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PICKLING OF STAINLESS STEEL

No Drawing.

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This invention relates in general to the pickling or cleaning of metals and has reference more particularly to the pickling or cleaning of alloys of the type commonly designated "stainless steel".

In the pickling of stainless steel sheets, for example, it has heretofore been the practice to immerse the sheets in a pickling solution such, for example, as the so-called "Krupp solution" which usually contains about 50% hydrochloric acid and about 10% nitric acid, sulphuric acid being sometimes included in addition to these acids.

The use of pickling solutions of this type is open to many objections, such as their relatively high cost, annoyance and danger to the workmen from poisonous gases and fumes which are expelled from the pickling bath, attack and dissolution of the virgin or base metal resulting in a loss thereof amounting to 3% or 4%, decided pitting or over etching of the surfaces of the metal, lack of uniformity and control of the pickling action, etc.

My invention has for its primary object the elimination of the aforesaid difficulties and disadvantages and the provision of a method of and solutions for cleaning or pickling stainless steel sheets, the use of which will materially lower the cost of pickling and result in uniform pickling, characterized by the fact that the surfaces of the virgin or base metal are not appreciably attacked or pitted and by the fact that obnoxious and harmful gases and fumes are not expelled from the pickling solutions, thereby avoiding detrimental effects to the workmen.

My pickling solution contains an alkali metal nitrate, such as sodium or potassium nitrate in an amount varying from about .2% to about 40% by weight of the solution, a mineral acid, such as sulphuric or nitric acid and in an amount varying from .2% to about 40% by weight of the solution, and water sufficient in amount to make up the balance of the solution. The solution preferably contains about 1% to about 5% of sodium or potassium nitrate and about 1% to about 5% of sulphuric or nitric acid.

The temperature of the pickling bath is preferably not less than 100° F., but may be

as high as the boiling point of the solution. A temperature of about 180° F. is found to be particularly satisfactory. The sheets of stainless steel are immersed in this bath until the scale is removed or softened to a point where it may be easily removed by scrubbing.

The cleaning or pickling action of the bath is believed to be dependent upon the liberation of nitric acid in statu nascendi from the nitrate salt by the action of the sulphuric or nitric acid thereon. This action apparently results in a softening of the scale on the metal which permits it to fall away from the base metal or to be easily removed by a light scrubbing action.

Since hydrogen is not generated in the pickling bath to an appreciable degree, the pickled sheets are not attacked thereby and are therefore free from "hydrogen brittleness".

While I have mentioned sodium and potassium nitrates as salts which may be used in my pickling bath or solution, and sulphuric and nitric acids as mineral acids which may be employed therein, it will be understood that other alkali metal nitrates may be employed as a source of nascent nitric acid and that mineral acids other than sulphuric and nitric acids may be employed to liberate the nascent nitric acid without departing from the spirit of the invention, the scope of which is defined in the appended claims. Moreover, while I have described my invention as particularly adapted for the treatment of stainless steel, it will be understood that it may also be effectively employed for the pickling or cleaning of ordinary iron and steel.

Claims:

1. The method of removing the scale from stainless steel alloys which consists in treating the alloys with a solution containing a mineral acid and an alkali metal nitrate.

2. The method of removing the scale from stainless steel alloys which consists in treating the alloys with a solution containing from about .2% to about 40% of a mineral acid and from about .2% to about 40% of an alkali metal nitrate.

3. The method of removing the scale from stainless steel alloys which consists in treat-

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ing the alloys with a solution containing from about 1% to about 5% of a mineral acid and from about 1% to about 5% of an alkali metal nitrate.

4. The method of removing the scale from stainless steel alloys which consists in treating the alloys with a solution containing sulphuric acid and sodium nitrate.

5. The method of removing the scale from stainless steel alloys which consists in treating the alloys with a solution containing from about .2% to about 40% of sulphuric acid and from about .2% to about 40% of sodium nitrate.

6. The method of removing the scale from stainless steel alloys which consists in treating the alloys with a solution containing from about 1% to about 5% of sulphuric acid and from about 1% to about 5% of sodium nitrate.

7. A solution for removing the scale from stainless steel alloys containing a mineral acid and an alkali metal nitrate.

8. A solution for removing the scale from stainless steel alloys containing from about .2% to about 40% of a mineral acid and from about .2% to about 40% of an alkali metal nitrate.

9. A solution for removing the scale from stainless steel alloys containing from about 1% to about 5% of a mineral acid and from about 1% to about 5% of an alkali metal nitrate.

10. A solution for removing the scale from stainless steel alloys containing sulphuric acid and sodium nitrate.

11. A solution for removing the scale from stainless steel alloys containing from about .2% to about 40% of sulphuric acid and from about .2% to about 40% of sodium nitrate.

12. A solution for removing the scale from stainless steel alloys containing from about 1% to about 5% of sulphuric acid and from about 1% to about 5% of sodium nitrate.

In testimony whereof I affix my signature.
NATHAN H. SCHERMER.

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