Patented Dec. 12, 1933

1,939,241

UNITED STATES PATENT OFFICE

1,939,241

PICKLING STAINLESS STEEL

Maurice Taylor, Stoneham, Mass., assignor to Merrimac Chemical Co., Everett, Mass., a corporation of Massachusetts

No Drawing. Application March 8, 1933. Serial No. 660,037

3 Claims. (Cl. 148—8)

This invention relates to the pickling of metal as practiced in the fabrication of metal articles and it has particular application to the pickling of the so-called stainless steels which are essentially nickel-chromium-iron alloys whereby a brilliant finish is obtained.

It is common practice to remove the scale from ferruginous articles by dipping them in a dilute solution of mineral acids such as sulphuric acid or hydrochloric acid. While this practice gives satisfactory results in the case of ordinary steel and iron objects, the results are not satisfactory in the case of alloys which are relatively more resistant to the attack of such mineral acids. Thus, for example, in the case of stainless steels the ordinary pickling bath is capable of removing the oxide scale but the resulting article has a dull and otherwise unsatisfactory finish necessitating polishing operations in order to obtain the desired luster. Even when stainless steel is dipped into a mixture of hydrochloric and nitric acids the product obtained has an unsatisfactory dull greenish finish.

I have now found that mixtures of nitric, hydrochloric and acetic acids give inordinately good finishes to stainless steel when used in the usual manner for pickling steel objects. The relative proportions of these acids is important it having been found that many mixtures of these same acids are productive of inferior results. A range within which I have been able to obtain very satisfactory results comprises:

40–50% acetic acid, 100%, CH_3COOH
10–15% nitric acid, 100%, HNO_3
4–8% hydrochloric acid, 100%, HCl
46–27% water.

The temperature and time of treatment may be varied according to the condition and nature of the article to be pickled as well as the concentration of the bath utilized for this purpose. Temperatures between 60° and 80° C. and durations of pickling of from one-half to five minutes have been found to give good results. I have also found that the best results are obtained if stainless steel which has been heat treated, is first pickled in the conventional type of pickling bath to remove the heat treatment scale. Thereafter the article is washed and dipped into the acetic-nitric-hydrochloric bath to give the desired luster and finish to the product.

The following examples will serve to illustrate specific embodiments of my invention. It is to be noted that these are exemplary only.

Example 1.—A heat treated stainless steel is first dipped into a 5% sulphuric acid pickling bath for from 12 to 18 minutes, which bath is maintained at about 80° C. This treatment enables one to remove the scale which results from the heat treatment. Obviously, the concentration, temperature and time of treatment will vary according to the condition of the article. Thereafter the article is drained or washed of sulphuric acid and dipped into a composition containing:

40% acetic acid, 100%, CH_3COOH
10% nitric acid, 100%, HNO_3
4% hydrochloric acid 100% HCl

the temperature of said composition being maintained at approximately 80° C. and the time of treatment extending for approximately one minute.

Example 2.—A stainless steel article which has been treated to remove the scale as described in Example 1, is dipped into a bath containing:

50% acetic acid, 100%, CH_3COOH
15% nitric acid, 100%, HNO_3
8% hydrochloric acid, 100%, HCl

The temperature of the bath is maintained at 60° C. and the time of immersion extended over a period of approximately 5 minutes.

Products obtained as a result of these treatments will, after washing and drying in the usual manner, be found to have a bright, satiny, silvery appearance that requires little if any polishing.

While the specific limitations set forth herein have been found to produce the desired results and it has been found that sulphuric acid may be added or substituted in part for the acetic acid, a wide variation from the range indicated has been found to be detrimental to the efficacy of the treatment. It is to be understood that a minor variation from the limits herein set forth may be countenanced without affecting seriously the quality of the steel product. It is likewise to be understood that although specific temperatures have been set forth and the time required

for the treatment has been indicated, these factors vary according to the nature of the goods being treated, the degree of luster to be imparted, as well as other factors.

What I claim is:

1. The method of pickling stainless steel which comprises subjecting it to the action of an acid mixture containing substantially the following ratio of acetic, nitric and hydrochloric acids:

40–50% acetic acid, 100%, CH_3COOH
10–15% nitric acid, 100%, HNO_3
4–8% hydrochloric acid, 100%, HCl

2. A pickling bath for stainless steel containing substantially the following ratio of ingredients:

40–50% acetic acid, 100%, CH_3COOH
10-15% nitric acid, 100%, HNO_3
4–8% hydrochloric acid, 100%, HCl
46–27% water.

3. The method as defined in claim 1 and further characterized in that the composition of the bath is substantially as follows:

50% acetic acid, 100%, CH_3COOH
15% nitric acid, 100%, HNO_3
8% hydrochloric acid, 100% HCl
27% water.

MAURICE TAYLOR.