Aug. 4, 1964 C. G. BOSCO 3,143,314

COILING DEVICE FOR HOT ROD

Filed Jan. 14, 1963 3 Sheets-Sheet 1

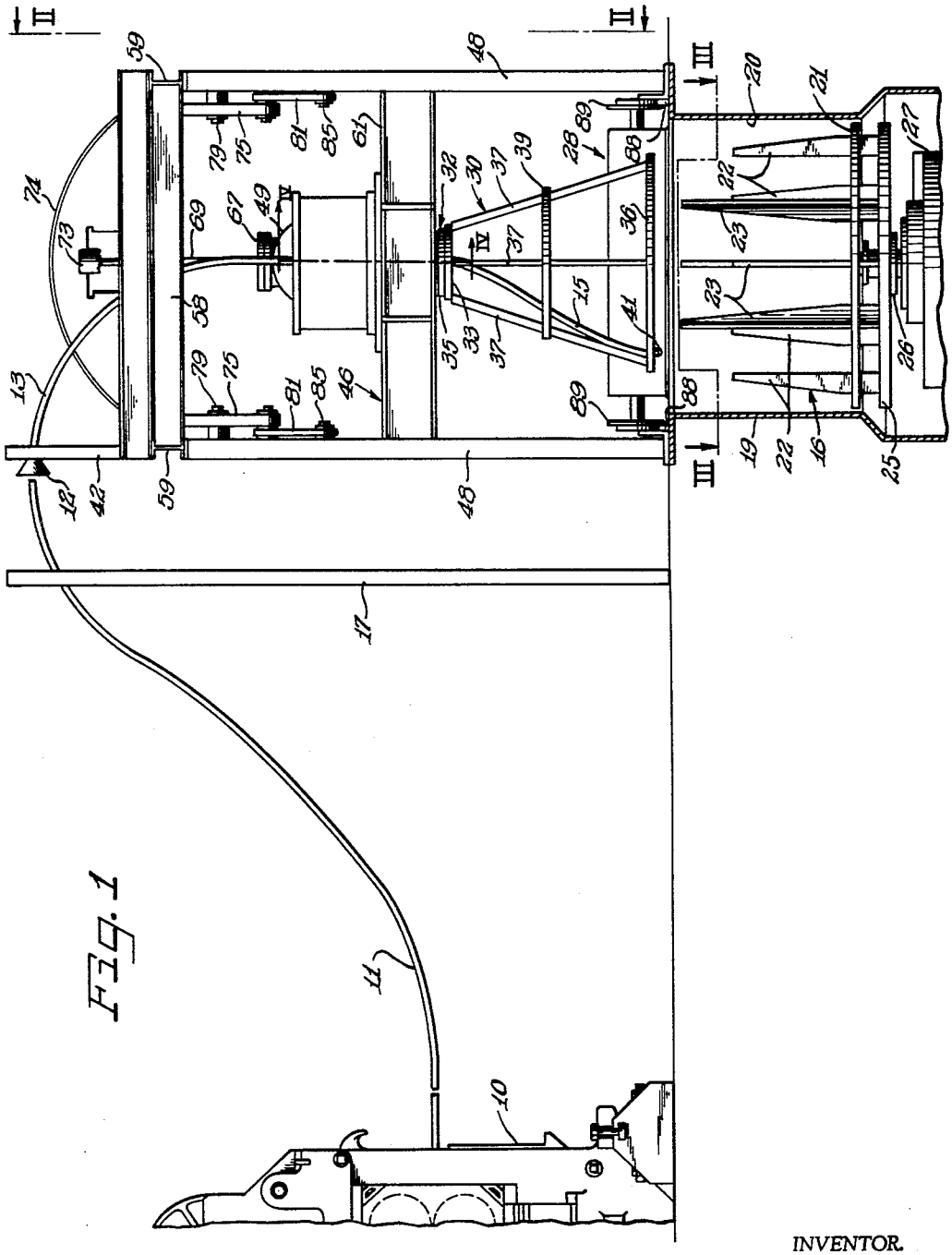


Fig. 1

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Fig. 2

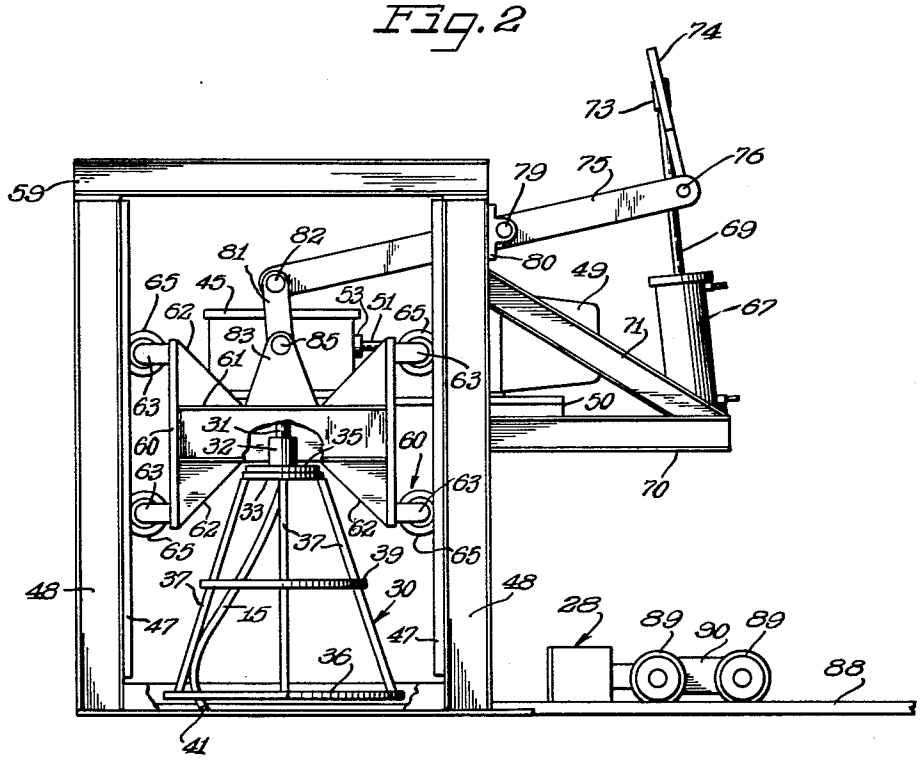
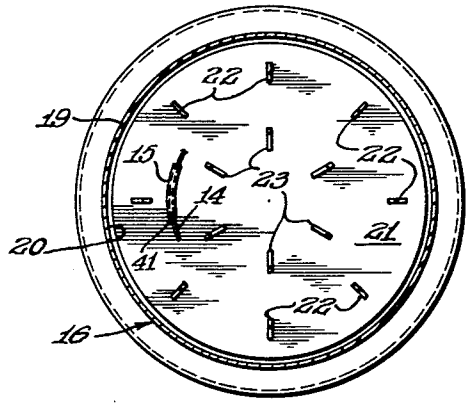


Fig. 3



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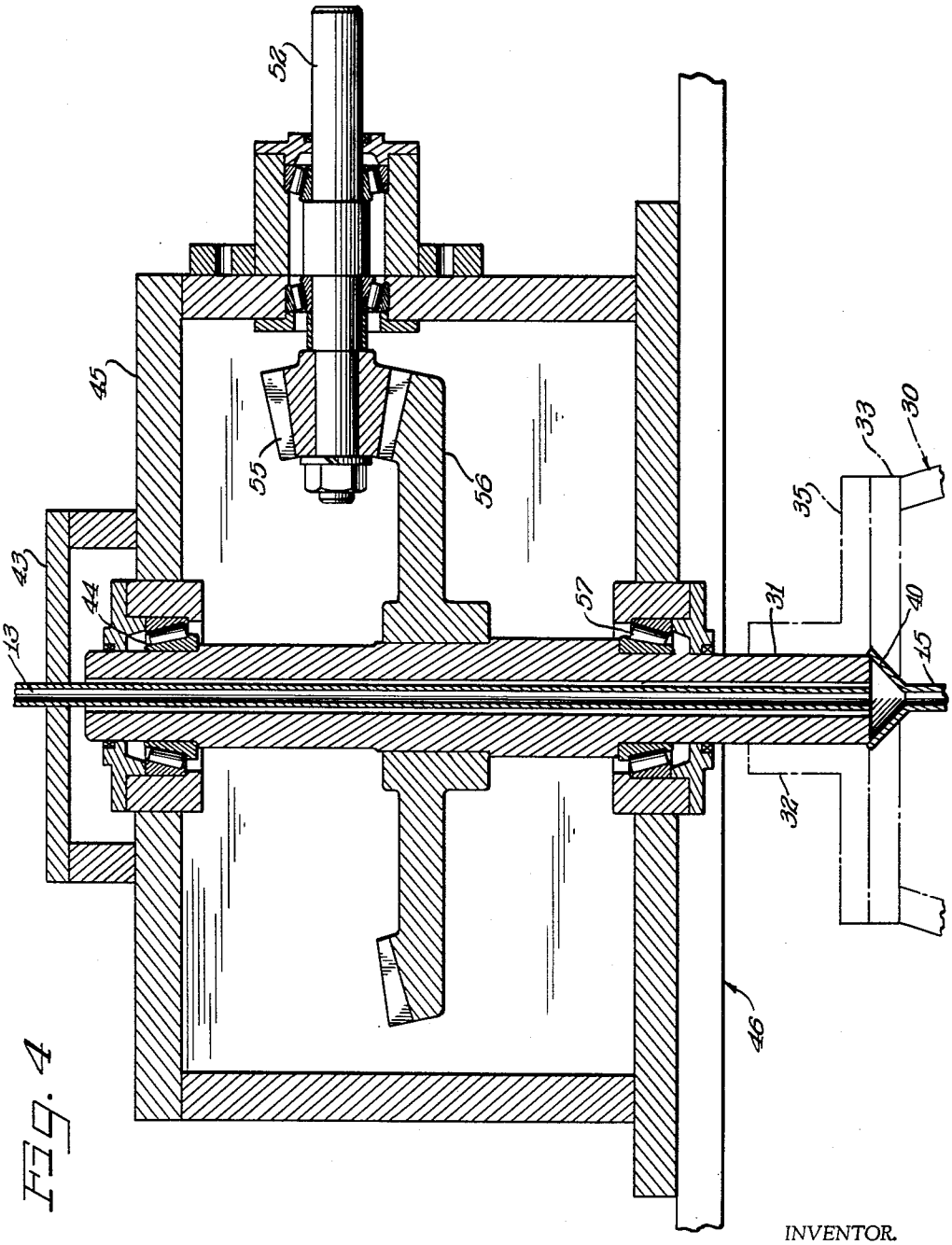


FIG. 4

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COILING DEVICE FOR HOT ROD

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3 Claims. (Cl. 242—83)

This invention relates to improvements in coiling devices particularly adapted to coil hot rod as the rod leaves the finishing stand of the Merchant Mill.

In the coiling of hot rod as the rod leaves the Merchant Mill, the rod has heretofore been fed from the finishing stand of the mill directly to a reel rotating about a vertical axis which may be below floor level and commonly called a pouring reel. The speed of rotation of the reel matches the delivery speed of the hot rod from the finishing stand. The reel, therefore, must rotate at a high rate of speed which may be in the order of 1100 r.p.m. Due to this high speed of rotation of the pouring reel, centrifugal force causes the rod to ride upwardly along the guide stakes of the reel with the result the rod does not settle down to a well formed coil and a full coil on the reel cannot be attained.

Each coil contains the rod rolled from a single billet and it is desirable that the pouring reel accept a full 1,000 pound billet. Due to the high speed of rotation of the pouring reel, however, the present day pouring reels will not accept a full 1,000 pound billet, but will only properly coil 600 pounds of material.

In accordance with the principles of the present invention, I am able to coil the rod rolled from a full 1,000 pound billet and I do this by laying the hot rod on the pouring reel by a feed pipe rotating in a direction opposite to the direction of rotation of the reel, and by so laying the hot rod on the reel the speed of rotation of the pouring reel is reduced to one half or less of its normal speed and the resultant coil is a well settled properly laid coil.

A principal object of the invention, therefore, is to provide a novel and improved apparatus for coiling hot rod from the finishing stand of a Merchant Mill so arranged as to produce a well settled properly laid coil at a materially reduced speed of rotation of the reel.

A further object of the invention is to provide a novel and improved apparatus for coiling hot rod as it leaves the finishing stand of a Merchant Mill, by laying the rod on a pouring reel with a rotating action rotating in a direction opposite to the direction of rotation of the pouring reel.

Another object of the invention is to improve upon the coiling devices for hot rod heretofore in use by rotating the coiling device in one direction at a linear speed slower than the linear speed of the rod as it leaves the finishing stand of the Merchant Mill, and by providing a counter-rotating rod feeding device laying the rod on the coiling device while rotating in a direction opposite to the direction of rotation of the pouring reel.

Another object of the invention is to improve upon the coiling devices for hot rod heretofore in use by rotating the coiling device in one direction at a linear speed slower than the linear speed of the hot rod as it leaves the finishing stand of the Merchant Mill, and by providing a counter-rotating rod feeding device laying the rod on the coiling device while rotating in a direction opposite to the direction of rotation of the pouring reel.

Still a further object of the invention is to provide a novel and improved apparatus of coiling hot rod as it leaves the finishing stand of a Merchant Mill, by laying the rod on a rotating pouring reel with a laying action rotating in a direction opposite to the direction of rotation of the pouring reel, and at a speed sufficiently high

to make up the difference between the speed of rotation of the pouring reel and the speed of travel of the hot rod as is leaves the finishing stand of the Merchant Mill.

These and other objects of the invention will appear from time to time as the following specification proceeds and with reference to the accompanying drawings wherein:

FIGURE 1 is a partial diagrammatic view in side elevation of a hot rod coiling device constructed in accordance with the principles of the invention, showing the feed for the rod from the finishing stand of the Merchant Mill to the rod coiling device;

FIGURE 2 is an end view of a portion of the coiling device shown in FIGURE 1 looking at the coiling device along line II—II of FIGURE 1 and showing certain details of the apparatus for laying the hot rod on the pouring reel;

FIGURE 3 is a fragmentary sectional view taken substantially along line III—III of FIGURE 1 with the motor removed and certain other parts broken away; and

FIGURE 4 is a fragmentary sectional view with parts broken away and taken substantially along line IV—IV of FIGURE 1 on a much larger scale.

In the embodiment of the invention illustrated in the drawings, I have generally shown in FIGURE 1 a finishing stand **10** of a Merchant Mill, with a rod feed or guide pipe **11** leading therefrom and guiding the pipe upwardly to a cone **12** on the receiving end of a stationary guide pipe **13** feeding the traveling hot rod to a rotating rod laying pipe **15**, laying hot rod **14** on a pouring or coiling reel **16**, rotating in a direction opposite to the direction of the pipe **15**.

The feed or guide pipe **11** may have a cone (not shown) like the cone **12** at its inlet end to guide the hot rod to the feed pipe **11** and extends horizontally of the finishing stand and then slopes upwardly to the cone **12** in a uniformly curved path to discharge the hot rod directly to the guide pipe **13**.

The pipe **11** is supported adjacent its discharge end on a support structure **17** generally shown in FIGURE 1. The support structure **17** may be of any desired construction.

As shown in FIGURE 1, the pouring or coiling reel **16** is mounted beneath the floor line in a shell **19** having an inner cylindrical wall **20** extending up to the floor line and of a diameter substantially equal to the outside diameter of a stripper plate **21**, stripping the coiled rod from guide stakes **22** and **23** of the pouring reel. The pouring reel **16** may be of a well known construction and includes a rotatable plate **25** spaced beneath the stripper plate **21** and of substantially the diameter of said stripper plate and having the guide stakes **22** and **23** mounted thereon and extending upwardly therefrom. The plate **25** is suitably coupled to a vertical shaft **26** which may be driven from reduction gearing (not shown) contained within a gear housing **27**, containing gearing therein (not shown) driven from a suitable motor (not shown) in a conventional manner. The stripper plate **21** is moved vertically by a suitable power device (not shown) to raise the coiled rod to floor level above the guide stakes **22** and **23**, to be moved to a conveying device (not shown) by a pusher **28**.

Referring now in particular to the device for laying the hot rod on the pouring reel **16**, a rotatable cage **30** is disposed above the floor line directly above the reel **16**. The cage **30** is rotatable about an axis coaxial with the axis of rotation of the reel **16** and is driven in a direction opposite to the direction of rotation of the reel **16**. The cage **30** is mounted on the lower end of a hollow shaft **31** by a coupling **32** on the lower end of said shaft, and depends from said shaft. The cage **30** includes an upper annular plate **33** suitably secured to a flange **35** of the coupling **32**. An annular plate **36** of an outside diameter

equivalent to the diametral distance between the insides of the stakes 22 is spaced beneath the annular plate 33 close to the floor line, and is connected to said annular plate by a series of circumferentially spaced ribs 37 diverging from the plate 33 to the plate 36. An annular plate or ring 39 connects the ribs 37 together between the plates 33 and 36 to rigidify the support structure for the plate 36.

The feed or rod laying pipe 15 has a cone 40 forming an upward continuation thereof and leads angularly downwardly from said cone 40 in a uniformly curved path outwardly to a rib 37 of the cage 30, and is suitably secured thereto. The pipe 15 has a curved discharge end 41 opening in a direction opposite to the direction of rotation of the cage 30 and positioned to lay hot rod 14 onto the stripper plate 21, in the spaces between the stakes 22 and 23.

The cone 40 is in axial alignment with the vertically extending pipe 13, extending through the center of the hollow shaft 31 and uniformly curving upwardly and outwardly to the cone 12. The pipe 13 is supported adjacent the cone 12 on an upright support structure 42 suitably supported for vertical movement with a carriage 46, carrying the cage 30, when it is desired to raise said carriage and cage to strip a coil from the reel 16, as will hereinafter be more clearly described. The pipe 13 is supported coaxially of the axis of rotation of the hollow shaft 31 on a top cover 43 for an upper bearing 44 for the shaft 31. The bearing 44 is suitably mounted in the top wall of a housing 45 for the gearing for driving the shaft 31, and cage 30.

The housing 45 is mounted on the carriage 46, guided for vertical movement along vertically extending guide tracks 47 mounted on and extending along the inner flanges of I-beams 48, suitably supported on the ground and extending vertically therefrom.

As shown in FIGURE 2 a motor 49 for driving the cage 30 is mounted on a platform 50 mounted on and extending to one side of the carriage 46. The motor 49 has a motor shaft 51 driving an aligned shaft 52 through a coupling 53. The shaft 52 is journalled in the housing 14 and extends therein. The shaft 52 has a bevel pinion 55 keyed or otherwise secured to its inner end, which meshes with and drives a bevel gear 56 keyed or otherwise secured to the hollow shaft 31, for driving said hollow shaft from the motor 49. The hollow shaft 31 in turn is journalled in the top and bottom walls of the housing 45 on the upper bearing 44 and on a bearing 57. The bearings 44 and 57 are shown as being tapered roller thrust bearings.

The motor 49 is a variable speed motor and the speed rotation of said motor may be set in accordance with the speed of rotation of the reel 16 to drive the cage 30 and feed or rod laying pipe 15 at a speed which will counterbalance the speed of rotation of the reel in accordance with the speed of travel of the rod laid onto the reel, to accommodate the reel 16 to be driven at a relatively low rate of speed, sufficiently low to prevent the hot rod from moving upwardly along the inner guide stakes 23 and to allow the coiled rod to settle down in a well formed coil.

The I-beams 48 are suitably mounted on the floor and are connected together at their upper ends by I-beams 58 and 59 to form a rigid supporting frame structure extending over the reel 16 and supporting the carriage 46 for movement therealong.

The carriage 46 is shown in FIGURE 2 as comprising two parallel spaced vertically extending plates 60, connected together by a cross frame structure 61 and reinforced by gusset plates 62, connected between the cross frame structure 61 and the plate 60. The cross frame structure 61 forms a support for the platform and the gear housing 45.

The plates 60 have pedestals 63 extending horizontally outwardly therefrom toward the tracks 47. The pedestals 63 are of a bifurcated formation and have wheels 65 rotatably supported thereon and guided for movement along the guide tracks 47.

The carriage 46 is vertically moved along the guide tracks 47 to raise the cage 30 and accommodate the stripper plate 21 to strip a coil from the reel 16 and to elevate the coil and accommodate the coil to be pushed away by a pusher 18 by a fluid pressure operated cylinder 67 having a piston rod 69 extensible therefrom. The cylinder 67 may be an air cylinder and may be transversely pivotally mounted on the outer end of a platform 70, extending outwardly of the I-beams 48 and braced to said I-beams by braces 71. The braces 71 are connected between said I-beams and the outer end portion of the platform 70 on opposite sides of the cylinder 67. As shown in FIGURES 1 and 2 the piston rod 69 is seated in its upper end in a downwardly opening socket 73 mounted intermediate the ends of the yoke 74, shown as being generally U-shaped in formation. The yoke 74 has lever arms 75 pivotally connected to its opposite sides on pivot pins 76 (FIGURE 1). The lever arms 75 are pivotally mounted intermediate their ends on the I-beams 48 adjacent the cylinder 67 on pivot pins 79 mounted in supports 80 mounted on and extending outwardly of said I-beams. The lever arms 75 extend inwardly of the I-beams 48 to positions adjacent the center of the housing 45, and have links 81 pivotally connected thereto on pivot pins 82. The links 81 depend from the inner ends of the lever arms 75 and are pivotally connected to upright connectors 83 on pivot pins 85. The connectors 83 extend upwardly of the side frame members of the carriage 46 adjacent the outer sides thereof. Upon the admission of fluid under pressure such as, air to the piston rod end of the cylinder 67, the carriage 46 will be raised to raise the cage 30 a distance sufficient to accommodate the coil to be pushed from beneath said cage when the coil is raised to floor level by the stripper plate 21.

The pusher 28 is diagrammatically shown in FIGURES 1 and 2 as being guided from movement along a track 88 extending along the floor and as being mounted on wheels 89 supporting a carriage 90 forming a support for said pusher. The pusher 28 may be propelled along the track 88 by hydraulic cylinder piston means (not shown) or by any other suitable means to push a coil from the stripper plate 21 at the termination of a coiling operation as the cage 30 is raised above floor level by the admission of fluid under pressure to the piston rod end of the hydraulic cylinder 67.

In operation of the coiling device of the invention, the reel 16 will be driven at a speed of one-half or less than the speed of travel of the rod as it leaves the finishing stand 10. The cage 30 and feed or laying pipe 15 will then be rotated in an opposite direction at substantially the linear speed of travel of the rod as it leaves the finishing stand and sufficiently high to compensate for the decrease in the speed of rotation of the reel 16 from the speed of rotation required to keep the reel 16 rotating at the output rate of the hot rod from the mill, as the rod leaves the finishing stand 10.

The feed pipe 15 laying the hot rod passing along said feed pipe at mill output speed will lay the hot rod on the coiling or pouring reel 16 until the rod produced from one billet has been coiled on said pouring reel. Since the speed of rotation of the pouring reel 16 has been materially reduced to a linear speed of at least half the speed of travel of the hot rod as it leaves the finishing stand, and at a sufficiently low rate of speed that centrifugal force will not be sufficiently high to cause the rod to move upwardly along the guide stacks 23, 23, the rod will settle to the stripper plate 21 and a uniform coil will be obtained and the pouring reel will accept a full 1,000 pound billet instead of the 600 pound billets that have previously been coiled.

When the coil is complete, the cylinder 67 will raise the carriage 46 and the cage 30 above the floor line a distance sufficient to accommodate the pusher 66 to push the finished coil, raised to the floor line by the stripper

plate 21, to a conveyor or like apparatus for carrying the coil rod for further processing.

The cage 30 being lowered and the stripper plate being moved downwardly to the position shown in FIGURE 1, the coiling process may be repeated, the carriage 30 and laying pipe 15 rotating at a preset speed governed by the speed the hot rod leaves the mill and the pouring reel 16 being started to rotate at its preset speed, at which time the apparatus will be ready for another coil.

While I have herein shown and described one form in which my invention may be embodied, it may readily be understood that various variations and modifications in the invention may be attained without departing from the spirit and scope of the novel concepts thereof.

I claim as my invention:

1. A coiling device for coiling hot rod and the like directly from the finishing stand of a Merchant Mill comprising a reel mounted below floor level for rotation about a vertical axis, means rotatably driving said coiling reel in one direction, a frame structure extending above floor level in alignment with said reel and having parallel spaced guide tracks extending vertically therealong, a carriage mounted on said frame structure for movement along said guide tracks, a gear housing supported on said carriage having a non-rotatable pipe extending downwardly therealong coaxial with the axis of rotation of said rotatable reel, a hollow shaft journalled in said housing and extending about said pipe, a motor supported on said carriage and a drive connection from said motor to said hollow shaft, a cage mounted on the lower end of said hollow shaft and depending therefrom, a rod laying pipe extending downwardly along said cage and terminating in radially spaced relation with respect to the axis of rotation of said cage and above said coiling reel and having a receiving end in axial alignment with said pipe, said cage and rod laying pipe being driven in a direction opposite to the direction of rotation of said reel and laying hot rod on said counter rotating reel at the speed of travel of the rod as discharged from the finishing stand on the Merchant Mill, power means holding said carriage and cage in fixed vertically spaced relation with respect to said coiling reel and for raising said cage above the floor level to accommodate the stripping of coiled hot rod from said reel.

2. A coiling device for coiling hot rod and the like directly from the finishing stand of a Merchant Mill comprising a reel mounted below floor level for rotation about a vertical axis, means rotatably driving said coiling reel in one direction, a frame structure extending above floor level in alignment with said reel and having parallel spaced guide tracks extending vertically therealong, a carriage mounted on said frame structure for movement along said guide tracks, a gear housing supported on said carriage having a non-rotatable pipe extending downwardly therealong coaxial with the axis of rotation of said rotatable reel, a hollow shaft journalled in said housing and extending about said pipe, a motor supported on said carriage and a drive connection from said motor to said hollow shaft, a cage mounted on the lower end of said hollow shaft and depending therefrom, a rod laying pipe extending downwardly along said cage and terminating in radially spaced relation with respect to the axis of rotation of said cage and above said coiling reel and having a receiving end in axial alignment with said pipe, said cage and rod laying pipe being driven in a direction opposite to the direction of rotation of said reel and laying hot rod on said counter rotating reel at the speed of travel of the rod as discharged from the finishing stand of the Merchant Mill, a stationary platform extending to one side of said frame structure, a fluid pressure operated cylinder having a piston rod extensible therefrom mounted on said platform, a link and lever connection from said piston rod to said carriage for holding said carriage and cage in fixed relation with respect to the ground and for raising said carriage and cage above the ground, to accommodate the stripping of coiled hot rod from said reel.

3. A coiling device for coiling hot rod and the like directly from the finishing stand of a Merchant Mill comprising a cylindrical shell extending downwardly from a floor line a substantial distance therebeneath, a reel mounted below the floor line for rotation about a vertical axis and including a rotatable plate, a motor rotatably driving said plate, a plurality of guide stakes extending upwardly of said plate and spaced inwardly of said shell, a stripper plate extending about said guide stakes and mounted for vertical movement therealong to raise a coil of wire on said guide stakes to floor level to accommodate stripping of the coil from said guide stakes, a cage spaced above the floor line and mounted for rotation about an axis coaxial with the axis of rotation of said reel, a motor, a geared drive connection from said motor to said cage for rotatably driving said cage in a direction opposite to the direction of rotation of said reel, a rod laying pipe extending downwardly along said cage and mounted thereon for rotation therewith and terminating in vertically spaced relation with respect to said reel and shell and in radially spaced relation with respect to the axis of rotation of said reel and having a discharge end portion opening in a direction opposite to the direction of rotation of said cage, for laying rod on said reel, means for guiding the hot rod directly from the finishing stand of the Merchant Mill to said rotatable rod laying pipe comprising a non-rotatable feed pipe terminating at its discharge end in axial alignment with the upper end of said rod laying pipe, a pusher for pushing the hot coiled rod stripped from said reel by said stripper plate from said stripper plate, said cage being mounted for vertical movement above the floor line a distance sufficient to clear the coiled rod on said stripper plate, and power means holding said cage in fixed vertically spaced relation with respect to the floor line and for raising said cage above the floor line to accommodate said pusher to push the coiled hot rod from said stripper plate.

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