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PICKLING OF METALS, ETC.

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This invention relates to the pickling and cleaning of metals, and particularly to the pickling of iron and steel, to remove scale therefrom, although the invention is of more or less general application to the cleaning and pickling of metals such as iron and steel for the removal of oxides or scale therefrom.

The pickling or cleaning of iron or steel is commonly effected by means of acid pickling or cleaning baths which remove the scale or oxide from the metal. The pickling baths commonly employed are acid baths which often attack the metal as well as the scale. This action on the metal is undesirable and objectionable, involving not only excessive consumption of acids, but also corrosion or dissolving of metal and tending to give a rough or pitted surface.

The present invention provides an improved bath for cleaning or pickling metals and also an improved process of pickling or cleaning the metal in which the acid pickling bath has incorporated therein a small amount of hexamethylenetetramine.

I have found that the addition of a small amount of hexamethylenetetramine prevents or retards or inhibits the attack of the acid pickling bath on the metal without interfering with the removal of scale or oxide by the acid bath.

The acid pickling baths with which hexamethylenetetramine is used may be acid baths such as are commonly employed for pickling or cleaning iron and steel, containing, for example, about ten percent of sulfuric acid. Such baths are gradually impoverished by the action of the acid in removing the scale or rust and their content of ferrous sulfate increases until the bath becomes too weak or too concentrated in ferrous sulfate for further use. Instead of using sulfuric acid baths, other acid baths can be used, including acid sulfate baths.

The amount of hexamethylenetetramine added to the bath for carrying out the pickling or cleaning operation can be varied. In general, only a small amount of hexamethylenetetramine is required, for example, a small fraction of one percent. From two to five pounds of hexamethylenetetramine for each ton of 60 degree acid used in the pickling bath has been found to give satisfactory results.

The carrying out of the pickling or cleaning operation may be the same as in ordinary practice. For example, the pickling can be carried out continuously by passing the material to be pickled, such as wire or sheets, through a number of baths in a regulated manner; or by immersing the article to be pickled in the pickling bath for a suitable period of time. The temperature of the bath can be varied, ordinarily being around 150° to 180° F. The pickling bath may be replenished by the addition of further amounts of acid until the iron sulfate reaches too great a concentration.

The addition of the hexamethylenetetramine to the bath prevents or retards or inhibits the action of the acid bath on the metal without interfering with the removal of scale or oxide. The formation of hydrogen by the action of the acid bath on the metal is also reduced and the evolution of acid mist or fumes also greatly reduced. There is also a saving in the acid as well as a protection of the metal. The reduced amount of action of the acid on the metal and the reduction in amount of hydrogen produced correspondingly reduces the amount of hydrogen absorbed by the metal.

The employment of the hexamethylenetetramine in the pickling or cleaning operation, according to the present invention, involves but small additional expense and results in advantages in operation, economy of acid, protection of the metal from attack, etc., which materially improve the pickling and cleaning operation.

I claim:

1. The method of cleaning or pickling metals which comprises subjecting the same to a non-oxidizing mineral acid pickling or cleaning bath and inhibiting the chemical action of the acid on the metal without interfering with the removal of scale or oxide, and thereby reducing the formation of hydrogen and the production of acid fumes and effecting an economy in the acid consumed, by incorporating in the acid bath a small amount of hexamethylenetetramine.

2. The method of pickling or cleaning iron or steel which comprises subjecting the same to a sulfuric acid pickling bath and inhibiting the chemical action of the acid on the metal without interfering with the removal of scale or oxide, and thereby reducing the formation of hydrogen and the production of acid fumes and effecting an economy in the acid consumed, by incorporating in the acid bath a

small fraction of one percent of hexamethylenetetramine.

3. The method of pickling or cleaning iron or steel which comprises subjecting the same at a temperature of between 150–180° F. to a sulfuric acid pickling bath and inhibiting the chemical action of the acid on the metal without interfering with the removal of scale or oxide, and thereby reducing the formation of hydrogen and the production of acid fumes and effecting an economy in the acid consumed, by incorporating in the acid bath a small fraction of one percent of hexamethylenetetramine.

4. The method of cleaning or pickling metals which comprises subjecting the same to a sulfuric acid pickling or cleaning bath and inhibiting the chemical action of the acid on the metal without interfering with the removal of scale or oxide, and thereby reducing the formation of hydrogen and the production of acid fumes and effecting an economy in the acid consumed, by incorporating in the acid bath hexamethylenetetramine in the proportion of from two to five pounds of hexamethylenetetramine to each ton of 60 degree Baumé sulfuric acid.

5. A non-oxidizing mineral acid bath for cleaning or pickling metals which contains a small amount of hexamethylenetetramine as an inhibitor.

6. A non-oxidizing mineral acid bath for cleaning or pickling iron or steel which contains a fraction of one percent of hexamethylenetetramine as an inhibitor.

7. A bath for cleaning or pickling metals which contains sulfuric acid and a small amount of hexamethylenetetramine as an inhibitor.

8. A bath for pickling or cleaning iron or steel which contains sulfuric acid and a small fraction of one percent of hexamethylenetetramine as an inhibitor.

In testimony whereof I affix my signature.

GEORGE D. CHAMBERLAIN.