

June 15, 1937.

S. NYBERG

2,083,660

MILL ENTRY BOX

Filed Jan. 5, 1934

3 Sheets-Sheet 1

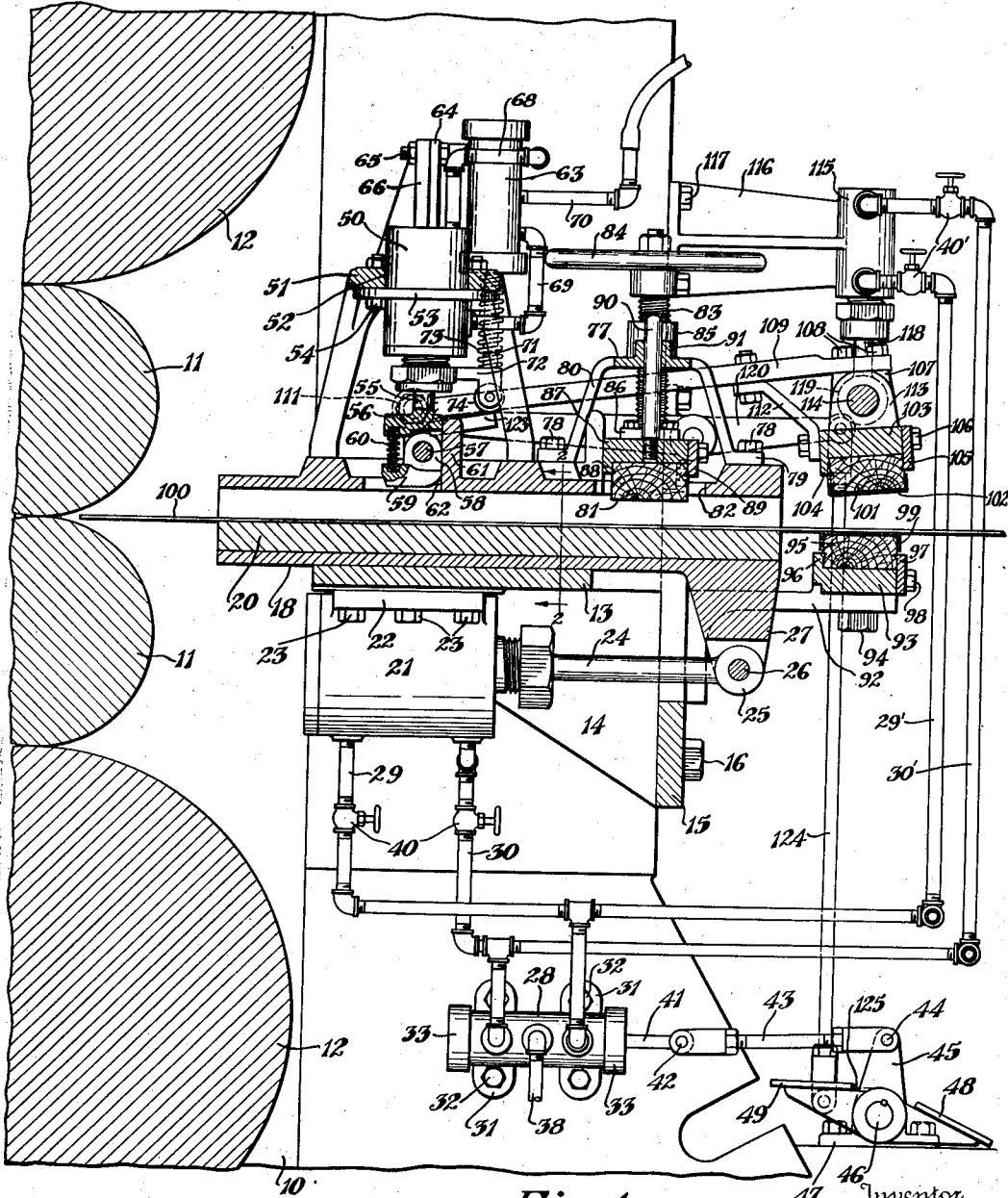


Fig. 1

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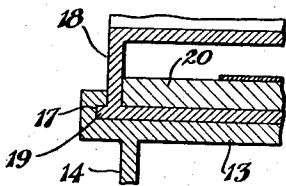


Fig. 2

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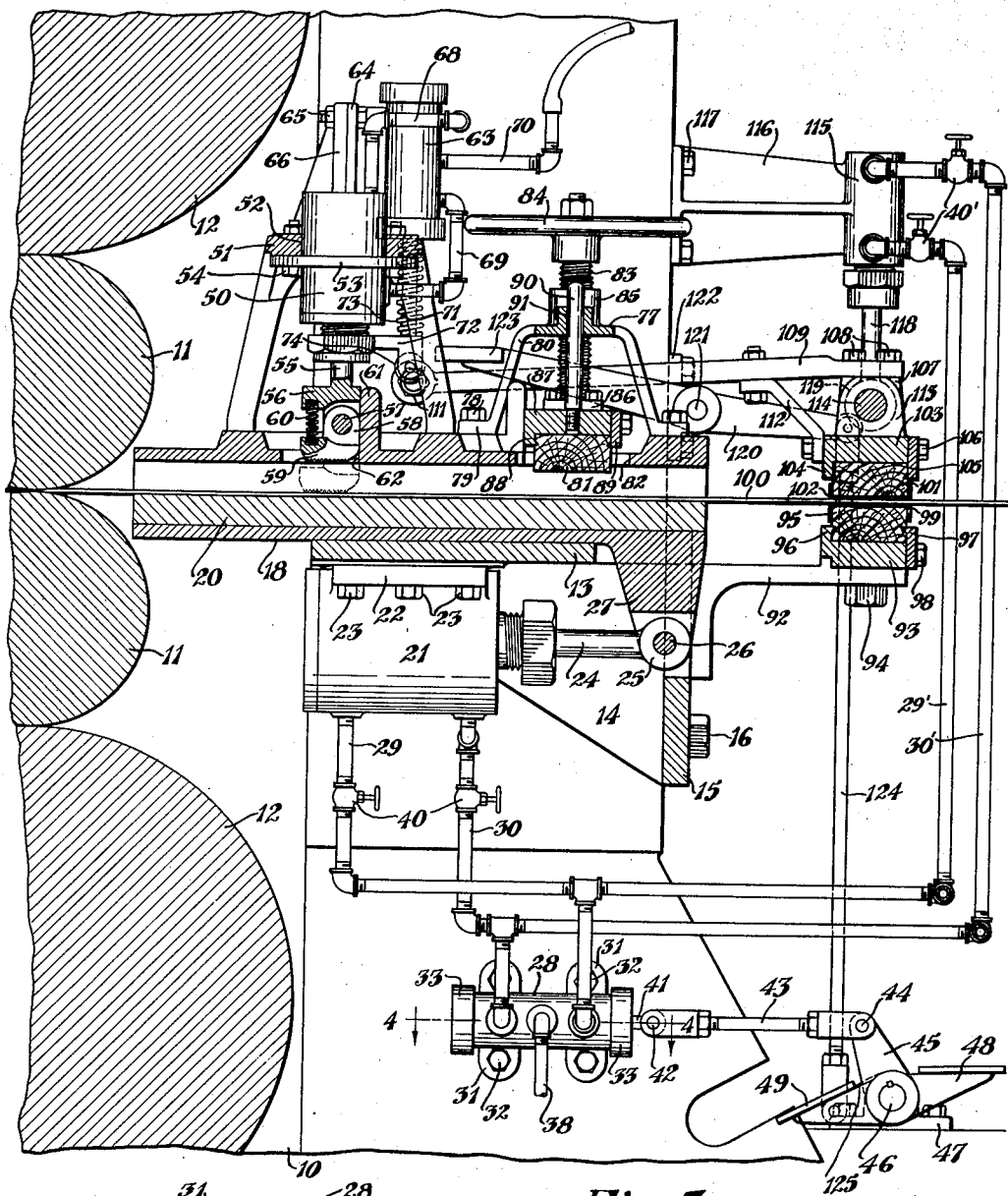


Fig. 3

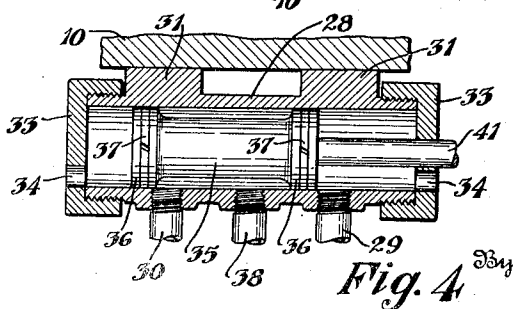


Fig. 4

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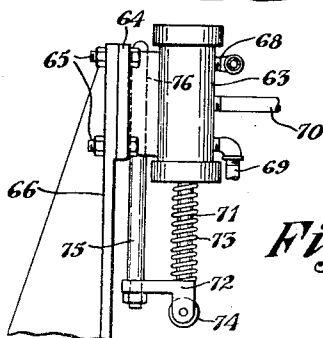
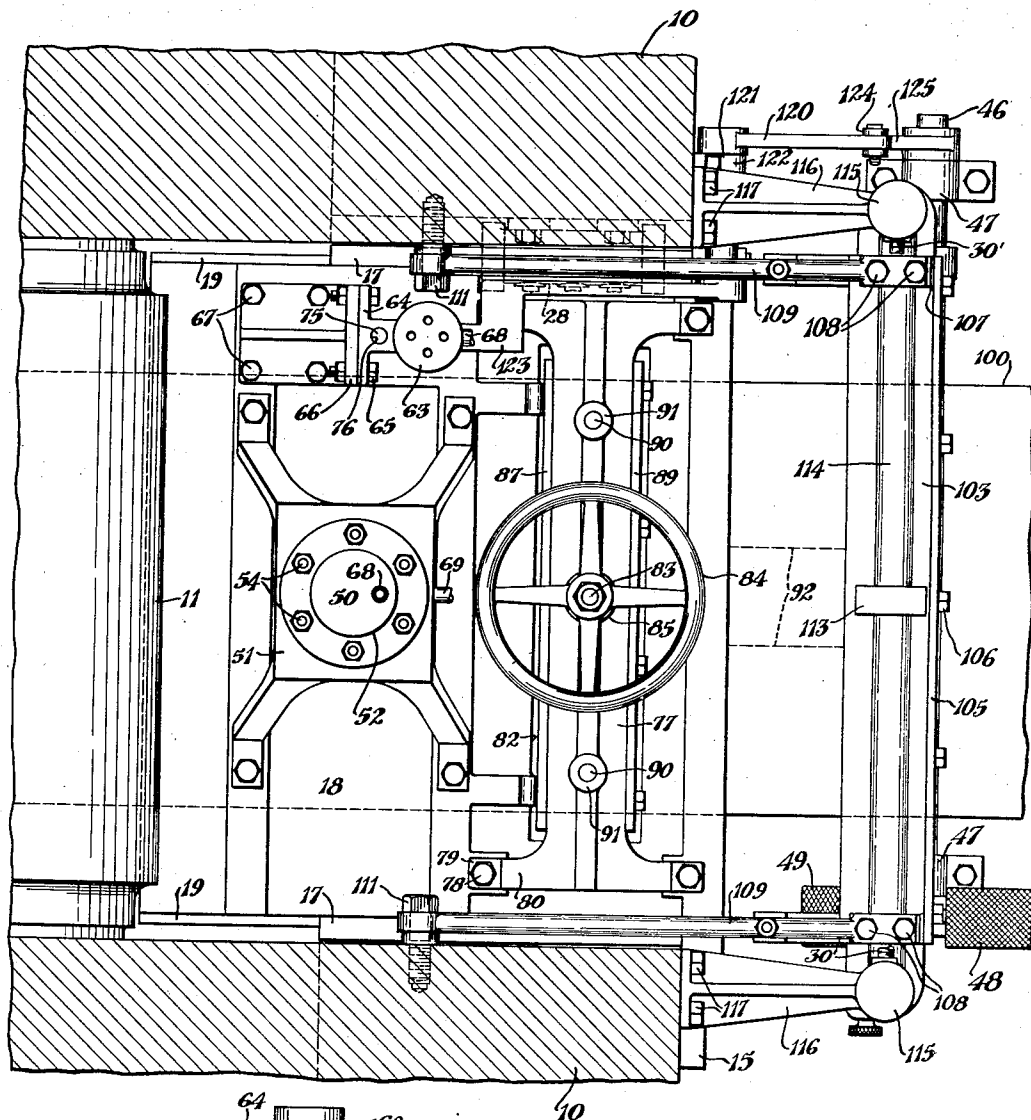
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,083,660

MILL ENTRY BOX

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Application January 5, 1934, Serial No. 705,384

10 Claims. (Cl. 80—43)

The invention relates to guide means for inserting the ends of metal strips or sheets into the bite of the rolls of rolling mills and is more especially adapted for use upon cold rolling mills for the rolling of strips or sheets of steel and the like, and more particularly upon roughing mills or mills for cold rolling strips or sheets of heavy gauge metal.

In the cold rolling of metal strips and sheets and especially where heavier gauges of metal are being worked or where the strips or sheets are passed through the roughing mill, considerable difficulty is experienced in inserting the end of the strip or sheet into the bite of the rolls of the mill and it frequently requires the services of several workmen and a considerable amount of time to start a new strip or sheet through the mill.

The object of the present improvement is to provide a traveling guide box by means of which the end of a strip or sheet may be quickly and easily guided into the bite of the rolls of the mill.

A further object of the improvement is to provide a cylinder operated guide box over which the end portion of the strip or sheet is adapted to be placed, a cylinder operated gripper being carried by the guide box and adapted to grip the strip or sheet tightly upon the guide box at the instant the guide box is moved toward the rolls of the mill and to automatically release the strip or sheet as the end thereof is inserted into the bite of the rolls.

Another object is to provide a cylinder operated wiper arranged to be moved into operative position simultaneously with the operation of the guide box and gripper.

A still further object is to provide a gripper which will automatically release the strip or sheet as soon as the end of the same is received into the bite of the rolls, in event of failure of the gripper cylinder to release the gripper at the proper time.

The above, together with other objects which will be apparent from an inspection of the drawings and the following description, or which may be later pointed out, may be attained by constructing the mill entry box in the manner illustrated in the accompanying drawings, in which

Figure 1 is a vertical sectional view of the improved mill entry box applied to a four-high roughing mill, showing the parts in the initial position with a strip or sheet in position to be gripped and entered into the bite of the rolls;

Fig. 2, a detail sectional view of a portion of the guide for the traveling guide box, taken as on the line 2—2, Fig. 1;

Fig. 3, a section similar to Fig. 1, showing the parts in the operative position;

Fig. 4, a detail section of the valve which controls the travel cylinder and the wiper cylinders, taken as on the line 4—4, Fig. 3;

Fig. 5, a detail elevation of the valve which controls the gripper cylinder; and

Fig. 6, a plan view of the entry box.

Similar numerals refer to similar parts throughout the drawings.

Portions of the housing of a four-high roughing mill for cold rolling of strips or sheets of steel and the like are indicated generally at 10, the mill being provided with the usual reducing rolls 11 and backing rolls 12 as in ordinary practice.

A guide bracket including a bed plate 13, transverse webs or flanges 14 and an attaching flange or web 15 is located between the housings 10 and attached thereto as by screws 16 located through the flange 15. Guideways 17 are formed at the side edges of the bed plate 13 and the sliding guide box, indicated generally at 18, is slidably mounted upon the bed plate 13 and provided with guide ribs 19 slidable within the guide grooves 17. A plate 20 of brass or the like is mounted upon the bottom of the traveling guide box 18, the upper surface of the plate being in the plane of the pass line of the mill.

The travel cylinder 21, which may be of any suitable design of fluid operated cylinder, is supported beneath the guide box, preferably by means of the flanges 22 connected to the bed plate 13 as by the screws 23. The piston 24 of this cylinder may be provided at its outer end with the enlargement or boss 25 connected, as by a pin 26, to the depending ear 27 formed upon or attached to the underside of the guide box 18.

For the purpose of operating the fluid cylinder 21, a double acting valve is provided and is located within the valve cylinder 28. A pipe 29 connects one end of the cylinder 21 with one end of the valve cylinder 28 and a similar pipe 30 connects the other end of the cylinder 21 with the other end of the valve cylinder whereby fluid may be conveyed from the valve to either end of the cylinder 21 in order to operate the piston thereof in either direction as desired.

The valve cylinder 28 is provided with integral attaching ears or lugs 31 for connecting the valve to one of the mill housings 10 as by the screws 32. A removable head 33 may be attached to each end of the valve cylinder 28 and each head is provided with an exhaust port 34. In the event air is used for the fluid for operating the cylinder,

it is, of course, unnecessary to connect any return pipes to the exhaust ports 34 as the air may be exhausted from the valve into the atmosphere.

A valve piston is slidably mounted within the valve cylinder and may comprise the reduced central portion 35 and the enlarged end portions 36 which may be provided with piston rings 37 of usual construction in order to prevent leakage of fluid around either end of the valve piston. A fluid supply pipe 38 leading from a suitable source, which may be compressed air, communicates with the central portion of the valve cylinder 28 and is adapted to be conveyed from the valve cylinder through the pipe 29 or 30 as desired.

In the position of the valve piston shown in Fig. 4, the fluid from the supply pipe 38 is conveyed through the pipe 30 to move the piston 24 of the cylinder 21 inward or to the left as viewed in Fig. 3, permitting the fluid from the inner end of the cylinder 21 to return through the pipe 29 to the right-hand end of the valve cylinder 28 and to exhaust through the corresponding exhaust port 34.

It will be seen that by moving the valve piston to the right, as viewed in Fig. 4, so that the enlarged portion 36 at the left-hand end thereof is located between the pipe 30 and the supply pipe 38, the fluid will be conveyed from the valve cylinder through the pipe 29 to the inner or left-hand end of the cylinder 21, moving the piston 24 thereof outward or to the right as shown in Fig. 1 and permitting the fluid to return from the outer or right-hand end of the cylinder 21 through the pipe 30 to the left-hand end of the valve cylinder 28 and to exhaust through the corresponding exhaust port 34.

Manually controlled valves 40 may be provided in the pipes 29 and 30 whereby the amount of fluid conveyed from the valve to either end of the cylinder 21 may be regulated in order to control the speed of operation of the piston 24.

In order to operate the valve, the piston rod 41 thereof is pivotally connected as at 42 to a link 43, the opposite end of which is pivotally connected as at 44 to a rocker arm 45 fixed upon a rocker shaft 46 journaled in bearings 47 mounted upon the floor in front of the mill, treadles 48 and 49 being fixed to opposite sides of said rocker shaft in position to be operated by the workman's foot.

A gripping device is carried by the sliding guide box and adapted to grip the strip or sheet as the guide box is moved toward the rolls and to instantly release the strip as the end of the same is entered into the bite of the rolls, a cylinder 50 being provided for operating said gripping device. This cylinder is supported above the guide box by means of the stool 51 having the central opening 52 through which the cylinder is located.

A peripheral flange 53 is formed upon the cylinder and connected to the stool as by the bolts 54. The cylinder 50 is provided with a piston 55 having a head 56 upon its lower end to which is pivoted as at 57 the flange 58 of the gripper foot 59, a coil spring 60 being located between the head 56 and the gripper foot to normally hold the foot in slidable contact with the upright flange 61 formed upon the top of the guide box adjacent to the opening 62 therein through which the gripper foot is adapted to be moved.

For the purpose of operating the gripper, a double acting valve is provided, being housed within a cylinder 63 and located adjacent to the cylinder 50. The valve cylinder 63 is provided

with an attaching flange 64 adapted to be connected as by the bolts 65 to the bracket 66 which is mounted upon the top of the guide box as by the screws 67.

A pipe 68 connects the upper end of the valve cylinder with the upper end of the cylinder 53 and a pipe 69 connects the lower ends of the two cylinders, a fluid supply pipe 70, leading from a suitable source of compressed air or the like communicating with the central portion of the valve cylinder. This valve cylinder is provided with a piston similar to that shown in detail in Fig. 4 and the piston rod 71 is provided at its lower end with an L-shaped head 72 between which and the lower end of the valve cylinder is located a coil spring 73 arranged to normally urge the valve piston downward within the valve cylinder.

A roller 74 is preferably located at the lower end of the L-head 72 and a guide rod 75 is carried by said L-head and slidably located through a guide opening 76 which may be formed in the attaching flange 64 or other portion which is stationary relative to the valve cylinder.

A stool 77 may be mounted upon the top of the guide box, being connected thereto as by the screws 78 located through the feet 79 of the legs 80 of the stool for the purpose of supporting a wiper block 81 which may be operated through the slot 82 in the top of the guide box. A screw 83, provided at its upper end with a hand wheel 84, is located through the internally threaded boss 85 formed at the central portion of the stool 77, the lower end of said screw being swiveled within a block 86 fixed upon the bar 87 to which the wiper block 81 is clamped as by the shoulder 88 and clamping bar 89. Guide pins 90 may be carried by the bar 87 and slidably located through the guide bosses 91 formed in the stool 77 so as to prevent turning movement of the bar 87.

A pair of brackets 92 are welded or otherwise fixed upon the entry bracket 13 and support the lower wiper bar 93 which is connected to said brackets as by the screws 94. The lower wiper block 95 is attached to the bar 93 as by the shoulder 96 and clamping plate 97 which is removably secured to the bar as by the screws 98. The upper surface of the wiping block 95 is covered with canvas or the like as indicated at 99 and arranged to contact with the under surface of the strip or sheet indicated at 100.

An upper wiper block 101, having its under surface covered by canvas or the like as at 102, is connected to the upper wiper bar 103 as by the shoulder 104 and clamping plate 105 connected to the wiper bar by the screw 106. The upper wiper bar 103 is provided at opposite end portions with upwardly extending lugs 107 attached by means of screws 108 to the outer ends of the wiper arms 109, the inner ends of which are pivoted to the housings 110 as by the bolts 111. Braces 112 may be attached to the wiper arms and upper wiper bar to provide a rigid structure.

A central lug 113 is formed upon the upper side of the upper wiper bar 103 and the shaft 114 is journaled through said central lug and the end lugs 107. The wiper cylinders 115 are mounted upon brackets 116 secured to the front faces of the housings 110 as by screws 117 and the pistons 118 thereof are provided at their lower ends with the bearing portions 119 through which the shaft 114 is located.

Branch pipes 29' and 30' are connected to the pipes 29 and 30 respectively, and lead to oppo-

site ends of the cylinders 115, manually operated valves 40' being located in said branch pipes for manually regulating the speed of operation of the pistons 118.

5 A lifter arm 120 is fulcrumed as at 121 upon a bracket 122 mounted upon one of the housings 10 and provided with a lifter finger 123 adapted to engage the roller 74 upon the lower end of the gripper valve piston 71. The outer end of the
10 lifter arm 120 is pivotally connected to the upper end of a vertical link 124, the lower end of which is pivotally connected to a rocker arm 125 fixed upon the rocker shaft 46.

15 With the parts in the initial position as shown in Fig. 1, the end portion of the strip or sheet is inserted through the guide box to the position shown in said figure. The treadle 49 is then depressed and through the rocker arm 45 and link 43 the valve piston 35 is operated, reversing the
20 flow of fluid to the travel cylinder 21 and the wiper cylinders 115.

Fluid entering the valve cylinder 28 from the supply pipe 38 is conveyed through the pipe 30 and branch pipes 30' to the upper ends of the wiper
25 cylinders 115, moving the wiper pistons 118 downward and thereby moving the upper wiper bar 103 and block 101 downward into contact with the strip or sheet 100 as shown in Fig. 3, so that any grease or oil upon the surfaces of the strip or
30 sheet is wiped therefrom as the strip or sheet travels between the upper and lower blocks 101 and 95 respectively.

At the same time, the fluid passing up through the pipe 30 to the travel cylinder 21 moves the
35 piston 24 thereof to the left or to the position shown in Fig. 3, carrying with it the guide box 18, as shown.

Simultaneously with the depression of the treadle 49, the link 124 and lifter arm 120 will
40 have raised the lifter finger 123 to the position shown in Fig. 3, raising the piston 71 of the gripper valve 63 so as to reverse the flow of fluid to the gripper cylinder 50, permitting the fluid entering the valve cylinder 63, from the supply pipe
45 70, to pass out therefrom through the pipe 68 to the upper end of the gripper cylinder 50, forcing the gripper piston 55 downward and clamping the gripper foot 59 upon the top surface of the strip or sheet 100, as shown in broken lines in Fig. 3.

50 Thus, as the guide box 18 is moved to the left by the travel cylinder, the strip or sheet will be clamped thereto by means of the gripper foot 59 and the end of the strip or sheet will be entered into the bite of the reducing rolls 11.

55 As the roller 74 rides off of the end of the lifter finger 123 the spring 73 will instantly move the valve piston 71 downward to the normal position, reversing the flow of fluid to the gripper cylinder and causing the fluid entering the valve cylinder
60 63 from the supply pipe 70 to pass downward through the pipe 69 to the lower end of the gripper cylinder 50, immediately raising the piston 55 thereof and moving the gripper foot 59 upward away from the strip or sheet, to the position
65 shown in full lines in Fig. 3.

The parts will then remain in the position shown in full lines in Fig. 3 until the strip or sheet has been passed through the mill, after which the parts may be reset to the initial position shown in Fig. 1 by depressing the treadle 48.
70 This again reverses the operation of the valve 28 and lowers the lifting finger 123 below the roller 74 of the gripper piston 71 so that as the guide box is moved back to the right, the valve 63 is not operated. Therefore, the gripper foot 59 will
75

remain in its upper position, as the parts are moved to the initial or starting position.

The wiper block 81 as above described is hand operated, and need not be used unless the strip or sheet is unduly buckled, in which event this
5 wiper block may be screwed down tightly upon the top of the sheet during the rolling operation.

I claim:

1. In combination with a cold rolling mill, a guide box at the entry side of the mill arranged to receive the end portion of a metal strip or
10 sheet to be rolled, a treadle, means operated by the treadle for gripping the strip or sheet upon the guide box, means operated by the treadle for moving the guide box toward the rolls of the mill and entering the end of the strip or sheet between the rolls, and means for then releasing the strip or sheet from the guide box.

2. In combination with a cold rolling mill, a guide box at the entry side of the mill arranged to receive the end portion of a strip or sheet to be
20 rolled, strip gripper means upon the guide box, a fluid operated gripper cylinder for operating the gripper means, a fluid operated travel cylinder for moving the guide box toward the rolls of the mill, a treadle for operating both cylinders to enter the end of the strip or sheet between the rolls, and means for then operating the gripper cylinder for releasing the gripper means.

3. In combination with a cold rolling mill, a guide box at the entry side of the mill arranged to receive the end portion of a metal strip or
30 sheet to be rolled, strip gripper means upon the guide box, a fluid operated gripper cylinder for operating the gripper means, a fluid operated travel cylinder for moving the guide box toward the rolls of the mill, a treadle for operating the travel cylinder, a lifter finger operatively connected to the treadle for operating the gripper cylinder to enter the end of the strip or sheet
35 between the rolls, and means for then operating the gripper cylinder for releasing the gripper means.

4. In combination with a cold rolling mill, a guide box at the entry side of the mill arranged to receive the end portion of a metal strip or
45 sheet to be rolled, strip gripper means upon the guide box, a fluid operated gripper cylinder for operating the gripper means, a valve for controlling the gripper cylinder, a fluid operated travel cylinder for moving the guide box toward the rolls of the mill, a valve for controlling the travel cylinder, a treadle operatively connected to the last named valve, and a lifter finger operatively connected to the treadle for operating the
50 first named valve.

5. In combination with a cold rolling mill, a guide box at the entry side of the mill arranged to receive the end portion of a metal strip or
55 sheet to be rolled, strip gripper means upon the guide box, a fluid operated gripper cylinder for operating the gripper means, a valve for controlling the gripper cylinder, a fluid operated travel cylinder for moving the guide box toward the rolls of the mill, a valve for controlling the travel cylinder, a treadle operatively connected to the last named valve, a lifter finger operatively connected to the treadle for operating the first
60 named valve, and spring means for then operating the first named valve in opposite direction.

6. In combination with a cold rolling mill, a guide box at the entry side of the mill arranged to receive the end portion of a metal strip or
65 sheet to be rolled, a stationary wiper bar arranged to support the strip or sheet in front of

the guide box, a vertically movable wiper bar above the strip or sheet, a fluid operated wiper cylinder for operating the movable wiper bar, strip gripper means upon the guide box, a fluid operated gripper cylinder for operating the gripper means, a fluid operated travel cylinder for moving the guide box toward the rolls of the mill, and means for operating all of said cylinders to lower the movable wiper bar upon the strip or sheet and to grip the strip or sheet and enter the end of the same between the rolls of the mill.

7. In combination with a cold rolling mill, a guide box at the entry side of the mill arranged to receive the end portion of a metal strip or sheet to be rolled, a stationary wiper bar arranged to support the strip or sheet in front of the guide box, a vertically movable wiper bar above the strip or sheet, a fluid operated wiper cylinder for operating the movable wiper bar, strip gripper means upon the guide box, a fluid operated gripper cylinder for operating the gripper means, a fluid operated travel cylinder for moving the guide box toward the rolls of the mill, means for operating all of said cylinders to lower the movable wiper bar upon the strip or sheet and to grip the strip or sheet and enter the end of the same between the rolls of the mill, and means for then operating the gripper cylinder to release the gripper means.

8. In combination with a cold rolling mill, a guide box at the entry side of the mill arranged to receive the end portion of a metal strip or sheet to be rolled, a stationary wiper bar arranged to support the strip or sheet in front of the guide box, a vertically movable wiper bar above the strip or sheet, a fluid operated wiper cylinder for operating the movable wiper bar, strip gripper means upon the guide box, a fluid operated gripper cylinder for operating the gripper means.

per means, a fluid operated travel cylinder for moving the guide box toward the rolls of the mill, a treadle, and means operated by said treadle for operating all of said cylinders to lower the movable wiper bar upon the strip or sheet and to grip the strip or sheet and enter the end of the same between the rolls of the mill.

9. In combination with a cold rolling mill, a guide box at the entry side of the mill arranged to receive the end portion of a metal strip or sheet to be rolled, a stationary wiper bar arranged to support the strip or sheet in front of the guide box, a vertically movable wiper bar above the strip or sheet, a fluid operated wiper cylinder for operating the movable wiper bar, strip gripper means upon the guide box, a fluid operated gripper cylinder for operating the gripper means, a fluid operated travel cylinder for moving the guide box toward the rolls of the mill, a treadle, means operated by said treadle for operating all of said cylinders to lower the movable wiper bar upon the strip or sheet and to grip the strip or sheet and enter the end of the same between the rolls of the mill, and spring means for then reversing the operation of the gripper cylinder to release the gripper means.

10. A combined sticker and drag for forcibly feeding material to be rolled into a rolling mill comprising a carriage mounted for movement toward and from a mill, tensioning means on said carriage for engaging and resisting the passage of a piece of stock therethrough, cooperating means mounted on said carriage in advance of said tensioning means for gripping and sticking the forward end of the material into the mill, and means automatically operable at a predetermined point in the movement of the carriage toward the mill for releasing said gripping means.

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