

UNITED STATES PATENT OFFICE

JAMES H. GRAVELL, OF ELKINS PARK, PENNSYLVANIA, ASSIGNOR TO AMERICAN CHEMICAL PAINT COMPANY, OF AMBLER, PENNSYLVANIA, A CORPORATION OF DELAWARE

METHOD OF PREPARING METAL FOR PAINTING

No Drawing.

Application filed October 2, 1928. Serial No. 309,903.

This invention relates to the art of preparing metal for receiving an adherent finishing cost and although it has various applications it will be found particularly useful for preparing sheet steel articles, such for instance as automobile bodies, fenders and stampings for receiving cellulose lacquer finishes.

This invention has among its objects to clean the metal, to remove rust, scale, grease, oil, acids, soldering fluids, dirt, etc. from the surface of the metal, to produce a coating on the metal to which the lacquer or other finish will adhere, to so treat the metal that the use of a coat of oil primer may be omitted when lacquering metal for example, steel, to reduce the time required for coating the steel with cellulose lacquers, to save expense and generally to improve the art of preparing metal for receiving coatings of paint, enamel, japan, lacquer or varnish or other material that will adhere indefinitely to the metal.

Generally stated the invention consists in coating the steel or other metal with phosphoric acid, permitting the said acid to chemically act on the metal to form a coating of soluble iron or other metallic phosphate and rendering the said coating adherent and insoluble in water.

When phosphoric acid is applied to the metal in the cold, its action on the metal is very slow and many hours may elapse before a noticeable coating of the soluble iron phosphate is developed. If the metal is heated after it has been coated with phosphoric acid, a satisfactory coating will develop in a few minutes.

As the metal to be finished is usually, either through accident or design, coated with oil, it is difficult to coat the metal with phosphoric acid, and even if this is accomplished, the coating of oil beneath the coating of phosphoric acid prevents the acid from chemically acting on the metal to any material extent. Hence it is necessary to provide some way to assist the acid to chemically act upon the metal being treated. This may be done by first washing the metal with an oil removing material such, for instance, as a solution of caustic soda or a solution of tri-sodium phosphate; or the metal may first be heated to a

temperature sufficient to burn off the oil. However the preferred method is to admix with the phosphoric acid an oil solvent, such for instance as an alcohol, a keystone, an ester or an ether, which will enable the acid admixture to penetrate the oil coating and thus permit the acid to chemically act on the metal. In practice an admixture of phosphoric acid, ethyl alcohol and butyl alcohol has been found to be a satisfactory mixture.

The coating developed by the action of the phosphoric acid is damp, non-adherent and soluble in water, due probably to the presence of much free phosphoric acid. Such a coating is not suitable to paint over so that in order to convert it to a suitable coating it is treated with a material adapted to neutralize the phosphoric acid. Any proper material may be used for the purpose, but slaked lime is considered preferable. Other materials such as zinc oxide, tin oxide, magnesium oxide, calcium carbonate, magnesium carbonate may be used as the neutralizer however and satisfactory results obtained. The lime may be dusted over the surface although it is preferred to use it in the form of a viscous or semi-fluid white-wash or paint produced by admixing the lime with water, cellulose pulp waste liquor and butyl alcohol.

Unless a very rough or crude finish is desired the material adapted to neutralize phosphoric acid, together with the deleterious products of its reaction, should be removed before the finish is applied. This may be accomplished by thoroughly washing the surface with water but where lime paint is used if it is permitted to dry on the surface it tends to crack and peel and is easily removed by simply brushing.

In the case of steel, to carry out my process commercially good results are obtained by spraying the metal to be treated with an admixture comprising approximately the following proportions:

	Gallons
Denatured alcohol-----	.70
Butyl alcohol-----	.20
Phosphoric acid (75%)-----	.10
the proportion of alcohol varying according to	100

to its purity and effectiveness as an oil solvent.

In case all oil has been previously removed from the metal the alcohols may be dispensed with and a suitable admixture of water and phosphoric acid be substituted, using more or less the same proportion of acid according to the rapidity of the action desired.

The metal is therefore placed in an oven heated to approximately 250° F. for a period of about fifteen minutes whereby a coating of soluble iron phosphate containing more or less free phosphoric acid will be developed. The metal is then removed from the oven and permitted to cool, after which it is sprayed or otherwise coated with a viscous or semi-fluid material which is an admixture comprising the following materials in approximately the proportions stated:

Water	.920 gallons
Evaporated cellulose pulp waste liquor	1.110 pounds
Quick lime	1.070 pounds
Butyl alcohol	.050 gallons

This neutralizes the free phosphoric acid and causes the soluble coating of iron phosphate to become adherent to the metal and to become insoluble in water.

The coating is therefore permitted to dry, during which time it absorbs any oil that may be present on the metal. As the coating dries it cracks and peels and when it has become entirely dry it is ready to be removed. This may be accomplished by brushing, preferably with a vacuum brush to avoid all dust. The coating that is removed comprises lime, neutralized phosphoric acid and such oil as was present on the metal, and in fact all deleterious products of the chemical reactions of the process.

The resultant coating produced on the metal has a dull gray mat appearance and may be readily washed with water without danger of dissolving it. It adheres firmly to the metal and is of such a character that paint, enamel, japan, lacquer, varnish or similar finishing coat is strongly held by it. As the surface produced by my process tends to retard the rusting of the metal, it materially assists the finish to resist corrosion and therefore increases the life of the applied finish. As cellulose lacquers hold well to the coating produced as described above the usual metal oil priming coat may be omitted and as such primers require a long drying period much time is saved in finishing the metal when my process is used.

What I claim as my invention is:

1. The method of preparing metal for receiving a finishing coat consisting in coating the metal with phosphoric acid, retaining the acid on the metal for a predetermined time to form a coating of water soluble metallic phosphate and thereafter rendering the said

coating of metallic phosphate adherent to the said metal and insoluble in water.

2. The method of preparing metal for receiving a finishing adherent coat consisting in coating the metal with an admixture comprising phosphoric acid and an oil solvent, retaining the acid on the metal for a predetermined time to form a coating of soluble metal phosphate, neutralizing the free phosphoric acid, drying the resultant coating and then removing the deleterious products of the neutralizing operation.

3. The method of preparing metal for receiving a finishing coat consisting in coating the metal with phosphoric acid, retaining the said acid on the metal for a predetermined time to form a coating of soluble metal phosphate and thereafter coating the metal with a material adapted to neutralize phosphoric acid for rendering the said coating adherent and insoluble in water.

4. The method of preparing steel for receiving an adherent finishing coat consisting in coating the metal with phosphoric acid, retaining the said acid on the metal for a predetermined time to form a coating of soluble metal phosphate and thereafter treating the said coating with slaked lime for rendering the said coating adherent and insoluble in water.

5. The method of preparing metal for receiving an adherent coat consisting in coating the metal with phosphoric acid to form a coating of soluble iron phosphate and thereafter treating the said coating with an admixture comprising slaked lime, water, cellulose pulp waste liquor and butyl alcohol for rendering the said coating adherent and insoluble in water.

6. The method of preparing steel for receiving an adherent coat consisting in coating the metal with phosphoric acid to form a coating of water soluble metal phosphate, rendering the said coating adherent and insoluble in water by coating the metal with a semi-fluid material adapted to neutralize phosphoric acid.

7. The method of preparing steel for painting consisting in coating the metal with an admixture comprising phosphoric acid and an alcohol, retaining the said admixture on the metal under the influence of heat for a predetermined time to form a coating of soluble iron phosphate, rendering the said coating adherent and insoluble in water by treating the said coating with a semi-fluid material comprising an admixture of which one ingredient is slaked lime, drying the said material on the said coating and mechanically removing the said dried material together with the deleterious products of its reaction.

Signed at New York, in the county of New York and State of New York, this 1st day of Oct., A. D. 1928.

JAMES H. GRAVELL.