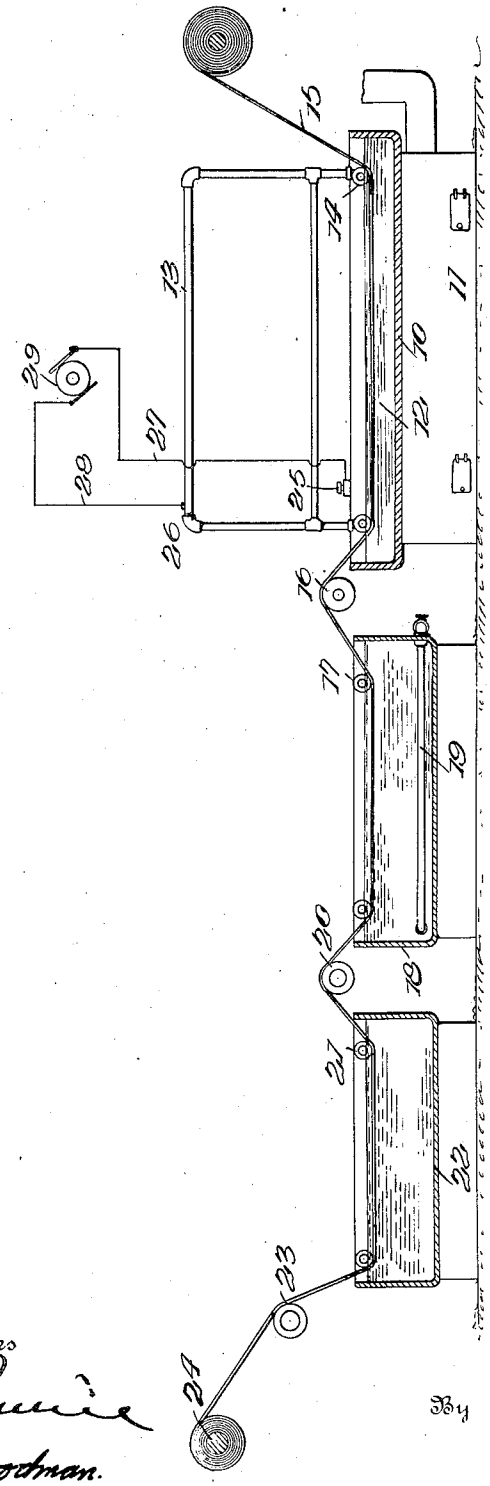
A. A. NELSON.

METHOD FOR CLEANING METALS.

APPLICATION FILED FEB. 25, 1914.

1,114,635. Patented Oct. 20, 1914.



Witnesses

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METHOD FOR CLEANING METALS.

1,114,635. Specification of Letters Patent. Patented Oct. 20, 1914.

Application filed February 25, 1914. Serial No. 820,988.

To all whom it may concern:

Be it known that I, ARON A. NELSON, citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Methods for Cleaning Metals, of which the following is a specification.

My invention relates to a new and improved method of and compound for removing scale, rust, oil or other impurities from iron or steel, the object of my invention being the provision of a method for accomplishing this with any form of article but particularly with sheet metal, wire and screening, the process being such that the cleaning may be continuously carried out and long strips of metal, wire and the like therefore cleaned.

Previous to this time metals have been cleaned by pickling them in an acid bath or by electrolytic action with acid solutions as the electrolyte. These methods, however, have been ojectionable because of the fact that the acid attacks the metal being cleaned and in the case of sulfuric acid, renders the metal more brittle. Moreover, the acid attacks the tank containing it. Because of this eating away of the metal being treated and the tank, the acid solution in a short time becomes so impure as to be useless and must therefore be continually renewed.

A further object of my invention is, therefore, the provision of a method for cleaning iron and steel without the employment of acids of any nature.

A further object of my invention is the provision of a method which will be much more rapid and consequently more economical than any of the acid pickling methods now in use.

In carrying out my invention, the metal being cleaned is passed through an electrolytic bath serving as the cathode. In this connection, a further object of my invention is the employment of an electrolyte of such nature that in a later step in the process it may be recovered as a by-product and again employed as an electrolyte, there being but slight waste for this reason.

In the pickling methods now commonly employed, the cleaning action takes place while the article being cleaned is in the electrolytic bath and such article is then washed in water to remove the acid solution which forms the electrolyte.

One object of my present invention is the provision of a method in which the cleaning of the article takes place not in the electrolytic bath but during the subsequent washing of the metal in water. Because of this, the electrolyte itself does not become contaminated by the impurities which are removed from the metal.

With these and other objects in view, my invention will be more fully described, illustrated in the accompanying drawing, and then specifically pointed out in the claims which are attached to and form a part of this application.

The drawing illustrates, diagrammatically, one simple form of apparatus for carrying out my improved metal cleaning operation, a continuous strip of sheet metal being illustrated as the article being cleaned.

My invention consists primarily in two steps, the metal to be cleaned being first passed through an electrolytic bath formed by the fusion of some salt of one of the alkaline metals, the metal being cleaned forming the cathode during its passage through this bath and as a consequence receiving a thin covering or surface film of the alkaline metal employed. Immediately after its passage from this electrolytic bath, the metal being cleaned is passed through a bath of hot water during which the film of alkaline metal covering it combines with the water with such rapidity or violence as to remove rust, scale, oil or other impurities from the surface of the metal. The metal is then ready, without further treatment, for passage into a galvanizing bath or into a second electrolytic bath arranged to electroplate it.

The alkaline metal employed as the electrolyte is preferably either sodium or potassium, the hydroxid salt being preferred. It will of course be understood, however, that I do not wish to limit myself to any particular salt of any particular alkaline metal, although I usually employ sodium hydroxid.

In the drawing, 10 indicates a container for the electrolytic bath of fused sodium hydroxid, this container being preferably formed of iron and supported over a heater

11 of any suitable type. The metal to be cleaned is passed through a bath of fused sodium hydroxid 12 contained in this container or pan 10 and in case a long strip of sheet metal, screening or wire is being cleaned, the metal is held beneath the surface of the bath by a suitable frame 13 mounted for movement toward and away from the bottom of the pan and provided at its lower ends with spaced rollers 14 extending into the fused sodium hydroxid and beneath which the metal being cleaned. here indicated as a strip of sheet metal 15, passes. Upon leaving this electrolytic bath, the strip of metal passes over an idler roller 16 and then beneath spaced rollers 17 which hold it beneath the surface of the water contained in a second pan 18, this water being maintained at approximately its boiling point in any suitable manner as by a steam coil 19. From this second bath, the strip of metal passes over a second idler roller 20 and then beneath rollers 21 which hold the metal beneath the surface of a third bath contained in a pan 22, from which bath it passes over an idler roller 23 and so to a reel 24. This third bath, in effect, forms no part of my present invention as it is merely a galvanizing bath or, in case the metal is to be electroplated, a second electrolytic bath.

All of the rollers beneath which the metal passes should be adjustably mounted to insure proper submersion of the metal in the various baths. These rollers may be mounted upon a frame such as the frame 13 shown in connection with the electrolytic bath of sodium hydroxid or they may be supported directly by the pans themselves as shown in the other baths. The pan 10 is provided with a binding post 25 and the frame 13 supporting and in electrical connection with the rollers 14 with a second binding post 26. Conductor wires 27 and 28 lead from any suitable source of electric current, such as a generator 29 to the binding post 25 and 26, respectively. It will therefore be seen that the sheet metal, while passing through the sodium hydroxid bath, acts as the cathode, the positive wire being connected to the pan 10.

As a result of the electrolytic action, the sodium hydroxid is ionized, the sodium ions passing to the strip of metal being cleaned and forming a surface film or coating over it. Upon passage of the sodium coated strip of iron or steel being cleaned into the water bath 18, this free metallic sodium combines with the water, the action being very rapid and therefore causing the throwing off of all impurities from the surface of the sheet metal, leaving the metal in proper condition for metallic coating either by passage through a bath of molten metal or by electroplating.

Although the primary advantage of this process over those now in use, as previously pointed out, consists in the fact that no acids are employed, which acids are detrimental to the metal being cleaned and to the pan or receptacle containing the bath, other advantages which accrue are worthy of notice. Chief among these is the fact that the sodium combining with the water in the pan 18 forms sodium hydroxid which may be readily separated from the impurities cast off from the metal being cleaned in any suitable manner as by filtering. This sodium hydroxid solution may then be concentrated and the sodium hydroxid crystallized from the solution. The sodium hydroxid thus recovered may then be again employed in the pan 10, very little loss of the electrolyte being therefore necessary. Furthermore, inasmuch as the actual removal of the foreign matter from the metal being cleaned takes place in the washing pan 18 and not the electrolytic bath, it will be clear that the fused sodium hydroxid remains clean and efficient as long as it lasts.

I find that under ordinary conditions, the metal being cleaned need be immersed in the electrolytic bath for not over thirty seconds to insure thorough removal of all impurities upon its passage into the water bath. It will therefore be clear that the operation is exceptionally rapid as with acid baths, with or without electrolytic action, the metal must be immersed for between a half hour or an hour after which it must be further treated to prepare it for electroplating or other metallic coating.

It will of course be understood that although I have illustrated but one form of apparatus, I do not wish to be limited to the form shown, my invention consisting rather in the employment of fused sodium hydroxid as an electrolyte for cleaning the metal and the subsequent reaction of the deposited sodium with water.

Having thus described the invention, what is claimed as new is:

1. A method of removing scale, rust and the like from iron and steel, which consists in passing an electric current to the iron or steel connected as a cathode in an alkaline electrolyte, and in then submerging the iron or steel in a bath of water.

2. A method of removing scale, rust and the like from iron and steel, which consists in passing an electric current to the iron or steel connected as a cathode in a bath of a fused alkaline metal salt and in then submerging the iron or steel in a bath of water.

3. A method of removing scale, rust and the like from iron and steel, which consists in passing an electric current to the iron or steel connected as a cathode, in a bath of a fused hydroxid salt of an alkaline metal,

and in then submerging the iron or steel in a bath of water.

4. A method of removing scale, rust and the like from iron and steel, which consists in passing an electric current to the iron or steel connected as a cathode in an electrolyte consisting of fused sodium hydroxid, and in then passing the iron or steel through a bath of water.

5. A method of removing scale, rust and the like from iron and steel, which consists in passing the iron or steel through an electrolytic bath of fused sodium hydroxid, an electric current being passed through the bath with the iron or steel as the cathode, and in subsequently passing the iron or steel through a cleansing bath.

6. A method of removing scale, rust and the like from iron and steel, which consists in passing the iron or steel through an electrolytic bath of fused sodium hydroxid, an electric current being passed through the bath with the iron or steel as the cathode, and in subsequently passing the iron or steel through a bath of water.

7. A method of removing scale, rust and the like from iron and steel, which consists in passing the iron or steel through a bath of fused sodium hydroxid forming an electrolyte in an iron container, an electric current being passed through the electrolyte with the container as the anode and the iron or steel as the cathode, and in subsequently subjecting the iron or steel to the action of water.

8. A method of removing scale, rust and the like from iron or steel, which consists in coating the iron or steel with an alkaline metal, and in subjecting the iron or steel so coated to the action of water..

9. A method of removing scale, rust and the like from iron and steel, which consists in first coating the iron or steel with an alkaline metal by electrolysis and in subsequently submitting the iron or steel so coated to the action of water.

10. A method of removing scale, rust and the like from iron and steel, which consists in forming an electrolytic deposit of sodium on the iron or steel and in subjecting the iron or steel to the action of water.

11. A method of removing scale, rust and the like from iron and steel, which consists in exposing the iron or steel to the action of water in the presence of an alkaline metal.

12. A method of removing scale, rust and the like from iron and steel, which consists in exposing the iron or steel to the action of water in the presence of sodium.

13. A method of cleaning metals which consists in exposing the metal to the action of moisture in the presence of an alkaline metal.

14. A method of cleaning metals which consists in forming an electrolytic deposit of an alkaline metal upon the metal to be cleaned and in then removing such deposit by the action of moisture.

In testimony whereof I affix my signature in presence of two witnesses.

ARON A. NELSON. [L. S.]

Witnesses:
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CHAS. A. ROSE.