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METHOD OF AND APPARATUS FOR ELECTROPICKLING METAL

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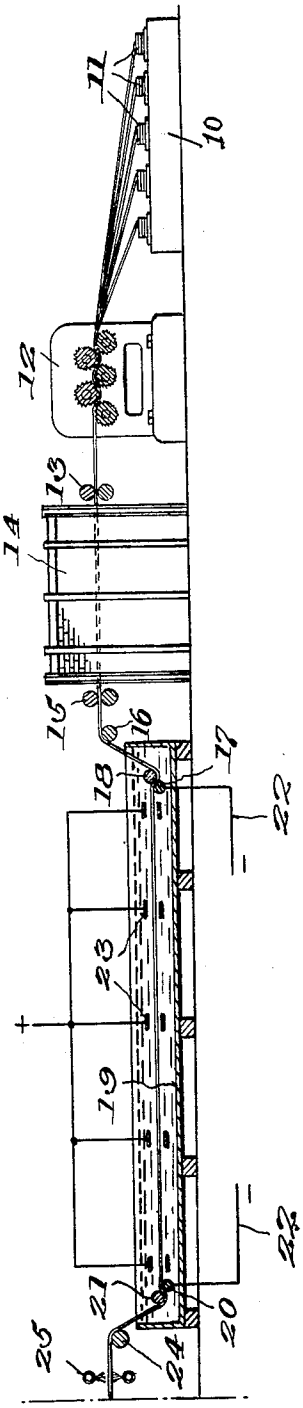

Fig. 1.

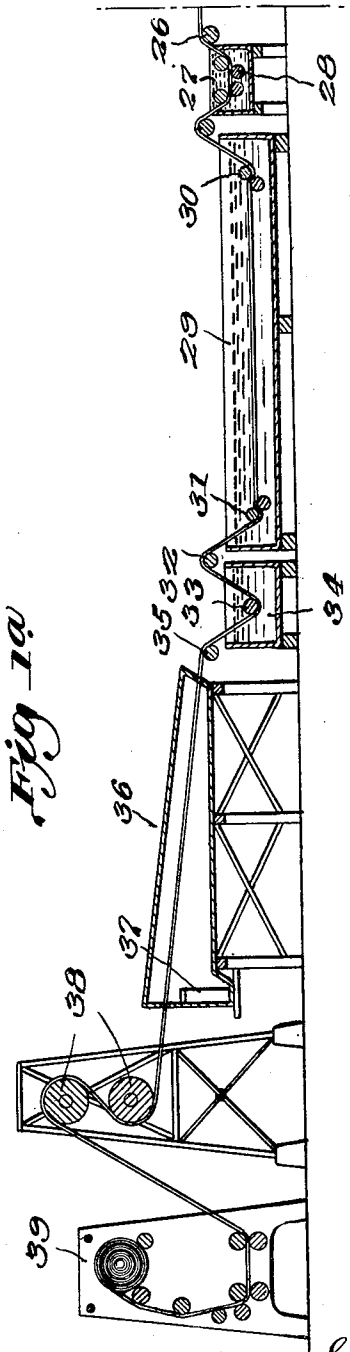

Fig. 1a.

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METHOD OF AND APPARATUS FOR ELECTROPICKLING METAL

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Application May 9, 1930, Serial No. 451,174

1 Claim. (Cl. 204—7)

The invention concerns the removal or "pickling" of the oxidized portions or scale from metal such as steel in flat rolled strips. Our object is to secure a product which has greater resistance from oxidation and be less acid brittle, than metals pickled by other methods in use up to this time, and requires less time for treatment, so that the tonnage of metal that can be treated being much greater the cost of treatment per unit is greatly reduced.

According to the practice in vogue known to us, pickling of metal, such as steel, is done by thermochemical methods. These are slow and their results are only partial as compared with the results of the treatment given under our invention.

According to our invention, in the treatment, an electrolyte is used from which evolution of hydrogen takes place and which, in the form of bubbles in the liquid strikes the surface of the metal with force or bombards it, so to speak, and thus quickly removes the scale of oxidized portions thereof. The invention is particularly adapted for treatment of flat-rolled continuous strips or ribbons. These run through the apparatus coming from rolls or reels, and after treatment are again coiled.

In the accompanying drawing:—

Figs. 1 and 1*a* are, respectively, a longitudinal section, arranged in two parts for convenient illustration, of apparatus embodying our invention.

As the same treating apparatus can be employed with a large number of strips or ribbons of steel at the same time, we place upon a platform, 10, a number of spools or reels, 11, in rows side by side upon vertical axes, each spool holding a coil of steel ribbon. From these reels the steel passes to and through a set of corrugated rolls, 12, relatively placed in two rows one above the other so that the strips will be bent back and forth and thereby the scale on the strips loosened. A suitable motor, not shown, of a variable speed type, is provided to drive said rolls. A motor of fifty horse-power may be used. For spreading or separating the strips as they pass to the rolls, 12, a device may be used similar to that for the like purpose in the pending Nachtman application No. 425,881. And such a separator or spreader may be used at suitable points throughout the length of the machine.

From the corrugated rolls, 12, the strips pass horizontally to smooth rolls, 13, which direct them into a furnace or hot water tank, 14, for heating the metal, the temperature desired being 212° F. From the heater the strips or ribbons pass between smooth rolls, 15, and then over a guide roll, 16, by which they are directed downward to rolls 17 and 18, at one end of a long tank, 19, which contains an electrolyte and thence to similar rolls, 20 and 21 at the far end of said tank, the two rolls of each of these sets being positioned one above the other so that the strips in passing between them will be slightly bent and thus a good electrical contact between the lower rolls, 17 and 20, and the strips assured for these lower rolls are parts of an electric circuit with leads, 22, that run to the minus pole of an electric generator, said rolls 17 and 20 being the cathodes. In passing horizontally through the electrolyte in the tank the strips pass between suitably spaced upper and lower anodes, 23, which by leads are connected with the positive side of the generator. The electrolyte used may be any one of several solutions. For example, sulphuric acid, sodium bisulphate with a small percentage of sulphuric acid or sodium bisulphate with a small percentage of sulphuric acid or sodium bisulphate with a half to two per cent of nitric acid or sulphuric acid with a small percentage of nitric acid.

The anodes may be of lead, graphitic carbon or corrosion-resisting iron, or any other metal that is insoluble in acid used in the pickling solution or electrolyte. The tank may be lined with lead or rubber for insulation.

The flow of current of electricity through the electrolyte results in the evolution or liberation of hydrogen with sufficient force as to result in its striking or beating against the metal surface and by that mechanical action removing the scale with greater speed than is otherwise possible. The use of numerous anodes along the length of the ribbons in passing through the electrolyte assures the thorough treatment of every portion of the surfaces of the strips or ribbons on all sides, with the result of far completer pickling than is possible by current practices.

From the far roll, 21, of the tank the strips pass upward to and over a guide roll, 24, just beyond which it passes between upper and lower spray pipes, 25, from which jets or sprays of water issue above and below the strips to rinse from the strips or ribbons of steel any adhering solution. Beyond the rinsing pipes the strips or ribbons pass to and over a roll, 26, from which they are directed downward into a tank, 27, containing cold water and within which are revolving brushes, 28, which scrub and cleanse the surfaces of the strips or ribbons.

If a bright finish or high polish of the metal surfaces is desired, the strips are then passed into and through a wooden tank, 29, that contains wa-

ter with a small percentage of either nitric acid or sodium cyanide, said tank being provided with guide rollers, 30, and 31, near each end. From the tank, 29, the strips pass to a roller, 32, from which they run downward over a roller, 33, in another rinsing tank, 34.

From the rinsing tank, 34, the strips or ribbons pass to and over a roller, 35, by which they are guided to a dryer, 36, which is a closed chamber, with sheet metal walls and which has a suitable heater, 37. From the dryer, 36, the strips pass over drums, 38, driven by a powerful motor, which pull the strips or ribbons onward from the dryer and through the entire apparatus. In order to make the operation continuous, when all of the strips are unwound from a supply reel, 11, their rear ends are welded to the front ends of a fresh supply of strips or ribbons on reels or spools, 11.

From the pulling rolls, 38, the now completely treated strips pass to a coiling machine, 39, so that the finished strips may be rolled or wound into coils for handling.

What we claim is:—

A method of pickling steel strip by a continuous process which includes the acts of subjecting the strip to the action of corrugated rolls that sharply bend the strip transversely back and forth and thereby loosen scale thereon, immediately thereafter subjecting the strip to heat treatment and then immediately thereafter while heated from such heat treatment passing it as an electrode through a pickling electrolyte.

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