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APPARATUS FOR COILING AND COOLING WIRE RODS.

APPLICATION FILED DEC. 4, 1915.

1,295,139. Patented Feb. 25, 1919.

Fig. 3.



Fig. 2.

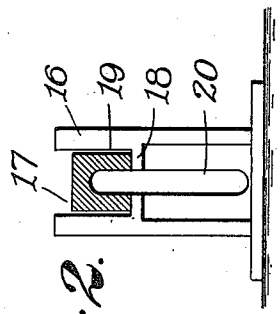


Fig. 1.

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APPARATUS FOR COILING AND COOLING WIRE RODS.

1,295,139. Specification of Letters Patent. Patented Feb. 25, 1919.

Application filed December 4, 1915. Serial No. 65,160.

To all whom it may concern:

Be it known that I, VICTOR E. EDWARDS, a citizen of the United States, residing at Worcester, in the county of Worcester and Commonwealth of Massachusetts, have invented a new and useful Improvement in an Apparatus for Coiling and Cooling Wire Rods, of which the following, together with the accompanying drawings, is a specification.

The present invention relates to apparatus for coiling and cooling wire rods as they emerge from the finishing pass of a rolling mill. The invention has particular reference to a means employed for laying the rod in a coil of peculiar formation, in such a manner as to expose as completely as possible the entire surface of each rod, so coiled, to the action of a cooling medium, or if desired, to the action of a deoxidizing medium during the period of cooling. The invention further resides in a novel means for assembling in compact and regular form the turns of the coils formed as above described, in order to render more convenient the subsequent handling and transportation of the rods. The above and other features of my invention are fully set forth in the following description and pointed out in the annexed claims, reference being had to the accompanying drawings which illustrate a preferred arrangement of my apparatus, and in which—

Figure 1 is a side view, partly in section, of said apparatus.

Fig. 2 is a fragmentary sectional view, on the line 2—2, Fig. 1.

Fig. 3 is a diagrammatic representation of the manner in which a rod is coiled by the action of my apparatus.

Similar reference characters refer to similar parts in the different figures.

Heretofore, in the treatment of wire rods emerging from the finishing passes of a rolling mill, it has been the usual practice to provide apparatus for coiling the rods, while hot, into a multiplicity of concentric turns, forming conveniently handled bundles; such bundles, if desired, could be cooled by passing them through a chamber containing a non-oxidizing atmosphere in order to prevent the further oxidizing action of the air during the period of cooling. However, it is clear that such treatment, while serving to arrest further oxidization of the rods, has no effect upon the oxid which has already been formed on the surface of the rods by reason of their exposure to the atmosphere while being rolled, and previous to their introduction, in coiled form, into a cooling chamber of the type described. It is clear, moreover, that this compact, concentric coiling of the rods, as heretofore practised, with the turns of each coil overlying and surrounding each other, prevents the exposure of all but a small portion of the surface of the coiled rod during the period of cooling, and thus has rendered useless, in the past, any attempt to subject the coils to a deoxidizing or reducing atmosphere for the purpose of removing the oxid already formed on the rods in the rolling operation.

The present invention, as hereinafter particularly described, provides apparatus for coiling each rod, emerging hot from the mill, in such a manner that there is practically a complete exposure of its surface during the period of cooling, whereby the cooling of the rods is rendered uniform. And more particularly, if a deoxidizing atmosphere be employed during the period of cooling, its action will be effective with respect to the entire surface of the rod, serving not only to arrest completely all further oxidization, but also to remove the oxid which has already formed on the rod by its exposure to the air during rolling. The coiling of the rods, in the manner above described, obviously puts them in an inconvenient form for subsequent handling and transportation, and my invention further provides novel means for assembling the turns of each coil, after the period of cooling, in substantially regular and concentric form, so that the coils, finally, are in a compact form most convenient for subsequent handling and transportation in the usual manner.

Referring to the drawings, which illustrate a preferred embodiment of my invention, the numeral 1 designates a stand of rolls constituting the finishing pass of a rolling mill, the same being of ordinary construction, and equipped with the usual delivery guide 2. In advance of the stand

of rolls 1, a bracket 3 provides a vertical bearing 4 for a shaft 5, rotated by any well known means, such as a pulley 6 and belt 7, driven from the driving shaft of the finishing rolls 1. Below the shaft 5, the bracket 3 has a shelf 8 which provides a bearing socket, substantially in axial alinement with the shaft 5, for a spherical enlargement 9 formed intermediate the ends of a rod 10. The upper end of the rod 10 has a spherical tip 11 received within an axially offset socket in the lower end of shaft 5. Near its lower end the rod 10 is enlarged, as at 12, to provide a curved channel section, open on the side facing the rolls 1. The lower end of this channel section carries a floating flange or washer 13, for a purpose hereinafter described.

Above the channel section 12 a curved guide member 14 is pivoted at 15 to the rod 10 and extends rearwardly and upwardly into alinement with the delivery guide 2. The member 14 is in the form of a channel and constitutes a continuation of the channeled lower end 12 of the rod 10, the channel being open on the under side of said member 14. At its end nearest the rolls 1 the member 14 is supported upon a bracket 16, which provides a guideway 17 for said end of member 14 to compel its reciprocation in alinement with the delivery guide 2. The bracket 16 provides inwardly directed projections 18 upon which the side walls 19 of the member 14 are supported for sliding movement, said bracket providing a space 20 between its sides, into which the channel of the member 14 opens.

As will be apparent, the rotation of shaft 5 imparts a circular movement, of relatively small radius, to the lower end of rod 10; the pivotal connection 15 of the member 14 with said rod likewise moves in a circle, of still smaller radius, thereby reciprocating the member 14 back and forth in the guideway 17. By the operation of the above described mechanism, a rod emerging from the finishing pass of the mill is directed downwardly by the channel constituted by the member 14 and the lower end 12 of the rod 10; the movement of said lower end, in a circular path, and at a lower linear velocity than the velocity imparted to the rod by the rolls 1, causes the rod to be coiled in circular turns of greater radius than the circular path of said lower end 12. In the event of any impedance to the movement of a rod through the passes of the mill, the lower open side of the channel thus formed permits the rod to be withdrawn therefrom, the bracket 16, as before stated, being constructed to provide the space 20 which allows this deflection of the rod from the guide channel. When so withdrawn, the use of hand shears, to sever the rod at the forward and rear ends of the guide channel, is permitted; the rear end of the forward portion of the rod thus severed will pass by gravity through the lower end of the channel section 12, and the severed length can be removed and discarded, after which the coiling operation may be continued, upon the removal of the cause of the impedance.

Below the lower end 12 of the coil laying member 10 is disposed a coil supporting surface, which, in the present instance, takes the form of a constantly moving conveyer belt or apron 21, which may be of the endless type, passing around rolls 22, 22. The speed of this conveyer is so related to the speed of the coil laying mechanism, that each turn of the rod laid by the above described coiling mechanism, becomes offset rearwardly of and, therefore, non-concentric to the next preceding turn, but overlaps the same, as shown clearly in Figs. 1 and 3, the result being that practically the entire surface of a rod so coiled, except at the two points where adjacent turns intersect each other, is exposed. It is to be understood that the rods emerging from the stand of rolls 1 are already cut, by suitable severing means, not shown, into predetermined lengths, each length adapted to form a separate and distinct series of coils or turns upon the traveling conveyer 21, of the form shown in Fig. 3. In this way, uniform cooling of the rod is insured, as the coil thus formed, comprising a series of non-concentric inclined turns, is carried forward on the conveyer. Furthermore, by inclosing the conveyer in a tunnel 23, having preferably a water cooled roof 24, with a frusto-conical entering passage 25 for the rod which is being laid, each rod so coiled may be uniformly and completely exposed to the action of a deoxidizing medium, introduced to the tunnel through a suitable pipe 26. The floating flange 13 surrounding the rotating rod 10 covers the upper end of passage 25 to prevent the escape of the treating medium from the tunnel.

The removal of each coil from the conveyer, at the extreme forward end thereof, is accomplished by an arm 27, pivoted at 28 on a movable truck 29, and having an extension 30 which is supported, normally, so as to intercept the successive non-concentric turns of each coil as they reach the extreme end of the conveyer, causing successive turns of the coil to be strung upon said arm, as the supporting surface of the conveyer moves downwardly around the forward roll 22. In this way the support of the coil is transferred from the conveyer to the extension 30, the successive turns of the coil assuming, by gravity, a regular concentric relation with respect to each other as the support of the conveyer is withdrawn; when the arm is tipped up, about its pivot, the turns are compacted thereon, by grav-

ity, thereby forming a coil suitable for handling and transportation in the usual manner.

I claim,

1. In apparatus of the character described, the combination with rod coiling mechanism, of a guide for conducting the rod from the rolling mill to said coiling mechanism, a longitudinally moving support on which the rod is delivered by said coiling mechanism whereby to form a series of offset exposed turns, and means for subjecting the rod to a reducing atmosphere while on said moving support.

2. In apparatus of the character described, the combination with rod coiling mechanism, of a support adapted for longitudinal traversing movement with respect to said coiling mechanism and on which the rod is delivered by said coiling mechanism whereby to form a series of offset exposed turns, and an inclosure, having a water cooled roof, surrounding said moving support.

3. In apparatus of the character described, a support on which a rod is delivered from a rolling mill, means for moving said support longitudinally, and an inclosure, having a water cooled roof, surrounding said support.

4. In apparatus of the character described, the combination with a rod coiling and cooling mechanism, of a guide for conducting the rod from the rolling mill to said coiling and cooling mechanism, said guide being open on its under side for the delivery of a rod therefrom by gravity when the free movement of the rod therethrough is impeded.

5. In apparatus of the character described, the combination with a coiling and cooling mechanism, of a guide for conducting the rod from the rolling mill to said coiling and cooling mechanism, said guide being curved and lying in a vertical plane, with its lower and concave side open for the delivery of a rod therefrom by gravity when the free movement of the rod through said guide is impeded.

6. In apparatus of the character described, a rod coiling mechanism, comprising a pivoted laying arm providing a rod guiding passage at its free end, means for moving the free end of said arm in a circular path, and reciprocating means hinged to said arm for guiding the rod into the receiving end of said passage.

7. In apparatus of the character described, the combination with a stand of rolls for advancing a rod longitudinally, of a pivoted rod coiling arm providing a rod guiding passage at its free end, means for moving the free end of said arm in a circular path, a reciprocating member hinged to said arm, and providing a conduit opening at one end into the passage of said arm, and means for maintaining the opposite end of said conduit in alinement with the pass of said rolls.

8. In apparatus of the character described, a rod coiling mechanism, comprising a pivoted laying arm providing a rod guiding passage at its free end, means for moving the free end of said arm in a circular path, and a curved member hinged to said arm and providing a conduit of which the passage of said arm is a continuation, said conduit and said passage being open on the inside of the curve.

9. In apparatus of the character described, the combination with a stand of rolls for advancing a rod longitudinally in a substantially horizontal plane, a pivoted rod coiling arm providing a downwardly directed rod guiding passage at its free end, means for moving the free end of said arm in a circular path, a member hinged to said arm and providing a curved conduit of which the rod guiding passage of said arm forms a continuation, and guiding means for said member to constrain the reciprocation of the opposite end of said conduit in alinement with the path imparted to the rod by said stand of rolls.

10. In apparatus of the character described, the combination with a stand of rolls for advancing a rod longitudinally in a substantially horizontal plane, a pivoted rod coiling arm providing a downwardly directed rod guiding passage at its free end, means for moving the free end of said arm in a circular path, a member hinged to said arm and providing a curved conduit of which the rod guiding passage of said arm forms a continuation, and guiding means for said member to constrain the reciprocation of the opposite end of said conduit in alinement with the path imparted to the rod by said stand of rolls, said conduit and said passage being open on the inside of the curve.

11. In apparatus of the character described, the combination with a stand of rolls for advancing a rod longitudinally in a substantially horizontal plane, a pivoted rod coiling arm providing a downwardly directed rod guiding passage at its free end, means for moving the free end of said arm in a circular path, a member hinged to said arm and providing a curved conduit of which the rod guiding passage of said arm forms a continuation, and guiding means for said member to constrain the reciprocation of the opposite end of said conduit in alinement with the path imparted to the rod by said stand of rolls, and said guiding means being recessed to permit the withdrawal of the rod from said conduit.

12. In apparatus of the character described, the combination with a coil laying arm movable in a circular path, of a support on which the rod is delivered by said

arm, an inclosure for said support providing an opening through which the rod is delivered by said arm onto said support, and means carried loosely on said arm for maintaining said opening substantially closed in all positions of said arm.

13. In apparatus of the character described, the combination with a stand of rolls for advancing a rod longitudinally, of a rod coiling mechanism, comprising means providing a downwardly curved conduit to receive the rod from the pass of said rolls, means for moving said conduit to carry its lower end around in a circular path, and means for maintaining the opposite end of said movable conduit in alinement with the pass of said rolls.

14. In apparatus for coiling and cooling a rod into a series of concentric coils, the combination of the following instrumentalities, means for coiling the rod, a support for the coil, means for moving the support to bring the coils nonconcentric and overlapping each other, and means for assembling said coils into concentric relation to each other.

15. In apparatus for coiling and cooling a rod into a series of concentric coils, the combination of the following instrumentalities, means for coiling the rod, a support for the coil, means for moving said support during the coiling operation, whereby said coils are made nonconcentric and overlapping, means for moving the support between the coils of each rod, and means for assembling the coils of each rod into concentric relation to each other.

16. In an apparatus of the class described for coiling and cooling a rod delivered from a rolling mill, the combination of the following instrumentalities, a laying tube, a guide for conducting the rod from the mill to said laying tube, a support for the rod as it leaves the laying tube, means for moving said support during the laying of the rod thereon to produce a series of nonconcentric overlapping coils, and an arm to receive said coils from said support and form a bundle of concentric coils by gravity.

Dated this 29th day of November, 1915.

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