UNITED STATES PATENT OFFICE.

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SOLUTION FOR RUST-PROOFING IRON AND STEEL.

1,287,605. Specification of Letters Patent. Patented Dec. 17, 1918.

No Drawing. Application filed June 16, 1916. Serial No. 103,928.

To all whom it may concern:

Be it known that I, WILLIAM H. ALLEN, a citizen of the United States, and residing at Detroit, in the county of Wayne and State of Michigan, have invented a new and Improved Solution for Rust-Proofing Iron and Steel, of which the following is a specification.

This invention relates to the rust-proofing of iron and steel through chemically changing the surfaces of the articles to be treated to basic ferro-ferric phosphates, or by depositing such phosphates thereon, and its object is to provide a liquid which will be very effective for such purpose.

This invention consists in mixing an acidic oxid salt of an alkali metal (such as the chromate, dichromate, manganate or permanganate of potassium or sodium) or of an alkaline earth metal (such as chromate, dichromate, manganate, or permanganate of calcium, magnesium, barium or strontium) with phosphoric acid, which mixture may be dissolved in water. These various salts have much the same action in connection with phosphoric acid in the presence of articles of iron and steel. When the solution is raised to substantially the boiling point and articles of iron or steel are inserted, intense chemical action occurs, indicated by the rising of gas bubbles. When the ebullition ceases, the articles are removed, dried and preferably coated with oil.

The production of the ferro-ferric phosphate of iron surface is especially effective in the presence of an acid by the aid of oxygen which may be obtained by the use of the acidic oxids of chromium or manganese in combination with bases, and known as chromates, dichromates, manganates and permanganates, and which yield oxygen available for the present purpose. These acidic oxid salts possess the property of oxidizing ferrous iron in acid solution into ferric iron, the acidic oxids being reduced to basic form and, together with other bases, entering into combination with the acid used, phosphoric in the present case.

A stock solution is usually prepared and used as required. To produce the solution, the chromate, dichromate, manganate or permanganate is mixed with the phosphoric acid and water in such proportions that the one hundred parts of solution consist of approximately .1265 parts of available oxygen, 50 parts of phosphoric acid and the remainder of water. When sodium dichromate is used the amounts are—

Sodium dichromate	.785	pounds
Phosphoric acid (75%)	66.6	pounds
Water qs. to	100.00	pounds

One half pound of potassium permanganate may be substituted for the sodium dichromate in the above formula.

When this solution is to be used, it is diluted with water until about 100 c. c. neutralize 150 c. c. tenth normal potassium hydrate solution to constitute a bath which is preferably heated to about 100° C., into which bath the articles of iron and steel to be treated are introduced. The iron and steel articles are attacked by the acid mixture, the action being intense at first, but after about two hours, it practically ceases, an insoluble basic phosphate of iron being formed at the surface of the articles being treated. The temperature is maintained at 100° C., stock solution being added from time to time to keep up the strength of the bath.

The articles of iron and steel are then removed from the bath, air dried, and if desired, are oiled, painted or enameled.

The dichromates and permanganates of sodium and potassium are preferred for the reason that they are easily obtainable in large quantities in the open market, but the chromates, dichromates, manganates and permanganates of the other metals can be used for this purpose.

The proportions of the available oxygen and acid can be changed as desired and the use of a stock solution omitted, but the proportions noted will be found to give satisfactory results within about the time specified. The complete action will require more time when lower temperatures and weaker solutions are employed.

I claim:

1. A bath for rust-proofing iron and steel consisting of a solution of a phosphoric acid and a chromate of an alkali metal.

2. A bath for rust-proofing iron and steel consisting of a solution of ordinary phosphoric acid and sodium dichromate.

WILLIAM H. ALLEN.