The present invention relates to improvements in cleaning metallic surfaces and protecting them from rusting, particularly those of articles of ferrous metals and consists in novel cleaning solutions containing phosphoric acid as the rust removing and preventive agent and oil sulfonation products, which facilitate the action of the phosphoric acid on the metal surfaces.

As is well known, aqueous phosphoric acid has the property of dissolving rust, scale and other mineral incrustations found on the surfaces of metallic articles when they have passed through the ordinary fabricating operations prior to painting or otherwise finishing them; co-incidently with such dissolving of rust, etc., the phosphoric acid attacks, to a slight extent, the metal itself to form a beneficial film of metal phosphate which protects the metal from further rust or otherwise being attacked by moist atmosphere. Such a protecting phosphate film however, does not form wherever the metal surface has come in contact with grease, oil or shows marks, such spots being liable to rust after the phosphoric acid treatment and at the same time paints and other coatings do not adhere well to such incompletely protected spots.

I have found that oil sulfonation products act on the oily or greasy spots of the metal surface cleaning them, whereby they become amenable to the action of phosphoric acid, which then forms a continuous protecting film over the whole surface. Such sulfonated oils on the other hand, do not interfere with the removal of rust, oxide, scale, etc., and do not prevent the attack of the metal by the phosphoric acid to produce the phosphate film.

The organic products which I have found useful for this purpose are the sulfonation products of animal and vegetable oils which are the glycerids of high molecular fatty acids. Physically, these products are characterized by being water soluble and generally liquid at ordinary temperatures.

While readily soluble in water, such sulfonation products are less soluble in a phosphoric acid solution of the concentrations usually employed for cleaning and rust preventing purposes. Therefore, can emulsify these sulfonation products with the phosphoric acid solution and use such emulsions which are easily applied to the metallic surfaces and removed by washing with water.

It is, however, more convenient to add to the mixture a water soluble common solvent for aqueous phosphoric acid and the sulfonated oil in amounts sufficient to produce a homogeneous solution. Methyl alcohol, ethyl alcohol, acetone, etc., are convenient solvents for the production of a homogeneous solution of phosphoric acid and a sulfonated oil in water.

The exact amounts of sulfonated oil which can be incorporated in this manner in aqueous phosphoric acid and will produce an efficient cleaning and rust preventive solution, is not particularly critical and amounts of from 1 to 5% of the solution have given excellent results.

I have, for instance prepared a base solution of 1 volume 85% phosphoric acid, 1 volume denatured alcohol or other similar solvent, 1.5 volumes of warm water, to which I added from 1 to 5% of one of the following sulfonation products: sulfonated castor oil, sulfonated corn oil, sulfonated cotton seed oil, sulfonated fish oil, sulfonated olive oil, sodium salt of sulfonated corn oil, sodium salt of sulfonated cotton seed oil, ammonium salt of sulfonated cotton seed oil, etc.

Pieces of sheet iron slightly rusted and coated with oil were immersed in such solutions; they were readily wet, the rust thereon dissolved quickly and left a rust preventing film of phosphate on and completely covering the metal.

It will be understood that when using the salts of the sulfonated oils, such as mentioned above, the free sulfonic acids will be formed in the phosphoric acid solutions and for this reason the salts will be the full equivalents of the sulfonic acids themselves.

1. A metal cleaning and rust preventing solution comprising aqueous phosphoric acid, a sulfonated vegetable oil and ethyl alcohol.
2. A metal cleaning and rust preventing solution comprising 1 volume of 85% phosphoric acid, 1 volume of denatured alcohol, 1.5 volumes of water and from 1 to 5% of the total of a sulfonated vegetable oil.
3. A metal cleaning and rust preventing solution comprising aqueous phosphoric acid, a sulfonated animal oil and ethyl alcohol.
4. A metal cleaning and rust preventing solution comprising aqueous phosphoric acid and a sulfonated glycerid of a high molecular fatty acid.
5. A metal cleaning and rust preventing solution comprising aqueous phosphoric acid and a sulfonated glycerid of a high molecular fatty acid and a water soluble, common solvent for phosphoric acid and said sulfonated acid.

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