

Patented Jan. 2, 1923.

1,440,619

UNITED STATES PATENT OFFICE.

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PROCESS OF CLEANING AND SURFACING SHEET STEEL.

No Drawing.

Application filed July 18, 1921. Serial No. 485,781.

To all whom it may concern:

Be it known that we, SAMUEL M. NOYES and SAMUEL PEACOCK, both citizens of the United States, each residing at Wheeling, in the county of Ohio and State of West Virginia, have invented certain new and useful Improvements in Processes of Cleaning and Surfacing Sheet Steel; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a process of providing sheet steel with a polished surface of ferrite preparatory to coating the same with tin, zinc, enamel, lacquer, etc., and has for its object to provide a method which will be more expeditious and less costly than those heretofore proposed.

With these and other objects in view the invention consists in the novel steps and combinations of steps constituting the process all as will be more fully hereinafter disclosed and particularly pointed out in the claims.

In order that the precise invention may be more clearly understood it is said:—As is well known, sheet steel is made by a rolling process, allowed to cool, and then piled in stacks. These sheets are known to the trade as black sheets. When said sheets are to be coated, as for example with tin, these black sheets are first treated with an acid, or are pickled, to remove the scale. The pickled sheets are next annealed. This is called black annealing. The annealed sheets are then cold rolled for the purpose of imparting to them a smooth surface. The cold rolled sheets are next annealed again because in the cold rolling they are of necessity strain hardened. This last mentioned annealing step is called white annealing. The sheets are next pickled again in acid because a greater or less amount of oxidation takes place during the white annealing step. After this last mentioned pickling step the sheets go direct to the tinning pots or machines where they are coated with tin in the well known manner.

It is also well known that when the plates are subjected to the last mentioned acid treatment a considerable quantity of hydrogen is evolved which is taken up by the iron and renders the surface thereof very brittle. When the plates are later heated by

the coating operation, this hydrogen is given off and blisters are formed. Further, it is well known that the original ingots out of which the sheets are made are not perfectly homogeneous in composition so that when the steel is subjected to rolling processes some portions are very hard and elastic while others may be soft.

The result is that when the sheets are greatly reduced in thickness as they are by the cold rolling process, the hard and elastic portions of the sheets are found to be springy or buckled. This unevenness of the sheets renders the subsequent coating process uncertain and costly.

According to this invention, on the other hand, we overcome not only the above objections but many others that will be later referred to. In carrying out this process we take advantage of the fact that rolled thin steel sheets have their surfaces made up of several compounds of iron, among them cementite Fe_3C and ferrite Fe . This cementite Fe_3C is quite hard and brittle so that it may be readily detached from the surface of the sheet leaving the ferrite or pure iron with a scratched or channeled appearance when viewed with a magnifying glass. Later when the channeled surface of pure iron is subjected to a grinding and a buffing, or polishing action the entire surfaces of the sheets are completely covered with a homogeneous film of pure iron in a highly polished state.

The result is, the later coating with tin, zinc or enamel has a material uniform in composition to adhere to, and it therefore coats said sheets in a manner more efficient and tenacious than has been possible heretofore.

Therefore, in carrying out the present invention we are enabled to omit all treatment with acids, we further avoid the strain hardening objections as well as the white annealing step that is made necessary by the cold rolling. That is to say, we take the original black sheets, anneal the same and without any treatment with acid pass them through any suitable grinding and buffing machine, and from this machine the sheets are passed directly through the coating machine and the process is completed.

This machine mechanically removes the above mentioned cementite crystals which under a magnifying glass will show the surfaces of the sheets to be roughened owing to

the hollows left therein by their removal, and the matrices of which are surrounded by substantially pure iron.

The mechanical removal of the cementite also takes off the scale or iron oxide originally present from the surface of the sheets, while said machine smooths down or spreads over said sheets a thin film of substantially pure iron in a smooth or polished condition thus supplying a film coating of pure iron which offers great resistance to atmospheric oxidation and supplies the above mentioned surface of uniform composition to receive and hold the coating material.

It therefore results that said sheets after passing through said cleaning machine may be carried directly to the coating bath such as tin, zinc, enamel or lacquer composition, with the result that they are coated at less expense and in a much shorter time than has been possible heretofore.

That is to say, it is well known that tin does not readily adhere to cementite, but readily alloys with ferrite so that it will now be clear that by proceeding according to the foregoing disclosure we are enabled not only to produce a more tenacious and thorough coating but to omit several steps of the prior processes together with their attendant costs and consumption of time and labor.

We omit the two pickling steps, we omit the cold rolling step which produces strain

hardening and we omit the subsequent annealing to take out this strain hardening, and of course the subsequent pickling and expense attending the same.

What is claimed is:—

1. The process of cleaning and surfacing sheet steel containing cementite and ferrite in its surface which consists in mechanically removing said cementite leaving channels in the ferrite; and mechanically spreading said ferrite over said surface to fill said channels and inhibit the subsequent oxidation of said surface, substantially as described.

2. The process of cleaning and surfacing sheet steel having a surface coated with scale and containing cementite and ferrite, which consists in subjecting said surface to a grinding action to remove said scale and cementite, leaving channels in the ferrite; then subjecting the channeled surface to a polishing action sufficient to spread said ferrite over said surface, filling said channels and producing an oxidation resisting surface layer, substantially as described.

3. A sheet of steel suitable for coating with other materials having a smooth polished surface devoid of cementite and consisting substantially of ferrite, substantially as described.

In testimony whereof we affix our signatures.

SAMUEL M. NOYES.
SAMUEL PEACOCK.