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METHOD OF TREATING THE SURFACES OF COLD-WORKED IRON CHROMIUM ALLOYS.

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To all whom it may concern:

Be it known that I, OTHO M. OTTE, a citizen of the United States, and a resident of Tarentum, in the county of Allegheny and the State of Pennsylvania, have made a new and useful invention in Methods of Treating the Surfaces of Cold-Worked Iron Chromium Alloys, of which the following is a specification.

This invention relates to chromium iron alloys and more particularly to those alloys known as "stainless iron" and "stainless steel." In such alloys, the chromium content may vary between 8% and 60% and the carbon content may vary depending upon the particular use to which articles made from the alloy are to be put. The alloy may contain silicon and other metalloids.

In one alloy with which I have had experience, the chromium content is approximately 12% and the carbon is approximately .12%. This alloy, when annealed, is suitable for the manufacture of articles such as pump shafts, valve stems, bolts, nuts, screws, pole line hardware and various other machined articles. In making such articles, the metal is worked cold and by this I mean machining operations such as the cutting or grinding of threads and other surfaces.

It has been found that when such material is worked cold, the surface is physically distorted and does not resist corrosion to the desired and necessary degree, unless it is polished. The polishing of such alloys is difficult and expensive and in many cases, practically impossible.

I have discovered that if the physically distorted surfaces of articles made from iron chromium alloys having a chromium content between 8% and 60% are treated with a nitric acid solution, their resistance to corrosion is greatly increased. Alloys containing between 9% and 16% of chromium with carbon under 1% have their resistance to corrosion increased to a marked degree by immersing them in a hot nitric acid solution of between 12% and 15% and the resistance is increased even though the article has not been hardened, tempered and polished.

The surface of articles made from such alloys in the annealed condition even though the surface has been physically distorted by cold working, can be made more resistant to corrosion than are the surfaces of hardened and tempered articles given a commercial polish.

I am aware that such articles as sheets and plates composed of such alloys have been pickled to remove scale and that in such pickling, nitric acid solutions have been used. So far as I am aware, however, no one has discovered how to increase the resistance to corrosion of surfaces that have been physically distorted by cold working except by polishing such surfaces.

My discovery provides a simple and cheap method of rendering such surfaces highly resistant to corrosion.

The method may be carried out by merely immersing the machined articles composed of such alloys in a bath of hot nitric acid for a few minutes and such bath will preferably be a 12% to 15% solution.

In some way not definitely understood by me, this treatment increases the resistance to corrosion of these physically distorted surfaces and it may be that the acid attacks the iron content of the surface that is uncombined with the chromium. Nevertheless, the fact remains that such treatment is effective.

Having thus described my invention, what I claim is:—

1. The method of increasing the resistance to corrosion of articles formed cold from chromium iron alloys, which consists in treating the surfaces of such articles with a solution of nitric acid.

2. The method of increasing the resistance to corrosion of the machined surfaces of articles formed from chromium iron alloys, which consists in treating such surfaces with a solution of nitric acid.

3. The method of increasing the resistance to corrosion of machined surfaces of articles formed from chromium iron alloys having a chormium content of between 8% and 60%, which consists in immersing such articles in a solution of nitric acid.

4. The method of increasing the resistance to corrosion of articles formed cold from iron alloys having a chromium content of between 8% and 60%, which consists in

treating the surfaces of such articles with a solution of nitric acid.

5. The method of increasing the resistance to corrosion of articles formed cold from chromium iron alloys having a chromium content between 8% and 60%, which consists in immersing such articles in a hot solution of nitric acid of approximately 12% or 15%.

In testimony whereof, I have hereunto subscribed my name this 22nd day of December, 1924.

OTHO M. OTTE.