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PROCESS OF FORMING A RUST-RESISTANT COATING ON METAL.

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To all whom it may concern:

Be it known that I, Dr. ALFRED MAI, citizen of Germany, residing at Munich, Bavaria, Germany, have invented certain new and useful Improvements in Processes of Forming a Rust-Resistant Coating on Metal; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improved process of forming a rust resistant coating or finish on iron or steel, or alloys of the same, by means of hot alkaline baths under addition of oxidizing agents and the object of my invention is to provide a method in which certain disadvantages of existing methods are avoided and certain advantages, as hereinafter set forth, are attained.

It is common practice to produce a rust resistant coating on iron by treating the latter in alkaline baths containing oxidizing agents. However, these baths soon become ineffective because of the absorption of carbonic acid from the air whereby a carbonate is formed which tends to impede the oxidation of the iron. At the same time products of decomposition will accumulate, so that the efficiency of the oxidizing bath will soon be exhausted.

It is the special object of my invention to eliminate these disadvantages, and the invention is based on the fact that the presence of caustic potash in statu nascendi acts favorably on the course of oxidation. According to my invention I accomplish this object by the addition of burnt and slaked lime or any other agent of similar effect to alkaline baths, one of the constituents of which is a potassium salt. In this way nascent caustic potash will always be formed, while the formation of carbonates with all its disagreeable attendant appearances and consequences will be arrested.

As oxidizing agents most of the inorganic agents, such as bichromates, permanganates, nitrates, nitrites, superoxides, chlorides, etc., as well as organic agents, such as aromatic nitro-compounds, including nitrated cotton, nitro-phenol, nitro-toluol, may be used. According to the degree of concentration of the bath and the character of the iron or steel treated, all shades, from jet-black to bronze or to brass-colored coatings, may be produced.

To prepare a bath according to my invention mix, for instance, 100 parts by volume of 33%-soda-lye with 3 parts by volume of niter and slaked lime and heat the bath to a temperature of 120 to 130 degrees of Celsius. Then immerse the articles to be treated for from 15 to 30 minutes dependent on the size of the articles, and polished iron if so treated will receive a black rust-resistant coat; the process may be carried on as a continuous one if desired. Deeper tints of black will be attained by treating the object for a few minutes with an inorganic acid, such as muriatic acid.

If a more concentrated lye is used to which a somewhat larger quantity of niter has been added, and the temperature raised to about 180 to 200 degrees, polished iron may be coated in such a bath within 5 minutes.

If cast-iron objects are to be coated, the casting-skin should be removed prior to the treatment, and such removal may be effected by an inorganic acid, such as muriatic acid.

After taking the object treated out of the bath it should be well washed in water, and the solution thus washed off the object may be again used. To remove the last remaining traces of lime the treated object should be immersed in a lime-solution, such as diluted acetic acid, which immersion should, in turn, be followed by washing with water. The drying may be done by heat or by rubbing in saw-dust. The treated object may be caused to shine by rubbing it with oil or by applying thereto a coating of fine varnish.

The main advantage of this process is that iron, steel or alloys of the same may, at the temperature mentioned, be coated in one cooking operation without a change of the properties of the metal and with perfect preservation of its surface, even when polished to the highest degree, the bath regenerating itself by the lime which is added thereto. This last mentioned circumstance renders the process economical and cheap and permits wholesale operations. The articles to be treated may be laid closely adjacent one another in the bath. The layer of oxide of iron formed on the object treated does not flake off nor does it give-off any black, as is the case with the products of similar processes already known. In addition, the practice of the process on a large scale, requires but few hands, even if large

quantities of metal are treated. It has further been found in the practice of the said process, that in the use of diluted lyes, with added oxidizing agents, the articles first treated will be less satisfactorily coated than those subsequently treated in the same bath, and to obtain speedy and satisfactory results it is essential that there be present in the bath the decomposition products of the oxidizing agents employed, i. e. if niter, permanganate of potassium, or bichromate of sodium or potassium be employed as oxidizing agents there should be present in the bath nitrate of soda, manganate of soda, chromate of soda or potassium, respectively.

If these products of decomposition are initially added to the bath in small quantities, the process will immediately operate satisfactorily and produce richer tints. This effect may be further increased by adding small quantities of an iron-salt, as, for instance, ferric nitrate.

Example.—In preparing a bath of about 100 kilograms of soda-lye and about 2 kilograms of niter, a speedy coating will be obtained by adding about 100 grams of nitrite of soda and 50 grams of ferric nitrate, the shades from jet-black to brass-yellow becoming more intense.

By means of my process I am also enabled to obtain lighter shades of coating than as above referred to, and for this purpose the objects to be treated should for protection against a too speedy action of the bath be covered with a protective layer, which may be produced, for instance, by immersion in a very thin solution of copper-sulfate or by blueing, as heating in hot air. Thereupon the tinting in the bath will gradually begin from yellow to bronze color. I prefer to work in this case with highly concentrated, even saturated lyes at temperatures of from 180 to 200 degrees of Celsius.

I claim:

1. The herein described process of forming a rust-resistant coating on metal, which consists in immersing such metal in a hot alkaline bath containing oxidizing agents and a substance causing the continuous production of nascent caustic potash.

2. The herein described process of forming a rust-resistant coating on metal, which consists in immersing such metal in a hot alkaline bath containing oxidizing agents and burnt, slaked lime.

3. In a process of forming a rust-resistant coating on metal as claimed in claim 2, the additional step of washing the treated metal in a diluted acid lime solvent.

4. The herein described process of forming a rust-resistant coating on metal, which consists in immersing such metal in a hot alkaline bath containing oxidizing agents and a substance causing the continuous production of nascent caustic potash, and at the beginning of said process adding to the bath quantities of the decomposition products of the oxidizing agents used.

5. The herein described process of forming a rust-resistant coating on metal, which consists in first applying a protective covering to said metal, and thereupon immersing the covered metal in a hot alkaline bath containing oxidizing agents and a substance causing the continuous production of nascent caustic potash.

6. The herein described process of forming a rust-resistant coating on cast metal bodies, which consists in treating such bodies with an inorganic acid to remove the casting skin, and thereafter immersing said bodies in a hot alkaline bath containing oxidizing agents and a substance causing the continuous production of nascent caustic potash.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

DR. ALFRED MAI.

Witnesses:

ALEXIS PHILIPPOFF,

ALEXANDER H. DE SOTO.