July 27, 1943. M. H. FREEMAN 2,325,121

COIL HANDLING APPARATUS

Filed April 23, 1940 3 Sheets-Sheet 1

Fig. 1.

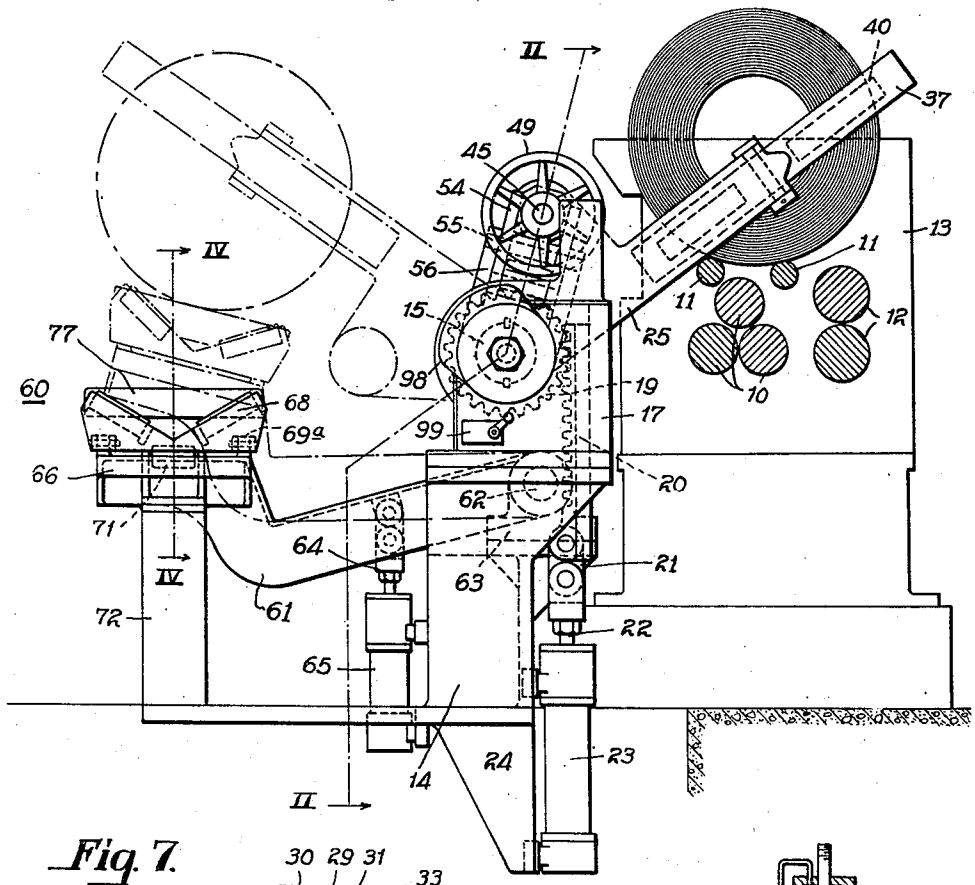
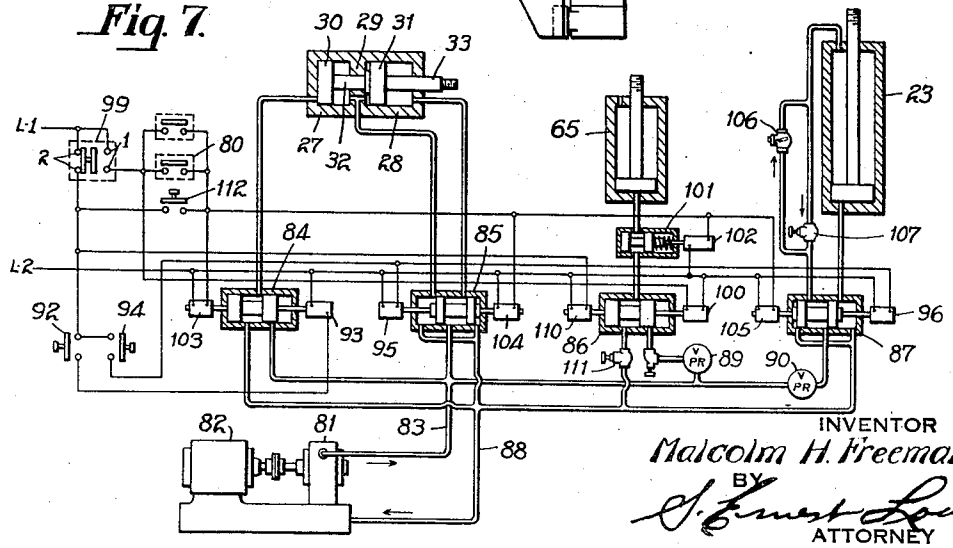


Fig. 7.



INVENTOR
Malcolm H. Freeman.
BY
J. Ernest Lewis.
ATTORNEY

July 27, 1943. M. H. FREEMAN 2,325,121

COIL HANDLING APPARATUS

Filed April 23, 1940 3 Sheets-Sheet 2

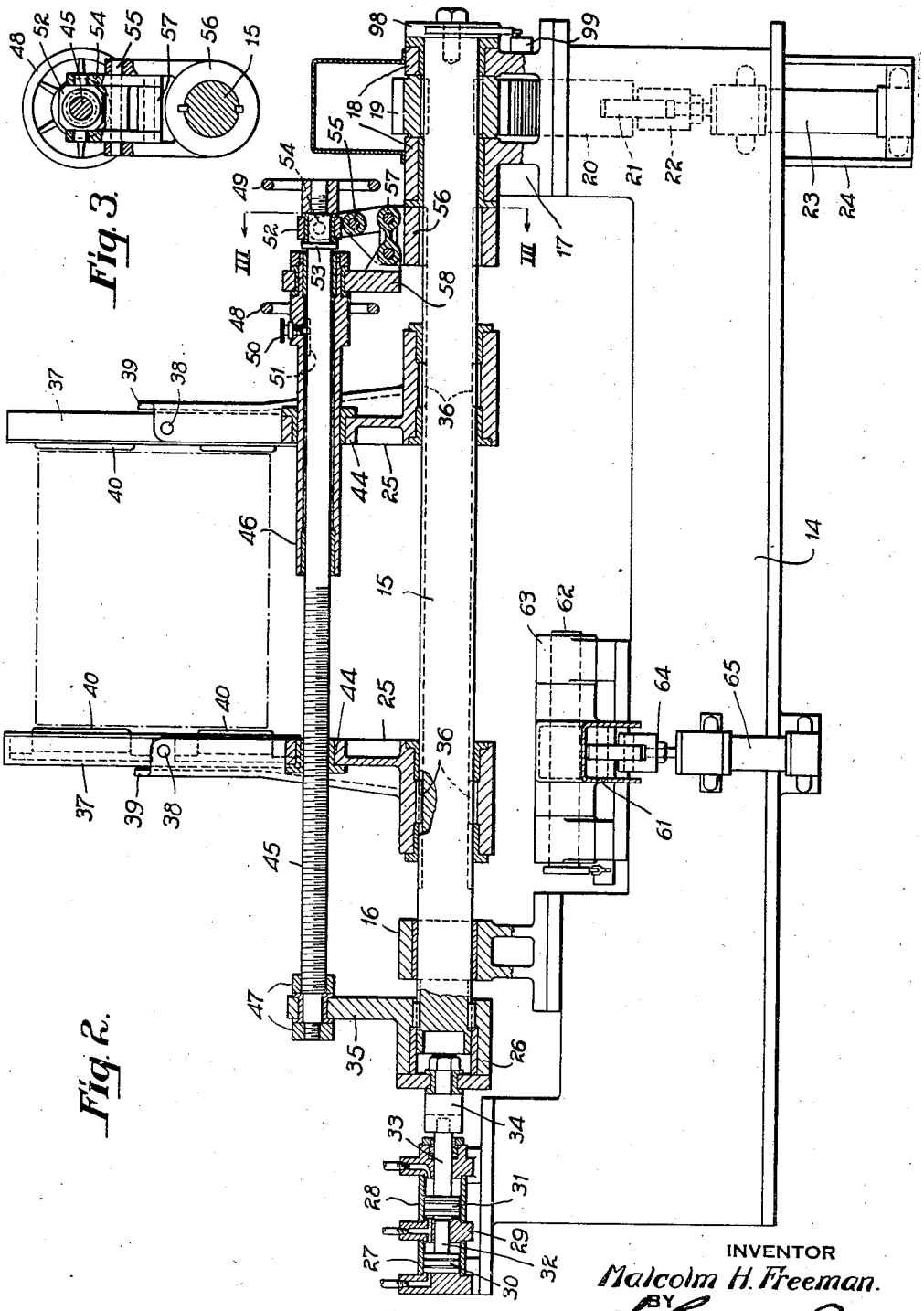


Fig. 3.

Fig. 2.

INVENTOR
Malcolm H. Freeman.
BY
O. Ernest Low.
ATTORNEY

July 27, 1943. M. H. FREEMAN 2,325,121

COIL HANDLING APPARATUS

Filed April 23, 1940 3 Sheets-Sheet 3

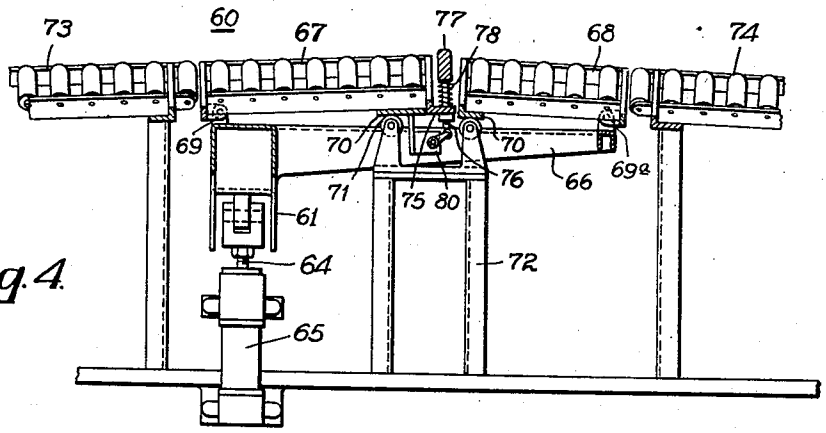


Fig. 4.

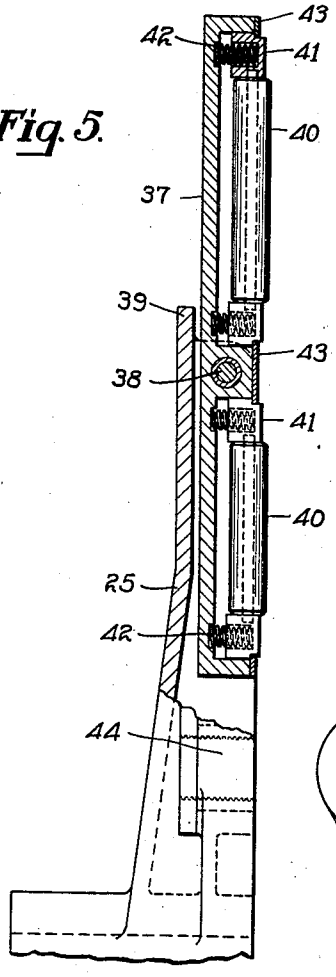


Fig. 5.

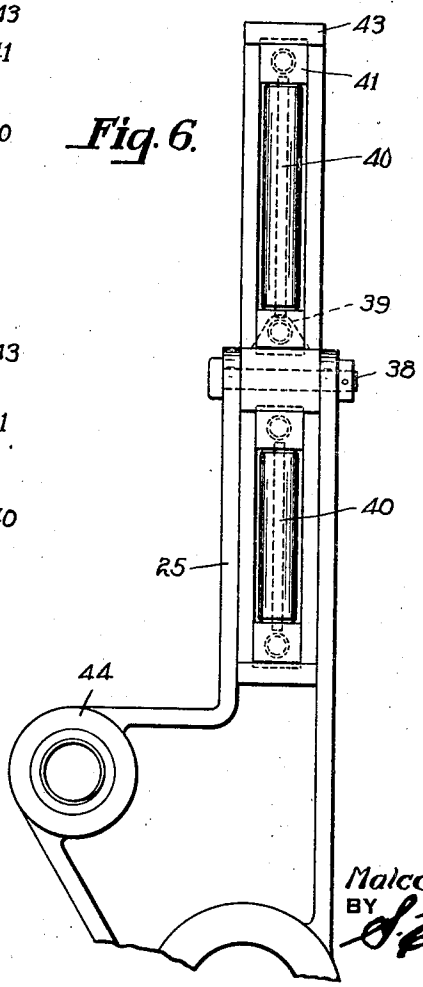


Fig. 6.

INVENTOR
Malcolm H. Freeman.
BY
S. Ernest Lee.
ATTORNEY

Patented July 27, 1943

2,325,121

UNITED STATES PATENT OFFICE

2,325,121

COIL HANDLING APPARATUS

Malcolm H. Freeman, Maryville, Tenn., assignor to Aluminum Company of America, Pittsburgh, Pa., a corporation of Pennsylvania

Application April 23, 1940, Serial No. 331,134

22 Claims. (Cl. 214—1)

My invention pertains to apparatus for handling and transferring work pieces and, while not necessarily so limited, is directed more particularly to a coil guide and unloader for a strip metal coiling machine.

In the art of processing strip metal, the strip is usually wound into coils to facilitate handling, feeding, and subsequent working or treatment of the metal. One type of coiler currently employed is provided with bending rolls that bend the strip and cause it to coil on itself in successive convolutions without using a reel or block or the like as is familiar to those versed in the art. Inasmuch as the coils vary both in width and diameter, the width of the coiler is necessarily great enough to accommodate the strips of maximum width; and since the forming coil rotates on supporting rolls or rods, a considerable amount of side movement or axial creeping is encountered, particularly during winding of the narrower strips. This creeping is liable to result in axial displacement of successive turns of the coil. Upon completion of the coiling operation the coil usually is ejected from the coiler by the action of a kick-out or ejector device which caused rapid discharge but often resulted in a damaged and deformed coil by reason of bouncing of the coil on the coil receiver, and sometimes the surfaces of the metal were badly scratched or otherwise marked, even interiorly of the coil, by reason of such rough handling. In the processing of highly polished and bright rolled strip, it is imperative that such marking of the metal be eliminated.

Some of the objects of my invention are to provide an improved unloader capable of removing the coils from such a coiling device rapidly and without in any way damaging or marking the surfaces of the metal; to provide means for yieldably engaging the ends of a forming coil, to guide and maintain the successive convolutions thereof in proper alignment; and to provide an upwardly movable coil receiver cooperating with the unloading device for relieving the same of its load at an elevated position so that the unloader can be returned to its position adjacent the coiler as quickly as possible.

A further object is to provide transfer mechanism having swinging clamping arms adapted to grip a coil at its ends and move it through an overhead arcuate path to a discharge position whereby flattening of the coil or surface marking of the metal is eliminated. Still another object is to provide a transfer device capable of handling coils or other bulky articles of various weights and sizes, which is positive in operation, wherein the articles are transferred at a predetermined speed unaffected by differences in weight, and which is generally of simplified and improved form.

A still further object is to provide improved control mechanism of simplified form for effecting automatic operation of the apparatus through a loading and unloading cycle.

Other objects and advantages of the invention will become apparent as the description proceeds, taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a side elevational view of a coil unloader disposed in cooperative relation with a coiler of the radial discharge type which is shown somewhat diagrammatically in section;

Fig. 2 is a view taken on the line II—II of Fig. 1;

Fig. 3 is a view taken on the line III—III of Fig. 2;

Fig. 4 is a view taken on the line IV—IV of Fig. 1;

Fig. 5 is a side view, on an enlarged scale, partly in section and partly in elevation, of one of the coil driving and clamping arms with its lower portion broken away;

Fig. 6 is a face view thereof; and

Fig. 7 is a schematic view showing the hydraulic operating mechanism and the electrical control system therefor.

Referring to the drawings illustrating the preferred embodiment of the invention, a conventional strip metal coiling device of the radial discharge type is provided with a group of bending rolls 10 arranged in pyramidal relation to impart a predetermined curvature to metal strip supplied thereto from any suitable source, whereby the strip is caused to curve upwardly and wind itself into a coil. During the coiling operation, the coil is supported on supporting rolls or rods 11 disposed above the bending rolls. As is usually the case, the exit roll of the bending roll group is adjustable relative to the apex roll thereof so that the curvature imparted to the strip can be varied, as desired. A pair of pinch rolls 12 may be employed to impart feeding movement to the strip. The rolls are journaled at their ends in spaced housings 13, and the bending rolls and pinch rolls are adapted to be driven in any suitable well known manner (not shown). Further description of the coiler is deemed unnecessary since it is well known to those versed in the art, and it per se forms no part of the present invention.

The coil transferring device is disposed behind the coiler and comprises a suitable supporting frame 14 extending transversely of the coiler. A horizontal rock shaft 15 is arranged with its axis parallel with the axes of the rolls of the coiler and is journaled adjacent its ends in spaced bearing blocks 16 and 17 that are secured to the frame 14. The block 17 is provided with axially spaced bearing portions 18 between which a gear 19, suitably secured to the shaft, is confined so as to prevent axial movement of the shaft. A vertically movable rack bar 20 is slidably supported in the block 17 and meshes with the gear 19. At its lower end the rack bar is connected through a link 21 with a piston rod 22 having an operating piston working within a cylinder 23, which is secured to a downwardly extending bracket 24 of the frame 14. Fluid pressure is admitted alternately to the opposite ends of the cylinder to reciprocate the rack bar, thereby turning the shaft 15 and swinging a pair of coil transferring members or arms 25 mounted thereon from a coil receiving position to a coil discharging position. a coil being thus carried through an overhead arcuate path as indicated in Fig. 1. Complete retraction of the piston in the cylinder 23 causes the arms 25 to be swung into position adjacent the coiler.

The shaft 15 projects beyond the bearing 16 and slidably supports a bracket 26 that has key connection with the shaft so as to be turned therewith (Fig. 2). Supported on the frame 14 in axial alignment with the shaft 15 is a hydraulic motor comprising two cylinders 27 and 28 arranged in tandem and separated by a dividing plate 29. Pistons 30 and 31 are disposed in the cylinders 27 and 28, respectively, and have attached thereto plungers or rods 32 and 33, respectively. The piston rod 33 extends through a packing gland in the cylinder end wall and is connected through a swivel 34 with the bracket 26, while the plunger 32 slidably extends through the plate 29 and abuts against the rear side of the piston 31 when it is retracted. The outermost cylinder 27 is shorter than the inner cylinder 28, thereby limiting the stroke of the respective pistons. The bracket 26 is provided with an arm 35 which is operatively connected to the members 25, by means hereinafter described, to move them simultaneously toward and away from each other, and said bracket is selectively moved inwardly toward the bearing 16, to move the members 25 first into guiding engagement with the ends of a forming coil and then into clamping engagement therewith preliminary to swinging movement for unloading.

The transfer members 25 are slidably mounted on the shaft 15 between the bearing blocks 16 and 17 and are fixed against rotation with respect to the shaft by keys or feathers 36 cooperating with elongated slots formed in the shaft, but any suitable non-rotatable sliding connection may be employed. Each member is of channel form in cross section and embraces a tilt bar 37 which forms an extension thereof. The bar 37 is radially supported at the outer end of the arm 25 on a pivot pin 38 for limited tilting movement relative to the arm, a lug extension 39 of the arm 25 limiting backward movement of the bar above the pivot. Elongated recesses or pockets are provided in the inner face of the bar 37 above and below the pivot pin 38, and disposed therein are elongated rollers 40 that are rotatably supported in end blocks 41 (Fig. 5). The blocks 41 are slidable within the pockets and are provided with springs 42 serving to maintain the rollers yieldably extended to their outermost position beyond the inner face of the bar. Cover strips 43 serve to retain the blocks in the recesses.

By reason of their spring mounting the rollers are adapted to yieldably engage the edges of a forming coil and to recede within the pockets in the bars 37 until flush with the inner opposed faces thereof when sufficient pressure is applied to the clamping members. The radially spaced guide rollers 40 are disposed at substantially diametrically opposite sides of the forming coil, as shown in Fig. 1. These rollers thus serve to prevent axial movement of any of the convolutions of the coil during formation of the coil, while their in and out movement in conjunction with rocking movement of the bars 37 accommodates any variations or irregularities in the width of the strip or unevenness at the ends of the coil.

The clamping members 25 are provided with rearwardly extending perforated bosses 44 (Figs. 1 and 6) that are provided with internal screw threads to receive therein a threaded rod 45, which is threaded for approximately one-half of its length, and an oppositely threaded elongated sleeve 46, respectively. The threaded end of the rod 45 is rotatably mounted in the arm 35 of the slide bracket 26 and suitably fixed against endwise movement as by means of nuts 47, and its unthreaded portion extends axially through the sleeve 46. Hand wheels 48 and 49 are secured to the adjacent ends of the sleeve 46 and the rod 45, respectively, whereby they may be rotated independently of each other to adjust the clamping members relative to the longitudinal center line of the coiler and relative to each other as required in accordance with the position of the strip as fed to the coiler. A spring pressed detent or latch 50 normally connects the sleeve 46 with the rod 45 for rotation in unison therewith, whereby the clamping members may be simultaneously moved in opposite directions for effecting greater or lesser spread therebetween to accommodate strips of various width, without disturbing their adjustment relative to the center line of the coiler. The inner end of the detent 50 operates in an elongated slot 51 in the rod 45 to permit relative axial movement between the sleeve and the rod. Of course, the detent is withdrawn to permit independent adjustment of the clamping members. If desired, shaft 45 may be motor driven to facilitate and increase speed of adjustment of clamping members 25. For this purpose the extreme end nut 47 (Fig. 2) may be replaced by a gear in mesh with a suitable motor driven transmission.

It will be apparent from an inspection of Fig. 2 that when fluid pressure is admitted behind the piston 30 the bracket 26 will be moved inwardly on the shaft 15 a distance equal to the stroke of the piston, and that the rod 45 also will be shifted to the right the same distance, thus moving its clamping member 25 inwardly to bring its rollers 40 into guiding engagement with the forming coil. The members 25 are normally adjusted to such a position that when the pistons 30 and 31 are fully retracted the rollers will not engage the edges of the strip but will be sufficiently close thereto as to be moved into guiding engagement therewith when actuated by the short stroke piston 30. In order simultaneously to move the other clamping member inwardly, I provide a thrust collar 52 which is confined between a

shoulder 53 and the hub of the hand wheel 49 on the rod 45, which collar has pivotal connection through trunnions with the upper end of a yoke lever 54. The lever 54 is pivoted at 55 to a supporting or fulcrum bracket 56 secured to the shaft 15, and at its lower end it has connection through a link 57 with a thrust plate 58 which is fixed to the outer wall of the sleeve 46, whereupon, through the connections just described, when the rod 45 is moved to the right, for example, the lever 54 is turned in a clockwise direction, thereby forcing the sleeve 46 toward the left to move its clamping member 25 inwardly (Fig. 2). In this manner the members 25 are simultaneously moved inwardly or contracted a predetermined distance into coil guiding position.

After coiling is completed, fluid pressure is admitted between the pistons 30—31, which results in further contraction of the members 25 to clamp or grip the coil endwise therebetween. Fluid pressure is then admitted to the lower end of cylinder 23 to elevate the rack bar 20, thereby turning shaft 15 and swinging the members 25, the coil being lifted from the supporting rolls 11 and carried to a coil discharging position located approximately diametrically opposite the coiler. The coil is then released by expanding the arms 25 by admitting fluid pressure to the front side of the piston 31. Thereafter, the arms are swung back into position adjacent the coiler by reversing pressure flow to the cylinder 23. The coil thus deposited on a transversely disposed receiving table 60 of the gravity conveyor type at the discharge position is free to gravitate to any desired point. Thus it will be seen that the coil is moved in a generally vertical direction to or from its support when loading or unloading, thereby eliminating dragging movement which might damage the surfaces of the metal, and further that bouncing of the coil is eliminated.

In order to relieve the arms of their load and permit them to be returned to the coiler to receive and guide a succeeding strip without undue delay, a portion of the coil receiver or table 60 preferably is arranged to be moved upwardly to intercept the downwardly moving coil carried by the arms 25. A rearwardly extending beam 61 is provided with a cross shaft 62 which is suitably supported in bearings 63 secured to the frame 14 at a point below and forwardly of the shaft 15. The beam has link connection with a piston rod 64 that is provided with a piston working in a vertical cylinder 65. At its outer end the beam is provided with a lateral rectangular extension 66 (Fig. 4). The movable portion of the table 60 is composed of two short sections of roller beds 67 and 68 arranged in end-to-end relation and pivotally connected at 69 and 69a to the opposite ends of the extension 66, the roller sections 67 and 68 being adapted for tilting relative to the extension. Lower cross bars 70 are mounted on the inner ends of the roller beds 67 and 68 and engage rollers 71 that are supported on the upper end of a vertical stand 72. The rollers project above the plane of the extension 66 sufficiently to hold the inner ends of the roller beds slightly elevated with respect to the outer ends thereof when the table is in lowered position so that a coil or coils thereon can gravitate onto gravity roller conveyors 73 and 74 disposed in alignment with the roller beds. The inner end of the roller bed 67 is so disposed relative to the center line of the coiler that all single coils will gravitate toward the left as viewed in Fig. 4, while divided coils may gravitate in both directions. When the table is raised the roller beds 67—68 are declined toward their inner ends, thus retaining a coil thereon until the table is lowered into registry with the conveyors 73 and 74.

An angle bar 75 is secured to the inner end of the roller bed 67, and through the horizontal flange thereof extends a pair of vertical rods 76 carrying a cross bar 77 at their upper ends. Springs 78 encircle the rods and yieldably maintain the bar elevated with respect to the plane of the roller bed. As the coil receiver is being lifted, the bar 77 is adapted to be depressed by engagement with a downwardly moving coil to actuate a limit switch 80 carried by the roller bed 67 in position to be engaged by one of the rods 76. Actuation of the switch 80 automatically controls the operation of the lifting table, the release of the coil, and the return of the arms 25 to position adjacent the coiler as hereinafter described.

Referring to Fig. 7, showing schematically the hydraulic operating system and the electrical control circuits therefor, a pump 81 driven by a motor 82 supplies fluid under pressure to a pressure line or conduit 83 that is connected to a plurality of control valves 84, 85, 86, and 87. An exhaust of return line or conduit 88 is also connected to the control valves and leads to the low pressure side of the pump or to a suitable sump therefor. These valves are of well known three-way and four-way types and are solenoid operated to their forward and reverse positions, respectively, two solenoids being provided for each valve. The valves are normally in the forward or reverse position but never in a neutral position, even though both solenoids are de-energized. Thus electrical current needs to flow through one solenoid just long enough to actuate the hydraulic valve, and the valve remains in this position after the circuit is broken until a current is supplied to the other solenoid to actuate the valve to its other position.

The valves are normally in the positions shown in Fig. 7, and it will be seen, therefore, that pressure is admitted through valve 87 to the upper end of the cylinder 23 so that the transfer arms 25 are held in their full line position (Fig. 1) over the coiling rolls; the lifting cylinder 65 is open to the exhaust line 88 through valve 86 and the table 60 is in its lowered position; while the pressure in cylinders 27 and 28 behind pistons 30 and 31 is exhausted through valves 84 and 85, respectively, and pressure applied through valve 85 to the front of piston 31 in cylinder 28, whereby the arms 25 are held in expanded or outer position with respect to the strip to be coiled. It is pointed out that full pressure is supplied to the cylinders 27—28 but pressure relief valves 89 and 90 are provided between the pressure line 83 and the valves 86 and 87, respectively, of the lifting cylinder 65 and the swinging cylinder 26, respectively. Relief valve 89 is set at approximately 85 per cent of the pump pressure, while relief valve 90 is set at approximately 65 per cent of the pump pressure. Thus, sequential operation is effected for the pistons in the cylinders 27—28 with respect to the pistons of the other cylinders, whereby the transfer arms 25 are moved into and out of clamping engagement with a coil prior to swinging movement thereof, and further assuring that the clamping pressure be maintained at all times to prevent accidental dropping of the coils. With the apparatus thus disposed in coil receiving position and with the transfer arms 25 initially adjusted manually to accommodate the width of the strip being coiled,

the operation in guiding and unloading is as follows:

The push button switch 92 is depressed momentarily and current flows from a supply line L1 through solenoid 93 of the valve 84 to line L2. The valve 84 is shifted to the right to its forward position to cut off exhaust to the rear of piston 30 and to admit pressure from the line 83 thereto. The pressure in front of piston 31 in the cylinder 28 is not cut off at this time so that pistons 30 and 31 are oppositely subjected to pressure, but the difference in force created by the area of the piston rod 33 causes both pistons to move inwardly to an intermediate position. This movement is transmitted through the bracket 26 and rod 45 to one arm 25 and through lever 54 and sleeve 46 to the other arm 25. Thus the arms are moved inwardly simultaneously into coil guiding position with the rollers 40 yieldably engaging the forming coil. However, in the coiling of some classes of strip material it will not be necessary to guide them, in which case the switch 92 will not be depressed.

After completion of the coiling operation, the operator will depress the push button switch 94 momentarily which results in energizing the solenoids 95 and 96 of the valves 85 and 87. These valves will substantially simultaneously be actuated. Valve 85 is moved to the left and connects the front side of the piston 31 to the relief or exhaust line 88 and also admits pressure to a point intermediate the pistons 30—31. The piston 31 moves inwardly its full stroke to move the members 25 inwardly to clamp the coil at its ends therebetween. After the pressure is built up in the cylinder 28 to exceed the pressure of the relief valve 90, then pressure is exerted beneath the piston in the swinging cylinder 23 to cause the arms to swing towards coil discharging position. During initial swinging movement, a cam 98 which is secured to the shaft 15 actuates a limit switch 99. The limit switch 99 is provided with a normally open circuit 1 and a normally closed circuit 2. Switch 99 is actuated after the arms have traveled through any desired part of their stroke and closes circuit 1 and opens circuit 2. Closure of circuit 1 causes the solenoid 100 of the valve 86 to be energized, and valve 86 is moved to the right and admits fluid pressure to the underside of the piston in the lifting cylinder 65. This pressure is admitted past a normally open valve 101 which is provided with a spring to maintain it in open position and with a solenoid 102 to move it against the pressure of the spring to closed position. At this time the solenoid 102 is de-energized and the valve, therefore, is in open position and the table 60, therefore, is moved upwardly. The upward movement of the table 60 is so timed that it intercepts a coil while it is being moved downwardly by the transfer arms 25. When the coil and receiving table meet at such elevated position, the coil depresses the bar 77 and actuates the limit switch 80, which in turn operates the solenoids 103, 104, 102, and 105 of the valves 84, 85, 101, and 87, respectively. These valves are actuated to their opposite positions, the valve 101 being thus closed to cut off pressure flow to the lifting cylinder 65, thereby to stop the upward movement of the table 60. By the operation of the valves 84, 85, and 87 fluid pressure is admitted to the front side of the piston 31 while pressure is exhausted from behind this piston and piston 30. The clamping arms 25 are, therefore, drawn apart or expanded relative to the ends of the coils, thus releasing the coil prior to retractive swinging movement of the arms which is effected by admitting fluid pressure to the upper end of the cylinder 23 and connecting its lower end to the exhaust line 88 by the operation of the valve 87. Here again it is pointed out that the release of the coil is effected prior to swinging movement of the arms by the provision of the relief valve 90.

The arms are returned to normal position adjacent the coiler rapidly by permitting flow of pressure fluid past a check valve 106 in the direction of the arrow, as shown in Fig. 7, the fluid thus flowing around needle control valve 107. The valve 107 is provided to control the exhaust from the upper side of the cylinder 23, thereby to control the rate of swinging movement of the arms toward discharge position. It will be seen from an inspection of Fig. 1 that normally after the arms and the coil carried thereby move across a plane extending vertically through the axis of the shaft 15 that the descending movement of the coil would be accelerated by gravity. Such acceleration, however, is prevented by controlling the exhaust from the upper side of the cylinder 23, the needle valve 107 preferably being adjusted to permit substantially the same rate of downward movement of the coil as is effected during upward movement thereof.

During retractive swinging movement of the arms 25 the cam 98 moves away from the switch 99 and it opens circuit 1 and closes circuit 2, and the solenoids 102, 103, 104, and 105 de-energize. The valve 101 is thereby permitted to be moved to its normal open position under influence of its operating spring. At substantially the same time, closure of circuit 2 of the switch 99 energizes solenoid 110 of the valve 86, which valve operates to permit the exhaust from the lower side of the lifting cylinder 65, a needle valve 111 controlling the rate of lowering movement of the table 60. As the table moves into registry with the conveyors 73 and 74, the plates 70 of the roller beds 67 and 68 engage the rolls 71 and the roller beds are lifted thereby so that the coil gravitates down the conveyor 73. The bar 77 is thereby released and it moves upwardly under influence of the springs 78, and the limit switch 80 is returned to normal open position. This completes the cycle of unloading movement.

A push button switch 112 is provided and is used only in case it is desired to move the arms 25 out of guiding engagement with a coil during the coiling operation. Operation of switch 112 operates the solenoid 103 of the valve 84 so as to move it to position to exhaust pressure from the rear side of the piston 30, whereupon the fluid pressure in front of piston 31 moves the arms to coil releasing position.

It will be seen from the foregoing description of operation that the operator is required merely to actuate the push button 92 for guiding each coil or set of split coils during coiling thereof, and thereafter operates the push button 94 to effect initiation of a clamping and unloading cycle, which cycle is completed automatically by operation of the mechanically operated limit switches.

It will be understood, of course, that the particular use described is exemplary only of one situation to which my invention is particularly adaptable, and that changes in the construction and operation of various of the parts of the apparatus may be made without departing from the invention as particularly pointed out in the appended claims.

I claim:

1. In a transferring apparatus, in combination, a pair of opposed transferring members mounted for swinging movement on a horizontal axis, manually operable adjusting means carried by said members for moving them along said axis toward and away from each other to vary the spread therebetween to a preselected distance, means for swinging said members about said axis, to move a work piece carried by said members in an overhead arcuate path, a receiving station and a discharge station located at opposite ends of said arcuate path, and reciprocable means connected to said adjusting means for moving said members axially from their adjusted positions into and out of clamping engagement with the end of the work piece.

2. In a coil transferring apparatus, in combination, a pair of opposed coil transferring members mounted for swinging movement on a horizontal axis, means for swinging said members in an overhead arcuate path between a receiving station and a discharge station located at opposite sides of said axis respectively, means for moving said members simultaneously into clamping engagement with the ends of a coil at said receiving station, and means located at the discharge station and actuated in response to delivery of the coil at said discharge station to operate said last named means to release the coil.

3. In a coil transferring apparatus, in combination, a pair of opposed coil transferring members mounted for swinging movement on a horizontal axis, means for swinging said members in an overhead arcuate path between a receiving station and a discharge station located at opposite sides of said axis respectively, said members being normally positioned adjacent said receiving station, means for moving said members simultaneously into clamping engagement with the ends of a coil at said receiving station, control means for the said moving means and the said swinging means operable to release the coil and to return said members to normal position, and means actuated in response to delivery of the coil to said discharge station to actuate said control means.

4. In a coil transferring apparatus, in combination, a pair of opposed coil transferring members mounted for swinging movement on a horizontal axis, means for swinging said members in an overhead arcuate path between a receiving station and a discharge station located at opposite sides of said axis respectively, said members being normally positioned adjacent said receiving station, means for moving said members simultaneously into clamping engagement with the ends of a coil at said receiving station, control mechanism for the said moving means and the said swinging means operable to release the coil and to return said members to normal position, means actuated in response to delivery of the coil to said discharge station to actuate said control mechanism, and means included in said control mechanism for effecting release of the coil in advance of return movement of said members to normal position.

5. In a coil transferring apparatus, in combination, a pair of opposed coil transferring members mounted for swinging movement on a horizontal axis, means for swinging said members in an overhead arcuate path between a receiving station and a discharge station located at opposite sides of said axis respectively, means for moving said members axially into and out of clamping engagement with the ends of a coil, control mechanism for controlling the operation of said swinging means and said moving means and normally operative to maintain said members in expanded position adjacent said receiving station, means for actuating said mechanism to initiate a transferring cycle whereby said members are moved into clamping engagement with a coil at said receiving station and swung toward said discharge station, depressible means at said discharge station and actuated by delivery of the coil thereto for actuating said mechanism to release the coil and return said members to normal position, and means included in said control mechanism for effecting operation of said moving means in advance of operation of said swinging means.

6. In apparatus for unloading a three-roll coiler, a pair of opposed coil engaging members mounted for swinging movement on a horizontal axis disposed transversely of and in rearwardly spaced relation to said coiler, and normally extended diametrically across the ends of a coil forming on said coiler, means for moving said members into engagement with the coil, separate means for imparting swinging movement to said members to move the coil upwardly and away fro the coiler and means positioned to receive the coil from said members.

7. In apparatus for unloading coils from a three-roll coiler, a pair of opposed coil engaging members mounted for swinging movement on a horizontal axis disposed transversely of and in rearwardly spaced relation to said coiler, said members extending radially from said axis across the ends of a coil forming on said coiler, means for moving said members simultaneously and through equal distances into guiding engagement with the ends of the coil forming on said coiler, additional means operative to move said members into clamping engagement with the formed coil, means independent of said moving means to impart swinging movement to said members, and means positioned to receive the coil from said members.

8. A coil unloader arranged to transfer coils from a three-roll coiler to a coil conveyor disposed rearwardly thereof, comprising in combination with said conveyor a pair of coil engaging members mounted for swinging movement on a horizontal axis disposed intermediate said coiler and said conveyor, said members extending radially from said axis across the ends of a coil forming on said coiler, means for moving said members toward each other to engage the coil therebetween, and means for swinging said members to transfer the coil engaged thereby to said conveyor.

9. In a coil transferring apparatus, in combination, a coil support, a coil receiver disposed behind said support, means movable into clamping engagement with a coil on said support and adapted to move the same in an arcuate path extending upwardly adjacent the support and downwardly adjacent said receiver, and means for moving said receiver upwardly in an intercepting path to relieve said coil from said first-named means at an elevated point.

10. In a transfer apparatus, in combination, a conveyor, a vertically movable coil receiver normally in registry with said conveyor, for movement of the material received thereby onto said conveyor, a pair of coil engaging arms mounted for swinging movement on a horizontal axis dis-

posed adjacent said receiver, means for moving said arms toward each other to engage a coil therebetween, means for swinging said arms to transfer the coil engaged thereby toward said receiver, and means operable during said swinging movement for moving said receiver upwardly to receive said coil from said arms at an elevated position with respect to said conveyor.

11. In a coil transferring apparatus, in combination, a coil conveyor, a vertically movable coil receiver normally in registry with said conveyor, a pair of coil engaging arms mounted for swinging movement on a horizontal axis disposed adjacent said receiver, means for moving said arms toward each other to engage a coil therebetween, means for swinging said arms to transfer the coil engaged thereby toward said receiver, means operable during said swinging movement for moving said receiver upwardly to receive said coil from said arms at an elevated position with respect to said conveyor, said coil receiver including two roller-bed sections in end-to-end relation and pivotally connected at their outer ends to the upper side of said receiver for tilting movement relative thereto, and means for elevating the inner ends of said roller beds with respect to their outer ends when the receiver is in lowered position, whereby to effect gravitation of a coil thereon to said conveyor.

12. In a transfer mechanism for unloading coils from a three-roll coiler, in combination, a trasverse gravity conveyor disposed rearwardly of the coiler, a vertically movable coil receiver normally in registry with said conveyor, for movement of a coil delivered thereto to said conveyor, a pair of coil engaging arms mounted for swinging movement on a horizontal axis disposed intermediate said coiler and said receiver, means for moving said arms toward each other to engage a coil therebetween, means for swinging said arms to transfer the coil engaged thereby toward said receiver, means operable during said swinging movement for moving said receiver upwardly to receive said coil from said arms at an elevated position with respect to said conveyor, depressible means carried by said receiver in position to be actuated through engagement with said coil, and means operable in response to actuation of said depressible means for effecting release of the coil at said elevated position and return of said arms to a position adjacent said coiler.

13. In mechanism for guiding and unloading coils formed on a three-roll coiler, the combination of a pair of swinging coil transferring arms normally disposed above the supporting rolls of the coiler and extending diametrically across the ends of a coil forming thereon, a coil receiver positioned behind said coiler in position to receive a coil transferred by said swinging arms, pressure actuated means operatively connected with said arms for selectively moving them inwardly into guiding and clamping engagement respectively with a coil, to guide the successive convolutions during formation of the coil and to clamp the coil after its formation, and a resiliently mounted roller carried by each arm in position to yieldingly engage the forming coil at one side of its axis.

14. In mechanism for guiding and unloading coils formed on a three-roll coiler, the combination of a pair of swinging coil transferring arms normally disposed above the supporting rolls of the coiler and extending diametrically across the ends of a coil forming thereon, a coil receiver positioned behind said coiler in position to receive a coil transferred by said swinging arms, pressure actuated means operatively connected with said arms for selectively moving them inwardly into guiding and clamping engagement respectively with a coil, to guide the successive convolutions during formation of the coil and to clamp the coil after its formation, a tilt bar pivotally mounted on the outer end of each arm, and rollers disposed at opposite sides of the bars' pivot in position to engage diametrically opposite portions of the coil, said rollers being yieldably mounted and adapted to recede into flush relation with the bars when clamping pressure is applied to the said arms.

15. In a coil transferring apparatus, in combination, a horizontal rock shaft, a pair of opposed coil clamping members slidably mounted on said shaft and fixed against rotation relative thereto, means operatively connected to said members for simultaneously moving them axially into and out of clamping engagement with the ends of a coil, a cylinder having a piston working therein, means connecting said piston to said shaft for imparting rocking movement to the shaft, means for admitting pressure fluid to one end of said cylinder, whereby to swing said members and a coil carried thereby upwardly and over the axis of said shaft and downwardly toward a discharge station, and an adjustable valve for automatically controlling flow of fluid from the other end of said cylinder, whereby to limit the rate of downward movement of the said members under the weight of the coil.

16. In a coil transferring apparatus, in combination, a horizontal rock shaft, a pair of opposed arms slidably mounted on said shaft and fixed against rotation relative thereto, means operatively connected with said shaft to turn the same and impart swinging movement to said arms in an overhead arcuate path between a receiving station and a discharge station located at opposite sides of said shaft, a shiftable member carried by each arm in screw threaded engagement therewith and arranged parallel with said shaft, a pivoted lever connecting said members to transmit movement from one member to the other in opposite directions, so as simultaneously to move said arms along said shaft into or out of clamping engagement with a coil by reciprocation of one of said members, and a cylinder disposed axially of said shaft and having a piston operatively connected to one of said members to reciprocate the same and actuate said arms.

17. Guiding and unloading apparatus for coils formed an a three-roll coiler, comprising a horizontal rock shaft disposed behind the coiler and parallel with the bending rolls thereof, a pair of coil engaging arms slidably supported on said shaft and fixed against rotation relative thereto, a shiftable member carried by each arm in screw threaded engagement therewith and arranged parallel with said shaft, a pivoted lever connecting said members to transmit movement from one member to the other in opposite directions, so as simultaneously to move said arms toward or away from each other, a pair of cylinders of different lengths disposed co-axially of said shaft, a piston in the inner cylinder and operatively connected to one of said members to shift the same inwardly, whereby to force said arms into clamping engagement with a coil, a piston in the outer cylinder and having a plunger engageable with the inner piston to move it in-

wardly a lesser distance, whereby to move said arms into guiding engagement with the forming coil, and means for rocking said shaft to swing said arms and a coil clamped therebetween to a discharge station.

18. Guiding and unloading apparatus for coils formed on a three-roll coiler, comprising a horizontal rock shaft disposed behind the coiler and parallel with the bending rolls thereof, a pair of coil engaging arms slidably supported on said shaft and fixed against rotation relative thereto, a spring pressed roller on the outer end of each arm, means for rocking the shaft to swing said arms and the coil clamped therebetween to a discharge station, and means for moving said arms into coil guiding and coil clamping positions selectively comprising a sleeve in screw threaded engagement with one arm, a rod extending axially through said sleeve and having screw threaded engagement with the other arm, thrust members rotatably mounted on the adjacent ends of the sleeve and the rod respectively, a fulcrum member carried by said shaft, a yoke lever pivoted to said fulcrum member and rotatably connected at opposite ends to said thrust members whereby said sleeve and said rod are simultaneously moved in opposite directions by reciprocation of said rod, a pair of cylinders disposed co-axially of said shaft, a piston in the inner cylinder and operatively connected to said rod, and a piston in the outer cylinder and having a plunger extending into the inner cylinder to abut the piston therein when it is retracted, the stroke of the outer piston being less than the stroke of the inner piston, whereby the outer piston is operated to move the said rollers on said arms into guiding engagement with the coil and the inner piston is operated to force the arms into clamping engagement with the coil.

19. The combination as set forth in claim 18, wherein said sleeve and said rod are provided with hand wheels whereby they may be rotated to adjust the arms relative to each other and relative to the coiler, and provided with an interconnecting latch operable to permit said adjustment of the arms either individually or in unison.

20. In a coil transferring apparatus, in combination, a substantially horizontal support on which a coil is supported on its side, a coil receiver in spaced relation to said support, a shaft intermediate said support and said receiver with its axis paralleling the axis of said coil, a pair of transfer arms slidably mounted on said shaft and fixed against rotation relative thereto, said arms extending radially from said shaft across the ends of said coil, means connected to said arms in offset relation to said shaft for simultaneously moving the arms along said shaft toward each other to clamp the coil therebetween, and means including reversible driving means operatively connected to said shaft for swinging said arms between said support and said receiver to transfer the clamped coil from the support to the receiver.

21. In a transfer apparatus, in combination, a pair of opposed transferring members mounted for swinging movement on a horizontal axis and adapted for relative movement along said axis, means including a power cylinder for swinging said members about said axis, to move a work piece carried by said members in an overhead arcuate path, a receiving station and a discharge station located at opposite ends of said arcuate path, means for moving said members axially into and out of clamping engagement with said work piece, and means cooperating with said power cylinder for automatically limiting the rate of movement of said members and said work piece under gravity acceleration during downward movement thereof from upper center to said discharge station.

22. In a transfer apparatus of the class described, a pair of opposed transfer members mounted for swinging movement on a horizontal axis, means for actuating said members into and out of clamping engagement with a work piece disposed therebetween, fluid pressure actuated driving means for swinging said members about said axis, to move said work piece in an overhead arcuate path from a receiving station to a discharging station located at opposite ends of said arcuate path, and means actuated by said driving means for automatically limiting gravity acceleration of said members and said work piece carried thereby during the downward portion of travel thereof toward said discharge station.

MALCOLM H. FREEMAN.