

UNITED STATES PATENT OFFICE

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PROCESS OF CLEANING METAL

No Drawing.

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The invention relates to methods of treating metal surfaces especially of iron or steel to prepare them for the application of protective or decorative coatings such as paint, lacquer or enamel. Such coatings applied in liquid form and dried by evaporation of solvents or otherwise are termed herein, for convenience, paint coatings. The primary object is to provide a treatment preliminary to the application of the coating whereby the formation of rust or oxide under the coating will be prevented.

It is well known that, when salts of alkali metal which dissociate in solution are brought into contact with a metal surface such as iron or steel in the presence of water, electrolytic action is set up which produces in the cathodic area an alkaline condition and in the anodic area an acid condition. Both of these conditions are destructive of the coating if they occur on the surface of the metal beneath the coating. The alkali tends to loosen the coating film from the metal and the acid causes or promote corrosion and oxidation of the metal.

These destructive effects contribute each to the development of the other so that a very small quantity of the alkali metal salts on the metal surface may be sufficient to produce, even within a day or two, a noticeable scaling or blistering of the coating and corrosion or rusting of the metal. In fact, I have found that ordinary industrial waters usually contain sufficient salts of the alkali metals so that, if such waters are used for washing or rinsing the metal surface preliminary to coating with enamel or the like, the drying off of the water in the usual manner will leave enough alkali metal salts, chiefly sodium salts, to produce the destructive effects above mentioned.

In accordance with the present invention, I prevent such effects by converting the alkali metal salts normally present in or deposited from ordinary industrial waters, as well as other salts present in the water which may form corrosion-promoting deposits, into salts which dissociate in the presence of moisture to form rust-inhibitive compounds, preferably phosphates. For this purpose it is sufficient to add to the final rinsing water a very

small quantity of phosphoric acid which, upon drying the surface, converts the slight residue of corrosion-promoting or rust-stimulating salts into rust-inhibitive phosphates. These phosphates are in no way detrimental to the subsequently applied coating and need not be removed, although it may be desirable to go over the surface lightly with a "tack rag" i. e., a rag made slightly tacky with varnish, to remove any powder or dust that may be loose on the surface.

The amount of phosphoric acid used in the final rinse water may be varied somewhat with the character of the water but the variation in the salt content of usual industrial waters is relatively so insignificant and the amount of phosphoric acid necessary is so small that variations in the quality of water may generally be disregarded. The proportion of acid recommended is not more than about one fourth of one percent of the amount of rinse water. With most city water supplies in the North Central States, a phosphoric acid addition of two hundredths of one percent is sufficient. Ordinary commercial phosphoric acid of about 85% strength is satisfactory for the purpose. If the available supply of industrial water is so impure that the proportion of acid specified is insufficient to counteract the effect of the undesirable salts, such water should not be used for rinse water and condensed steam or other relatively pure water should be employed for a final rinse with addition of phosphoric acid as described to counteract any residue from the last or previous wash waters.

Assuming that the metal surface is free from rust and scale, or has been freed therefrom by ordinary pickling processes, after which the surface is usually oiled, it is desirable first to wash the surface in some bath adapted to remove oil or grease, such, for example, as a bath containing an alkaline washing compound. Other methods of removal of grease may, however, be employed for example, cleaning with oil solvents such as volatile hydrocarbons. A subsequent washing, preferably with water, may then be employed to remove the products of the cleaning operation. The metal is then dipped or

rinsed in the dilute phosphoric acid solution and, after drying, is ready to receive the paint coating.

The process described is of especial utility in treating steel or iron parts of automobiles to which paint coatings, particularly enamels, are generally applied. Great difficulty has been met with, hitherto, in producing on such parts at low cost enamel coatings of satisfactory durability. Various treatments have been suggested designed to produce on the iron surface a rust-proof coating of iron and/or other phosphates as by the process known as "Parkerizing" or by the use of mixtures of cleaning agents including relatively strong solutions of phosphoric acid. The present invention does not contemplate the formation of any material amount of iron phosphate on the surface nor the use of phosphoric acid to act in any way as a cleaning agent for the metal but merely the neutralization of the corrosion-stimulating salts present in the rinsing water. The process is therefore very much less expensive and troublesome than the phosphoric acid treatments hitherto proposed. Nevertheless, it has proven highly effective as a remedy for the difficulties encountered in producing durable paint coatings on surfaces of ferrous metal.

I claim:

1. The process of preparing ferrous metal surfaces for paint coatings comprising cleaning the surface then finally rinsing in ordinary industrial water containing salts tending upon dissociation in solution to promote corrosion of the metal to which has been added phosphoric acid in amount substantially only sufficient to form with the said salts rust-inhibiting phosphates, said amount being between two and twenty-five hundredths of 1%, and then drying the surface.

2. The process of preparing ferrous metal surfaces for paint coatings comprising cleaning the surface, then finally rinsing in water containing salts tending upon dissociation in solution to promote corrosion of the metal to which has been added from two to twenty-five hundredths of one percent of phosphoric acid, and then drying the surface.

3. The process of preparing ferrous metal surfaces for reception of paint coatings comprising cleaning the surface with agents not leaving phosphoric acid on the surface, then finally rinsing with wash water containing salts tending upon dissociation in solution to stimulate formation of rust to which has been added phosphoric acid in amount between two and twenty-five hundredths of one percent, the quantity of such salts being sufficiently low so that the said addition will convert them into rust-inhibiting phosphates.

In testimony whereof I affix my signature.

HARRY C. MOUGEY.