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COMPOSITION FOR TREATING METALS

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My invention relates to the treatment of metals, and more particularly has reference to a novel composition and method for removing and preventing rust and like formations on metal surfaces.

It is an object of my invention to provide a composition and method for the removal and prevention of rust, dirt, scale, and other formations on the surfaces of metals.

A further object of my invention resides in the provision of a composition which is not only adapted to remove rust from corroded metal surfaces, but which also creates an impervious protective coating thereon to thereby prevent the further formation of rust and the like on uncorroded metals or on metals which have previously been treated for the removal of rust.

It is a still further object of my invention to provide a process for producing on metal surfaces a protective coating which is impervious to water or moisture to thereby inhibit the formation of rust.

Still another object of my invention resides in the provision of a rust remover and preventative which is viscous and possesses adhesive properties whereby the same may be applied without difficulty to vertically positioned metal surfaces.

Still another object of my invention is to provide in a rust remover and preventative a sizing for metal surfaces previous to the application of paint.

Other objects of the present invention not at this time more particularly enumerated, will appear from the hereinafter detailed description of my novel composition and process.

It has long been known that phosphoric acid acts on iron and iron rust to form insoluble iron phosphate which is finely divided and naturally settles over the surface treated. According to my invention the insoluble iron phosphate may be bound to the surface treated by the addition of a binder. In order that the metal surface treated shall not be attacked by elements of the atmosphere, particularly moisture, and thereby rust further, the binder should preferably be a water insoluble material.

I have found that casein, a water insoluble protein, may be associated with phosphoric acid or other metal etching acid or compound to act as a binder, to effect the formation of an impervious coating on metal surfaces, and to function as a sizing on metal surfaces which are to be given an application of paint.

It will be understood, of course, that the invention is not limited to the use of casein as other water insoluble binders may be effectively employed. However, casein is quite low in cost and is therefore preferred over more expensive water insoluble materials. Also, although it is preferred to employ phosphoric acid in the composition and method, other metal etching acids may be employed, such for example, as hydrochloric, sulphuric, etc. Although the composition and method find special application in the removal and prevention of rust on iron, steel, and other ferrous metal surfaces, the invention may well be applied to the treatment of non-ferrous metal surfaces for removal and prevention of dirt, scale, corrosion, etc.

Aside from commercial economy, the use of casein in the preparation has certain advantages over other water insoluble binders, especially where the treated metal surface is to be given an application of cold water paints. The casein reacts with the lime content of cold water paints to form calcium caseinate which is even more insoluble in water than casein. In addition to acting as a binder, the insoluble calcium caseinate, by virtue of its high degree of insolubility, enhances the imperviousness of the protective coating. Or the insoluble calcium caseinate may be otherwise formed on the treated metal surface to better insure the impervi-

ousness of the protective coating. For example, after the acid-casein mixture has been applied to the metal surface, the same may be given an application of slaked lime (calcium hydroxide) in a manner similar to a white wash, thus producing the insoluble calcium caseinate, or if it is desired to apply a calcium compound in water solution, calcium chloride may be used to form the insoluble caseinate. Likewise insoluble caseinates other than the calcium caseinate may be formed on the treated surface. The caseinates of barium, strontium, and magnesium are other examples of insoluble caseinates, and therefore the hydroxides or salts of these metals may be applied to the treated metal surfaces to form insoluble caseinates. It will be understood, of course, that the formation of insoluble caseinates is not essential as the casein itself forms a sufficiently impervious coating for ordinary purposes. However, the production of an insoluble caseinate on the treated metal surface increases the imperviousness of the coating, and this may be brought about by the application to the treated metal surface of a compound of any element which forms an insoluble caseinate.

It is known that the action of phosphoric acid on iron and rust is accelerated or catalyzed by the presence of a soluble phosphate. If casein is employed in the preparation, any soluble phosphate, such as sodium phosphate, potassium phosphate, etc., may be added to the preparation and by virtue thereof the operating time for the phosphoric acid to act on the metal is shortened, especially where the metal is treated in a dipping bath. However, instead of adding to the casein-phosphoric acid mixture a soluble phosphate from an extraneous source, it is preferable to employ casein glue in the preparation in lieu of casein. Most casein glues as found on the market contain sodium hydroxide in addition to the casein and, due to the amphoteric nature of the latter, the sodium hydroxide and casein react to form some sodium caseinate in the mixture. When this substance is added to phosphoric acid, sodium phosphate is formed thus producing in the mixture a soluble phosphate which, as explained, acts as an accelerator or catalyzer for the rust removing action. It will be understood then that if casein is employed in the preparation, any soluble phosphate may be added to act as an accelerator or catalyzer, but if casein glue is employed, such addition is unnecessary as a soluble phosphate is formed without the addition of one from an outside source. Therefore, where quicker action is desired, it is preferable to employ casein glue in the preparation instead of casein, but if casein is employed a soluble phosphate may be added if it is desired to hasten the reaction.

Although the invention is no wise limited to the proportions of acid and casein or other insoluble binder, I have found that the following proportions are most desirable:

	Per cent
Pure phosphoric acid by weight	42½
Water by weight	56
Casein by weight	1½

If commercial phosphoric acid is employed in place of the pure acid, the preferred proportions will be as follows:

	Per cent
Commercial phosphoric acid by weight	85
Water by weight	13½
Casein by weight	1½

The ingredients of the preparation may be incorporated in any manner, but I prefer to first mix the acid with the proper proportion of cold water, heat to about 100° C., and add the casein slowly during the heating while mixing.

It will be evident that my novel composition may be applied to metal surfaces in various ways, for example, by spraying, brushing, dipping, etc. Inasmuch as the preparation is rendered viscous and adhesive by virtue of its casein content, when applied to vertical surfaces it does not run off before the acid has had time to react. It will be found that the preparation acts quickly on the metal surface and the surface may be wiped clean of the composition and its reaction products to give a clean uncorroded surface. If it is desired to produce an impervious coating on the metal to thereby prevent further rust formation, the first application of the preparation may be allowed to dry on the metal or the first application may be removed with its reaction products and the surface then given a second application and allowed to dry. The coating will be found to be impervious to moisture and water due to the fact that the casein is insoluble in water so that further rust formation is prevented. The casein also binds the particles of insoluble iron phosphate tenaciously to the surface and forms a sizing for a subsequent application of paint if the surface is to be painted. As explained above, this protective coating is sufficiently impervious for ordinary purposes but the imperviousness may be increased, if desired, by the application of cold water paints, lime, calcium chloride, other calcium compounds, or compounds of barium, strontium, magnesium, etc., to form insoluble caseinates.

This may readily be done by the application of the insoluble caseinate former subsequent to the rust removal or preventative treatment. The application may be made either before or after the complete drying of the coating. The reaction time is, however, less when the caseinate former is applied before the coating has dried.

As already explained, a soluble phosphate may be added to the preparation to accelerate the action of the etching acid, especially in dipping baths, or instead of casein there may be employed casein glue which will produce in the mixture soluble sodium phosphate.

Although I have described my invention with considerable particularity, it will be understood that various changes and modifications may be made therein without departing from the spirit and scope of the invention as defined in the appended claim. For example, the invention is not limited to the use of casein or casein glue as other water insoluble binders may be employed. Likewise metal etching acids other than phosphoric may be used and the invention may be applied to the treatment of metals other than iron and steel. Also the invention is not limited to the specific proportions of ingredients herein described, nor to the details of operation.

Having described my invention, I claim:

A compound for treating metal surfaces comprising 42½% by weight of pure phosphoric acid, 56% by weight of water, and 1½% by weight of casein.

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