UNITED STATES PATENT OFFICE.

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METHOD OF PREVENTING STEEL FROM RUSTING.

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To all whom it may concern:

Be it known that I, JAMES H. GRAVELL, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented a certain new and useful Method of Preventing Steel from Rusting, of which the following is a specification.

This invention relates to preventing steel from rusting, and its objects are to provide a simple and satisfactory method of treating iron and steel for that purpose; a comparatively inexpensive compound suitable for use in the process, and a steel or iron product that will remain free from rust.

One of the known methods of treating steel to prevent it from rusting consists in subjecting the steel to the action of phosphoric acid and then painting it, the phosphoric acid neutralizes, destroys or removes substances such as soldering fluid, perspiration from the hands, etc. That method is to a great extent satisfactory, but requires considerable skill in its operation owing to the fact that the syrupy phosphoric acid used is a liquid and consequently care must be exercised in removing all this liquid before the paint is applied; otherwise the liquid acid prevents the paint from adhering satisfactorily to the surface.

I have discovered that oxalic acid may be substituted, in whole or in part, for phosphoric acid with very beneficial results, owing to the fact that oxalic acid is a dry substance and does not remain in the liquid state like phosphoric acid, yet has the desirable property of removing, changing or neutralizing the above named substances which cause steel to rust.

In carrying out the process of this invention, I make a saturated solution of oxalic acid and water and apply this to the steel, allowing it to remain on the steel for about five minutes. I then wipe the steel dry with a cloth or allow it to air dry and then paint the steel. When the coat of paint is dry the steel remains rust-proof for a very long period and remains free from rust even after the paint seems to have been entirely destroyed by the atmosphere. The process affords a very cheap and easily practised method of making steel and iron rust-proof, and it entirely prevents the formation of rust under the paint which is the chief difficulty in trying to rust-proof iron and steel by painting.

If the process is carried out as I have just described, there is some crystallization of the oxalic acid on the surface of the steel which although it does not interfere with the rust-proofing, is an objectionable feature in some fine painting work where the surface must be absolutely smooth, and it is especially unsuitable when only one coat of thin lacquer, paint, varnish or enamel is used, as the roughness due to the crystallization of the oxalic acid shows through the finish. In order to overcome this disadvantage, I wash the steel with water after treating it with the oxalic acid thus removing the oxalic acid, but it should be noted that this water treatment does not remove the beneficial effect of the oxalic acid on the steel.

Commercial steel or iron often has a thin coating of oil in order to prevent it from rusting and I have found that in such cases the above described material, that is, oxalic acid and water, will not wet the surface of the steel and therefore does not produce the desired results, but if alcohol is substituted, in whole or in part, for the water in making up my solution I secure a liquid which has all the desirable qualities of the oxalic acid and water with the additional advantage that it will wet and act on a metal which is oily. I have found that considerable water can be added to the alcohol solution of oxalic acid without destroying the oil penetrating properties. I have found a very satisfactory solution for treating oily steel to consist of a saturated solution of oxalic acid and water to which is added one-third of its volume of alcohol.

Steel treated according to my method, as above described, must of course be painted as soon as the metal has been properly treated; otherwise the metal is apt to rust.

In order to prevent this rusting of the metal, so that it can remain for a longer period indoors without painting, I add a small amount of phosphoric acid to the oxalic acid liquid. An admixture containing the following ingredients will be satisfactory, although the quantity may be varied to a great extent.

Oxalic acid	4 pounds.
Water	8 gallons.
Alcohol	3 gallons.
Phosphoric acid (85% solution)	1 gallon.

I use this oxalic acid admixture containing the phosphoric acid in the same way as

I do the aqueous solution of oxalic acid, but it is noted that this admixture is of advantage where the metal is oily and where it is not to be painted at once, as the alcohol in it allows it to wet the oily surface and the phosphoric acid content prevents rusting until the metal is painted or otherwise protected from the weather.

From the foregoing description it is evident, and it is a fact, that metal is subjected to the corrosive action of a solution of oxalic acid at a temperature insufficient to decompose the latter.

As this invention is of a chemical nature it is evident to those skilled in the art that similar chemicals may be substituted without otherwise changing the action of my admixture and I do not desire to limit myself to those specific ingredients as it is evident that chemical equivalents may be substituted.

I claim:

1. The method of preparing iron or steel articles just previous to painting, which consists in subjecting them to the corrosive action of a solution of oxalic acid at a temperature insufficient to decompose the latter.

2. The method of preparing iron and steel for painting which consists in subjecting it to the action of a solution of oxalic acid in alcohol.

3. The method of preparing iron and steel for painting which consists in subjecting it to the action of a solution of oxalic acid and phosphoric acid in alcohol.

4. The method of preparing iron and steel for painting which consists in subjecting it to the action of a solution of oxalic acid and phosphoric acid in alcohol and water.

5. An admixture for preparing iron and steel for painting consisting of oxalic acid and alcohol.

6. An admixture for preparing iron and steel for painting consisting of oxalic acid, alcohol and phosphoric acid.

7. An admixture for preparing iron and steel for painting consisting of oxalic acid, water, alcohol and phosphoric acid.

JAMES H. GRAVELL.