cooling of the molten bath.

By this method mild steel articles $\frac{1}{8}''$ to $\frac{1}{2}''$ thick and treated at 800° C.–900° C. have been found to obtain a coating of aluminum equal to .68 ozs. per square foot of surface after an immersion of one minute; of this coating approximately .26 ozs. per square foot is as metallic aluminum at the surface and .42 ozs. per square foot is alloyed with the steel below the surface.

Copper and copper alloys when similarly treated readily alloy at the surface with the aluminum or aluminum alloy used. Care must be taken that the temperature at which they are treated does not exceed the melting point of the basic metal.

By another method an article e. g. of iron or steel, impregnated with cadmium as aforesaid is placed in a closed container together with powdered aluminum or aluminum alloy (alone or in combination with other metals or salts); the article need not be brought into contact with the powder itself but may be so arranged that the vapours generated from the powder come into intimate contact with the said articles. The container is then subjected to the required temperature and for the time necessary to give the desired result. Articles may be treated in this manner at from 650° C. to 1000° C. for half an hour or longer according to the basic metal, size of article and the depth of penetration desired.

It will readily be understood that the invention is applicable to all articles or objects to which a coating of cadmium can be ap-

plied although of course the depth to which the aluminum or aluminum alloy can penetrate depends on the substance surfaced with cadmium. As cadmium can be deposited on plumbago it will be seen that a variety of materials can be so coated.

What I claim is:—

1. A process of impregnating a foundation article with a surface alloy of a substance comprising aluminum, which consists in first treating the article with cadmium and then treating the article with a substance comprising aluminum, the second treatment being carried out at a temperature below 900° C.

2. A process of impregnating a foundation article with surface alloy of a substance comprising aluminum, which consists in first treating the article with cadmium and then treating the article with a molten substance comprising aluminum at a temperature between 700° C. and 900° C.

In testimony that I claim the foregoing as my invention I have signed my name this eighth day of February, 1927.

WALTER SMITH.