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2,338,165

METHOD OF CLEANING FERROUS METAL ARTICLES

Filed June 23, 1942

2 Sheets-Sheet 1

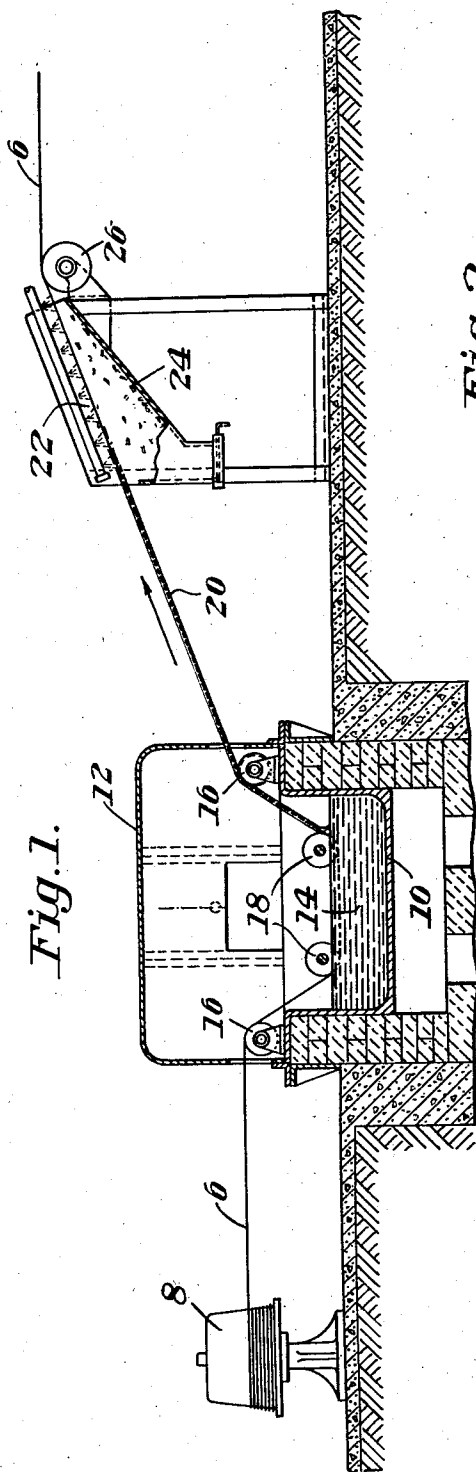
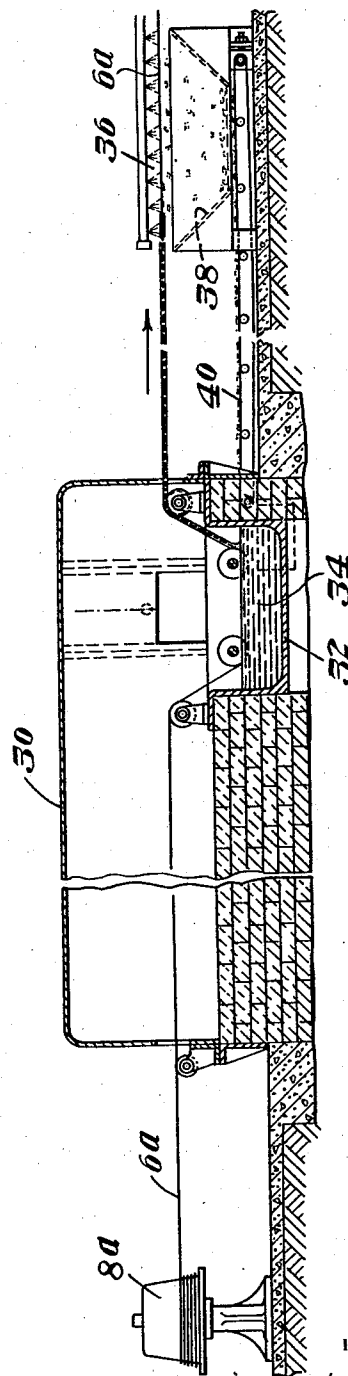


Fig. 2.



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Fig. 3.

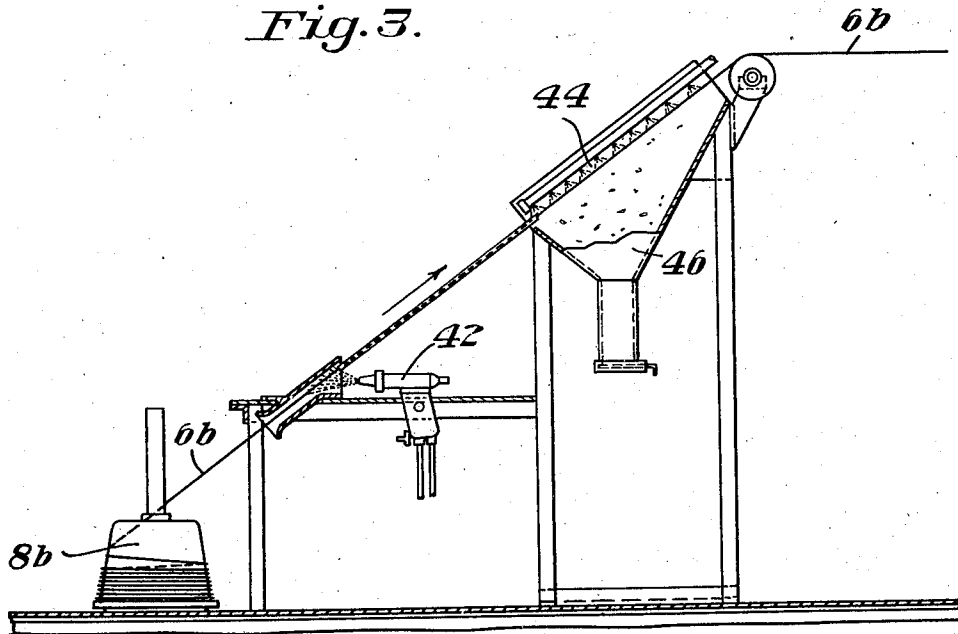
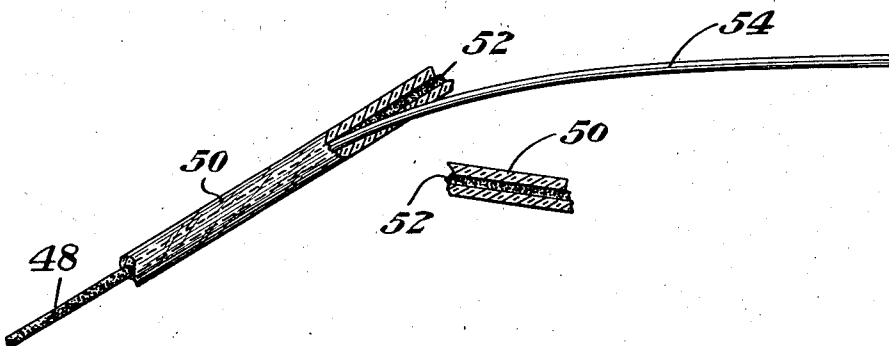


Fig. 4.



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UNITED STATES PATENT OFFICE

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METHOD OF CLEANING FERROUS METAL
ARTICLES

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4 Claims. (Cl. 29—81)

The present invention provides improvements in removing oxide scale from ferrous metal bodies such as, for instance, steel wire, which improvements obviate certain disadvantages which hitherto have been encountered in previous scale-removing practices.

Thus, it is customary to remove oxide scale from ferrous bodies by passing the said bodies into an acid bath, such as a bath of sulphuric acid of suitable concentration, whereby such acid dissolves the scale from the bodies, thereby cleaning them.

In this pickling process the solution of the scale in the acid bath is accompanied by the evolution of hydrogen through action of the acid on the bodies, and this evolved hydrogen produces in many instances serious embrittlement of the pickled metal, which must be subjected to additional operations for relieving this embrittlement.

In accordance with the present invention there is provided an improved process for cleaning oxide scale from ferrous metal bodies without the necessity of pickling the said bodies, and thereby eliminating the aforesaid embrittlement; and while the invention will be described in particularity with reference to the cleaning of steel wire as being the preferred adaptation thereof, it will be understood that the invention is not limited to such adaptation.

The invention will be understood by reference to the accompanying drawings which show various embodiments of the invention as applied to the cleaning of steel wire, hot rolled rod, and the like, and wherein:

Figure 1 represents a sectional elevation of an embodiment of the invention as applied to the cleaning of wire or the like preparatory to galvanizing;

Figure 2 is a sectional elevation showing an embodiment of the invention as applied to a continuous heat treatment of wire or the like;

Figure 3 is a sectional elevation showing a further embodiment of the invention wherein hot rolled rod is being treated in accordance with the present improved process; and

Figure 4 is a perspective view with parts broken away showing a wire which has been treated and cleaned by the present invention.

Generally speaking, the invention comprises cleaning an oxide film or scale coating from a ferrous metal shape, such as steel wire, or hot rolled rod, or other shapes, by applying a coating of glass to the shape by passing the shape through a bath of molten glass so as to cause the glass to adhere to and solidify on the shape, it being

found that when the glass coating cools and contracts sufficiently, it will suddenly disintegrate and separate from the wire and carry with it the oxide film that was on the wire, leaving the wire in a cleaned and bright condition.

It is found in practice that this action occurs at a temperature of approximately 400° F., this temperature of course varying somewhat with the composition of the glass which is employed. In this connection it may be pointed out that virtually any glass composition will be found to be effective, such as a glass containing silica with soda and lime, although glass containing sodium fluoride or borax is found to be less suited for the present process.

It is desirable, of course, that the glass have as low a melting point as is feasible, the temperatures at which the operations are carried out and the rate of cooling to which the coated wire or rod is subjected influencing, to some extent, the composition and the melting point of the glass frits which are employed.

Generally speaking, also, the process may be operated by passing the wire or rod through a bath of molten glass, or passing it through a bed of powdered glass, in the latter case dependence being placed on high temperatures of rod or wire to cause adherence of the glass and fusion thereof onto the rod or wire, or by spraying of molten glass onto the wire or rod in a manner similar to metal spraying, using a powder pistol to effect the coating.

Referring more particularly to the drawings, and first to Figure 1, the wire 6 is shown as being drawn from a reel 8 and passed through a container 10 enclosed in a suitable heating chamber 12 and containing a bath of molten glass 14, which has been produced by melting a suitable frit, and which is maintained molten by the heat of the heating chamber 12. The wire 6 is guided through this bath 14 by means of rollers 16 and 18, the wire 6 receiving a coating 20 of the glass. As this coating 20 is molten as it emerges from the bath 14, and since the invention is based upon the fact that when cooling and contraction has proceeded to a definite temperature and amount, the coating suddenly separates from the wire and takes the oxide film with it. It is found in practice to employ suitable accelerated cooling means, indicated at 22, which preferably are provided for accelerating the required solidification and contraction of the glass coated wire. The cooling means are such as to produce the requisite cooling, the separated glass being cooled in a suitable cooling

hopper 24, from which the glass may be returned through a suitable conveyor, or otherwise, to the container 18.

In accordance with Figure 1, the cleaned wire passes over a sheave 26, and thence to suitable galvanizing, or other treating, instrumentalities.

Figure 2 shows diagrammatically the application of the invention to wire which is being subjected to continuous heat treating.

As will be seen from Figure 2, the wire 6^a being drawn from the reel 8^a passes through the patenting furnace 30 near the outlet end of which is placed a container 32 to contain molten glass, which is indicated at 34, the heat of the furnace maintaining this glass in molten condition. The coated wire passes through cooling means 36, where the glass which suddenly separates is caught in a receiver 38 and carried back to the furnace by means of a conveyor 40. Oxide coating on the wire is removed, as has been described above.

In Figure 3 there is shown a further adaptation of the invention, wherein molten glass is sprayed onto the wire 6^b, which is being drawn from a reel 8^b, by means of a spray pistol 42. Cooling means 44 are provided, with a catcher 46 for the separated glass.

Figure 4 shows the action of the glass in removing the scale from the wire. This view is taken from an actual specimen which was handled in a particular manner to prevent a complete separation of the glass coating. The oxide film on the wire is indicated at 48, and it will be seen that the glass coating indicated at 50 dissolves the oxide film, as is indicated at 52, leaving the wire 54 clean and bright. It will be observed that the removed coating forms a layer in the glass adjacent to the bore therein formed by the wire.

It will be understood, of course, that if the wire or rod is at a temperature sufficiently high to melt the frit, this may form a bed in solid form

through which the wire or rod may be passed, the frit melting and forming the glass coating on the wire or rod, which then acts as described above.

I claim:

1. The process of cleaning scale from wire, rod, and other ferrous metal shapes, which comprises applying a coating of molten glass to the oxide-bearing wire, and cooling and contracting the coated wire until there is caused a sudden and violent separation of the glass coating from the wire with attendant separation of the scale, which is retained by the glass on separation thereof from the wire.

2. The process of cleaning scale from wire, rod, and other ferrous metal shapes, which comprises applying a coating of molten glass to the oxide-bearing wire, cooling to approximately 400° F., thereby contracting the coated wire until there is caused sudden and violent separation of the glass coating from the wire with attendant separation of the oxide, which is retained by the glass on separation thereof from the wire.

3. A method of cleaning wire having an oxide coating thereon, which comprises passing the wire through a bath of molten glass until the glass forms a coating on the wire, and then cooling and contracting the coated wire until there is caused a sudden and violent separation of the glass coating from the wire, the oxide coating on the wire being retained in the glass, thereby cleaning the wire.

4. A method of cleaning wire having an oxide coating thereon, which comprises spraying molten glass onto the wire until a coating thereof is formed on the wire, and then cooling and contracting the coated wire until there is caused a sudden and violent spontaneous separation of the glass coating from the wire, the oxide coating on the wire being retained in the glass, thereby cleaning the wire.

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