Feb. 3, 1942. J. B. SUTTON 2,271,783

ROUND STRAIGHTENER

Filed Aug. 2, 1940 7 Sheets-Sheet 1

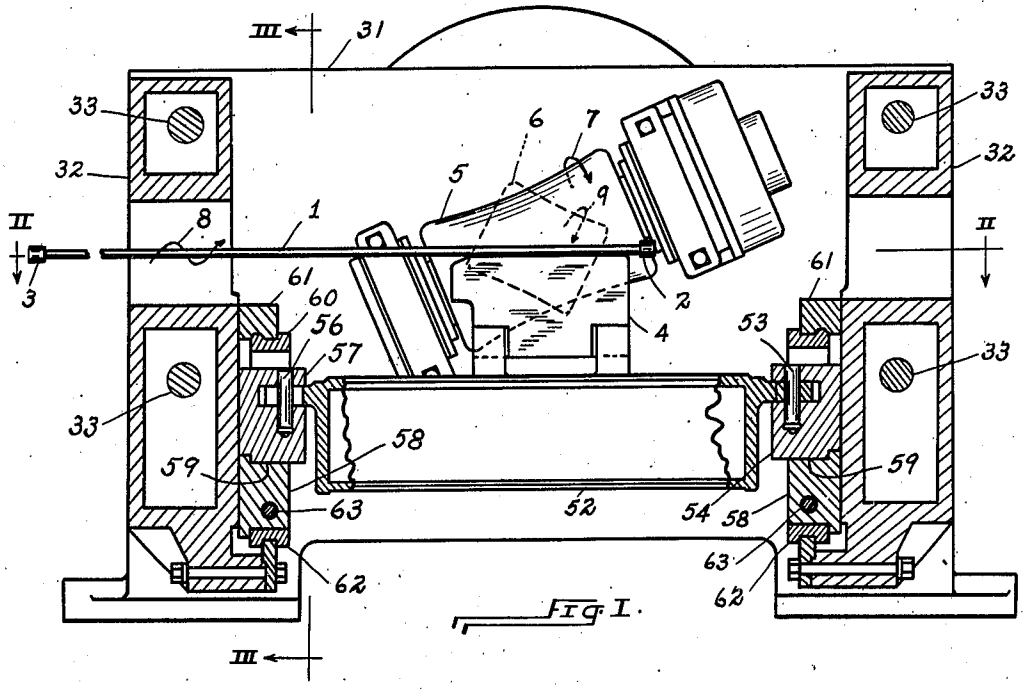


Fig. I.

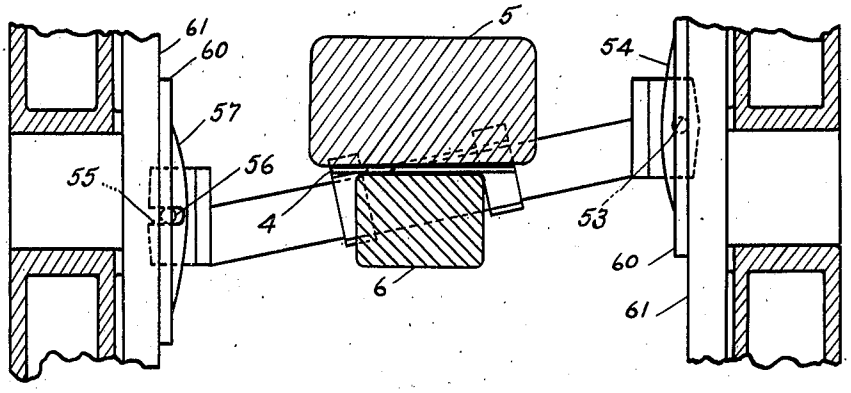


Fig. II.

INVENTOR

John Blair Sutton

by Christy, Parmelee & Wharton

his attorneys

Feb. 3, 1942. J. B. SUTTON 2,271,783

ROUND STRAIGHTENER

Filed Aug. 2, 1940 7 Sheets-Sheet 2

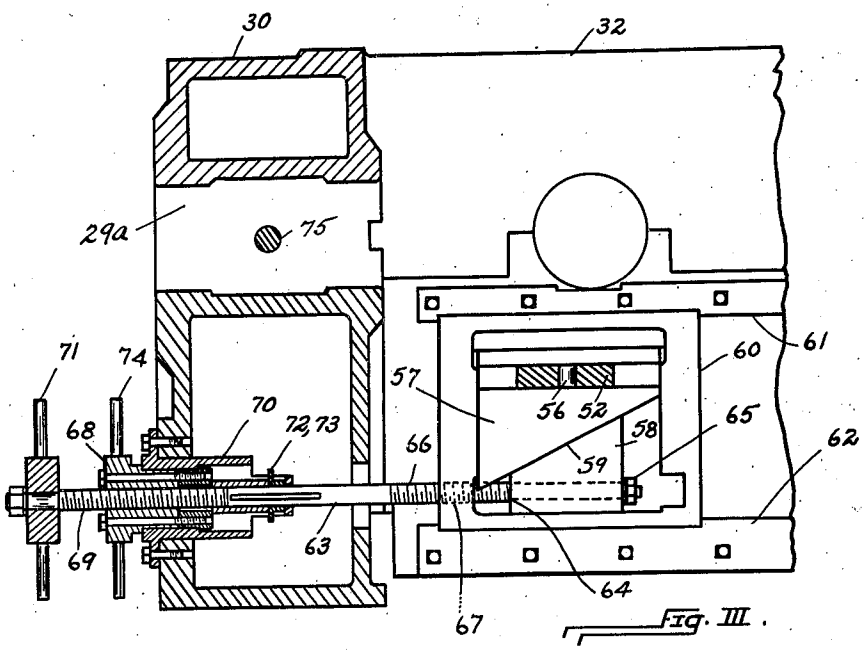


Fig. III.

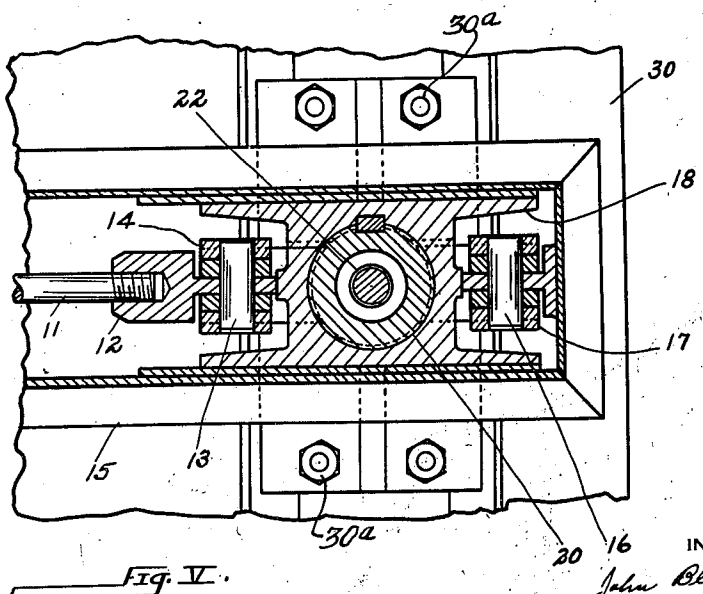


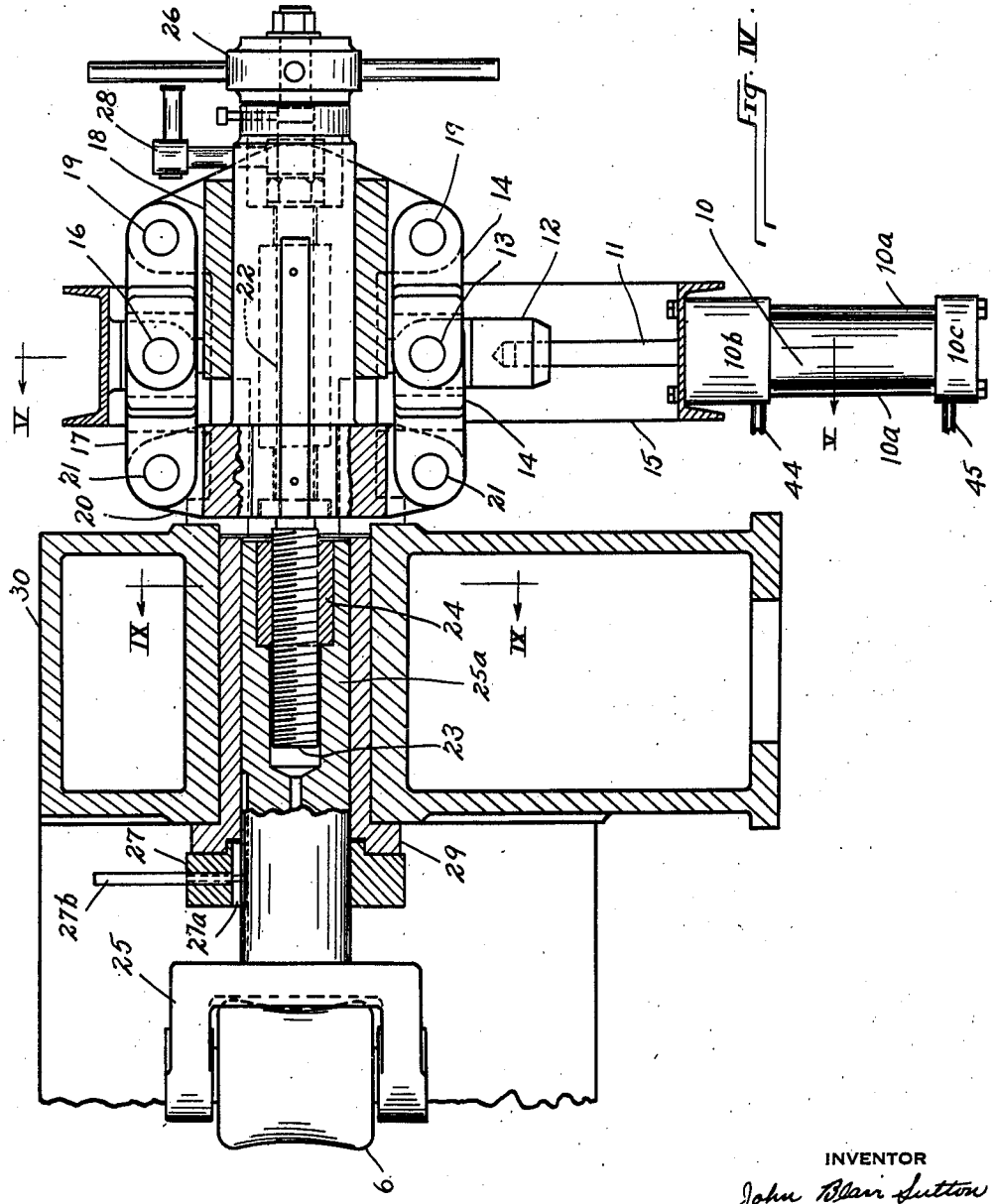
Fig. V.

INVENTOR
John Blair Sutton
by Christy, Parmelee & Wharton
his attorneys

Feb. 3, 1942. J. B. SUTTON 2,271,783

ROUND STRAIGHTENER

Filed Aug. 2, 1940 7 Sheets-Sheet 3



INVENTOR

John Blair Sutton

by Christy, Parmelee and Wharton

his attorneys

Feb. 3, 1942. J. B. SUTTON 2,271,783

ROUND STRAIGHTENER

Filed Aug. 2, 1940 7 Sheets-Sheet 4

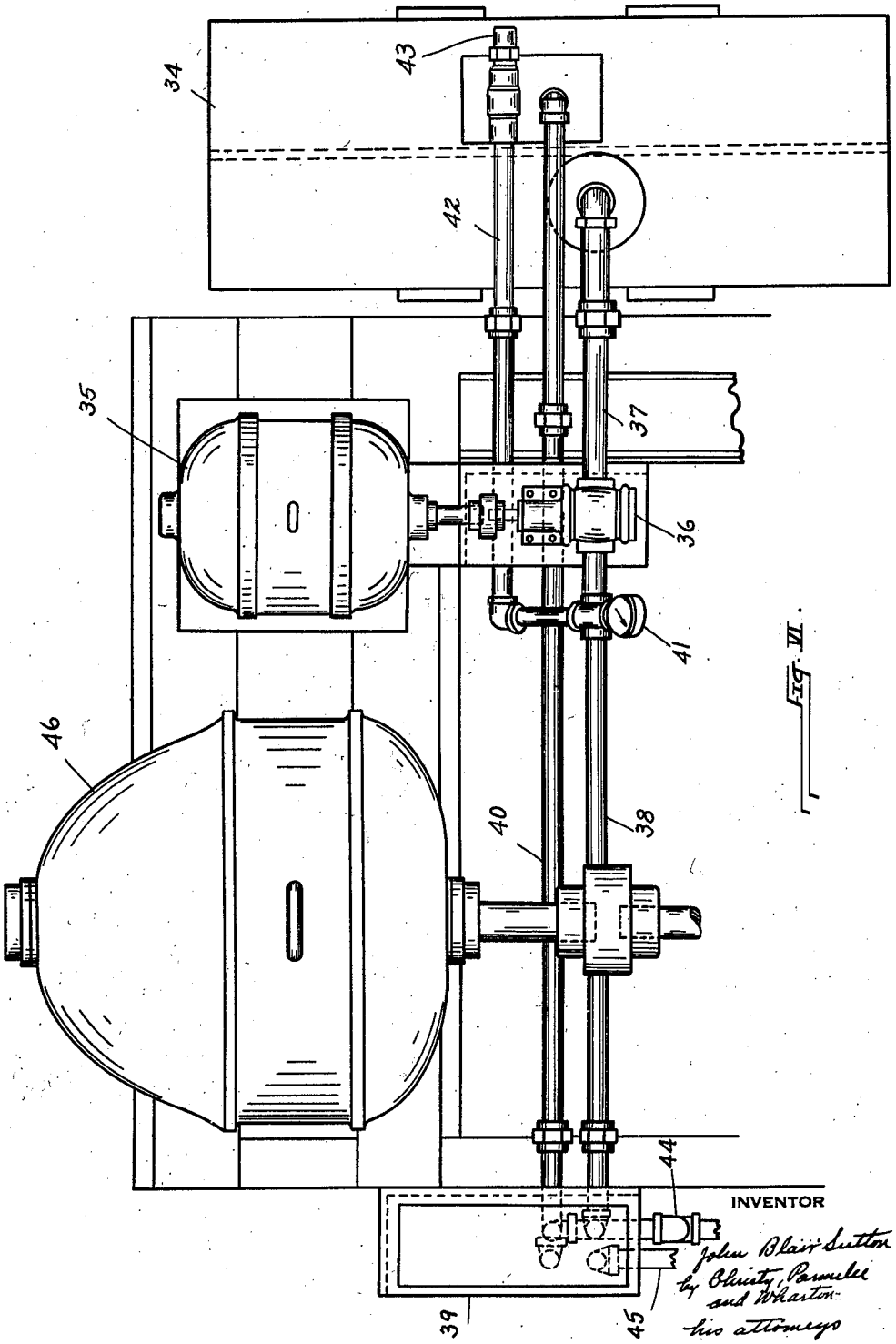


Fig. III.

INVENTOR

John Blair Sutton
by Christy, Parmelee and Wharton
his attorneys

Feb. 3, 1942. J. B. SUTTON 2,271,783

ROUND STRAIGHTENER

Filed Aug. 2, 1940 7 Sheets-Sheet 5

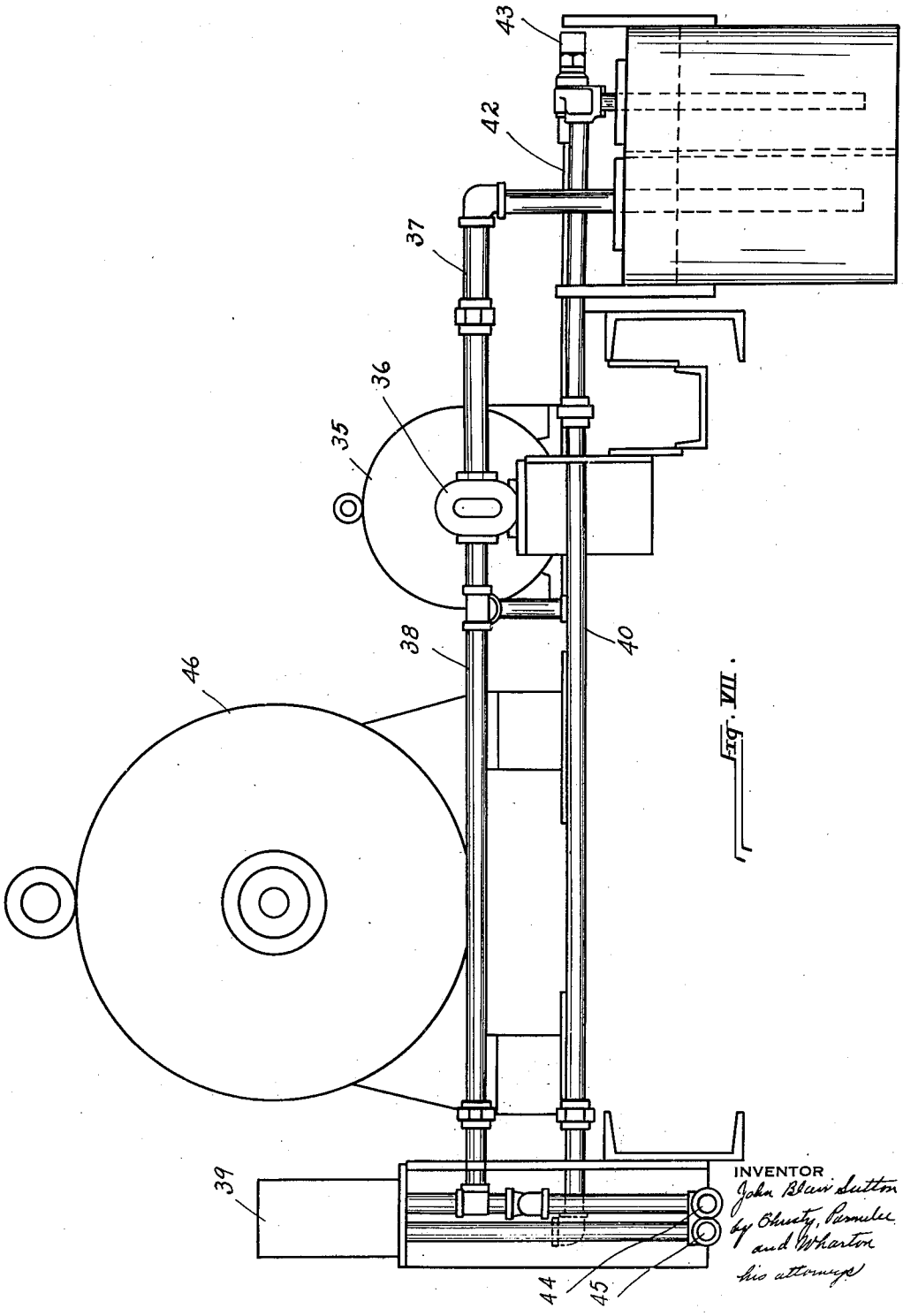


Fig. VIII.

INVENTOR
John Blair Sutton
by Christy, Parmelee and Wharton
his attorneys

Feb. 3, 1942. J. B. SUTTON 2,271,783

ROUND STRAIGHTENER

Filed Aug. 2, 1940 7 Sheets-Sheet 6

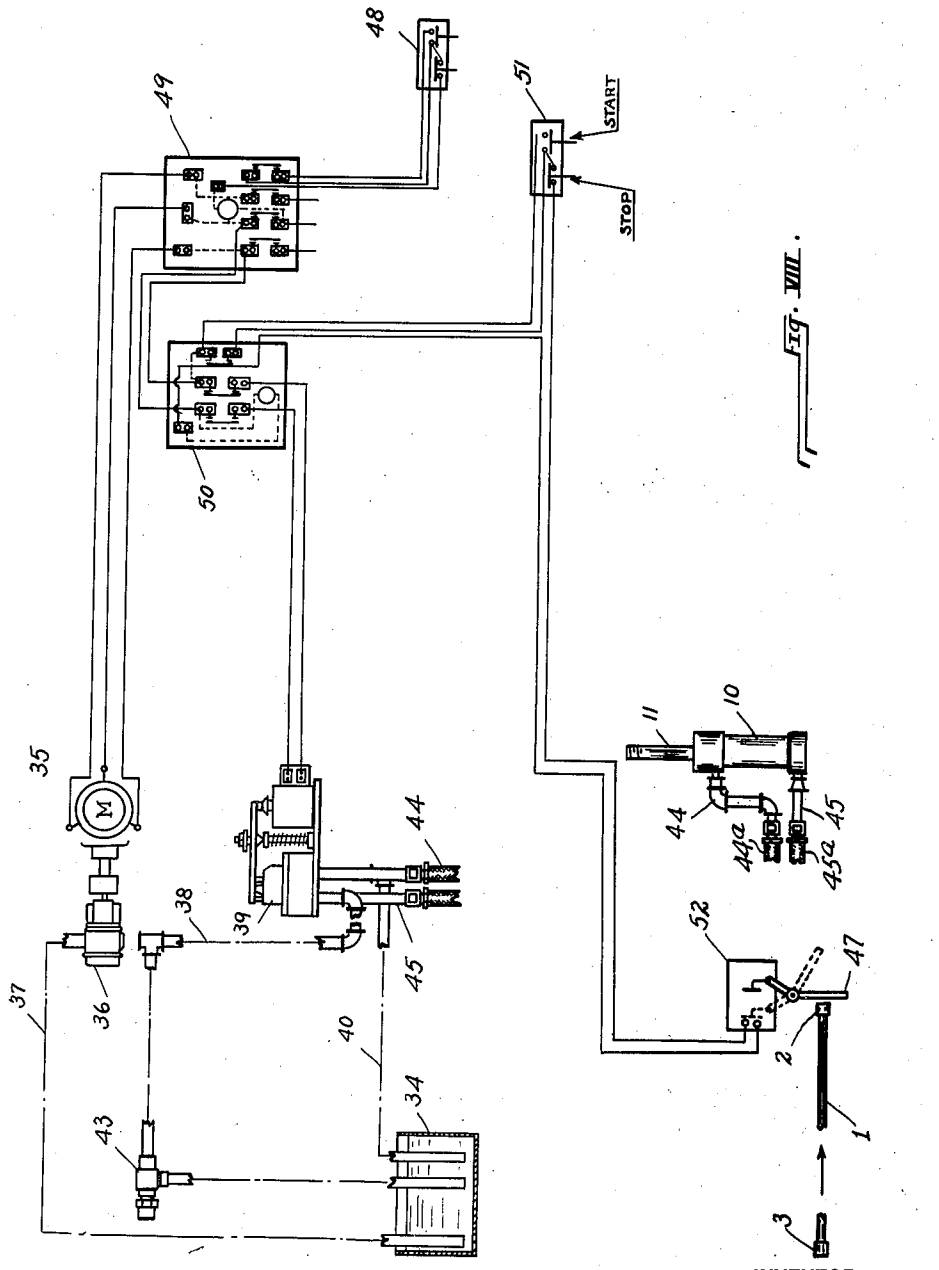


FIG. VIII.

INVENTOR
John Blair Sutton
by Christy, Parmelee and Wharton
his attorneys

Feb. 3, 1942. J. B. SUTTON 2,271,783

ROUND STRAIGHTENER

Filed Aug. 2, 1940 7 Sheets-Sheet 7

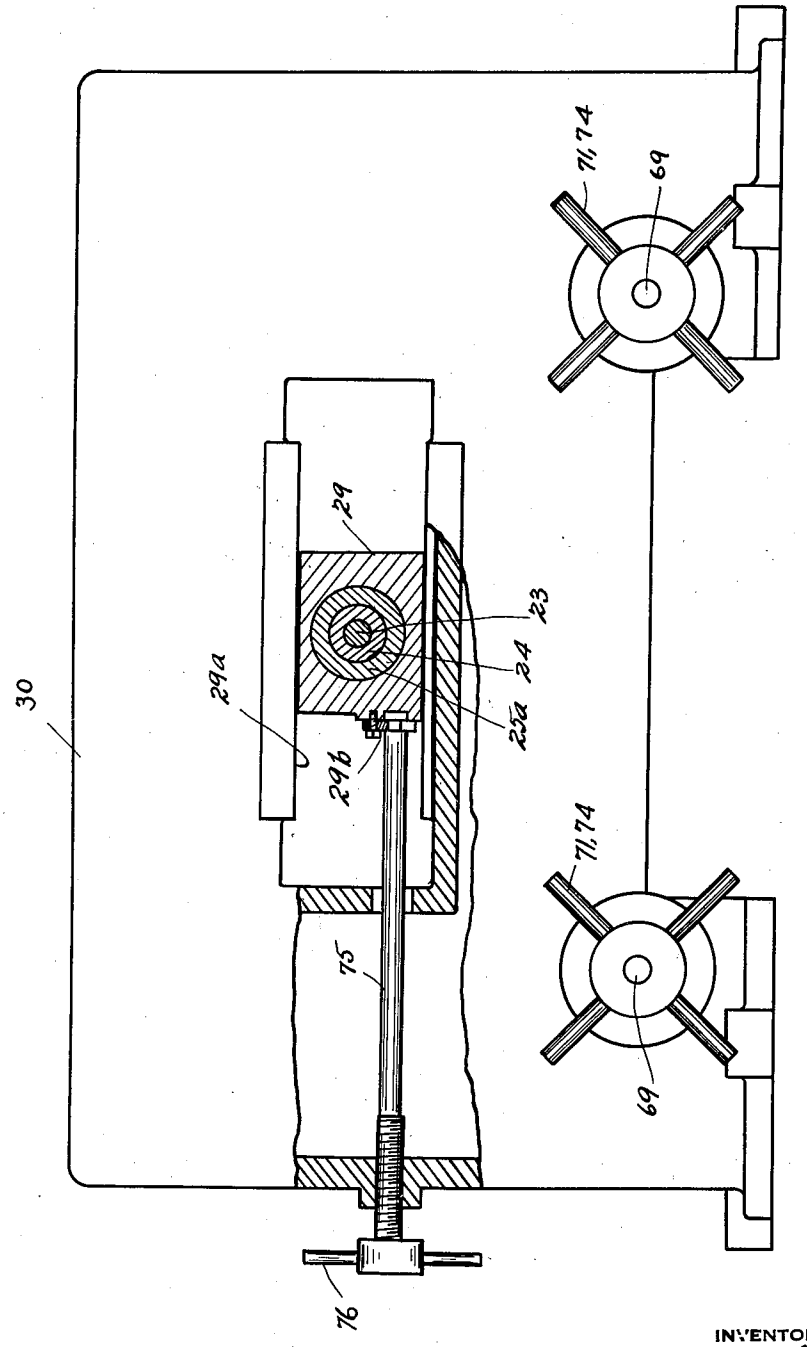


Fig. XI.

INVENTOR
John Blair Sutton
by Christy, Parmelee & Wharton
his attorneys

Patented Feb. 3, 1942 2,271,783

UNITED STATES PATENT OFFICE

2,271,783

ROUND STRAIGHTENER

John Blair Sutton, Pittsburgh, Pa.

Application August 2, 1940, Serial No. 349,843

22 Claims. (Cl. 153—60)

This invention relates to rolling machines and particularly to machines for straightening round stock having enlarged, threaded, or otherwise deformed portions. Straightening such stock in ordinary roll machines is difficult due to the entry of the enlarged, or otherwise deformed, portions into the passes with the consequent mutilation of the stock and the rolls.

One object of the invention is the provision in a straightening machine of novel means for automatically withdrawing a roll from its operating position upon the approach of an enlarged, or otherwise deformed, portion of stock, and for returning the roll to operating position when the enlargement, or other deformation, has proceeded beyond the pass.

Another object is to provide a novel mechanism for moving a roll towards and away from a pass, said mechanism being hydraulically operated and arranged to deliver a powerful thrust in the direction in which it is desired to move the roll.

Still another object is to provide a novel automatic system for controlling such a mechanism.

A further object is to provide a novel universally adjustable supporting base for the guide upon which the stock rests as it is fed through the pass.

In the accompanying drawings, illustrating one suitable embodiment of my invention, Fig. I is a vertical section of a straightening machine taken in a plane parallel to the pass line for the stock. Fig. II is a fragmentary and primarily schematic horizontal section on line II—II of Fig. I. Fig. III is a fragmentary vertical sectional view taken on line III—III of Fig. I, showing means for adjusting the advanceable and retractable roll of the machine longitudinally with respect to the mechanism for moving it toward and away from the center line of the pass and transversely with respect to the pass. Fig. IV is a vertical sectional view of the mechanism for moving the advanceable and retractable roll of the assembly toward and away from the pass line of the machine. Fig. V is a fragmentary cross-sectional view taken on line V—V of Fig. IV. Fig. VI is a plan view, and Fig. VII an elevation of a hydraulic system for moving the roll. Fig. VIII is a diagram showing the hydraulic roll-moving system and an electrical control system therefor. Fig. IX is a view partly in elevation and partly in section on the line IX—IX of Fig. IV, showing means for adjusting the advanceable and retractable roll of the machine along the pass line of the machine and transversely with respect to the mechanism for moving the roll.

Referring to Figs. I to V the straightening machine illustrated is arranged for straightening round stock 1, having deformed ends. As shown, the deformation at the ends of the stock consists of upsets 2 and 3. The stock is supported on a guile 4 and is operated upon by a driven roll 5 and an idler roll 6, such rolls being constructed and fundamentally related in accordance with well-known practice. Travel of the stock is indicated by arrow 8, and rotation of the rolls 5 and 6 indicated by arrows 7 and 9 respectively.

Figs. IV and V illustrate supporting and actuating mechanism, by means of which the idler roll 6 is maintained in active position for cooperation with the driven roll 5, by means of which it may be withdrawn, laterally of the pass, to permit passage of enlarged portions of stock, such as the upsets 2 and 3, and by means of which it may be returned for operating upon normal portions of stock.

Motive power for advancing and retracting the idler roll is provided by a fluid pressure cylinder 10. The piston of cylinder 10 carries a piston rod 11, which is connected through a link 12 with the pin 13 forming the common pivotal connection for the links 14 of a lower toggle. The pressure cylinder 10 is fixed to a movable frame 15, and has an upper and lower head 10*b* and 10*c* connected by rods 10*a*. Frame 15 is connected with a pin 16, forming the common pivotal connection for the links 17 of an upper toggle. In the position shown in Fig. IV, both the upper and the lower toggle extend parallel to the line of movement along which the idler roll 6 is advanced and retracted.

Fig. V, of the drawings shows the connection of frame 15 to the upper toggle. A link block guide 18 is fixed to the frame of the machine, and to it the outer arms of both toggles are pivoted at their distal end by pins 19, and the distal ends of the inner arms of both toggles are pivoted by pins 21 to a link block 20 that is slidable in the guide 18.

When pressure fluid is admitted to the cylinder above the piston (the parts then being arranged as in Fig. IV) the piston rod 11 moves downward, pulling down the pins 13 and bringing the arms 14 into angular relation. As the piston rod 11 moves downward carrying pin 13 with it, cylinder 10 and frame 15 move upward carrying with them the pin 16. In this way the

thrust of the piston is oppositely transmitted to cause opening movement of the toggles. The outer arms of both toggles being secured to the immovable guide 18, and the inner arms of both toggles being pivoted to the movable block 20, the opening movement of the toggle pins 16 and 13 results in the outward motion of the block 20 in the guide 18. Admission of fluid below the piston reverses the operation.

The movement of the link block 20 is transmitted to the idler roll 6 by adjustable supporting means that include a screw 22, secured against longitudinal movement but rotatable in the block 20. The threaded portion 23 of the screw is engaged in a screw box 24, secured in a longitudinally extending shank 25*a* of a forked roll support 25 that carries the idler 6. The screw 22 carries a hand wheel, 26, rotation of which adjusts the roll 6 in or out in relation to the block 20.

A guide block 27, through which the shank 25*a* extends, carries a key 27*a* for holding the idler roll support and idler roll in angularly adjusted position. Key 27*a* is held in place by lever 27*b* tapped into the guide block 27. Screw 22 is normally held against rotation by a lock screw 28. These agencies give rigid backing for the idler in its adjusted operative position, which position determines the pass through which the stock moves. The overall advancement and retraction is, as indicated above, caused by the straightening or deflection of the toggles.

The shank 25*a* of idler roll support 25 is surrounded by a slide block 29, extended through a housing 30 to which the link block guide 18 and slide block 29 are clamped by through bolts 30*a* (see Fig. V). Release of the bolts 30*a* permtis the entire idler roll assembly to be adjusted laterally of the machine and parallel to the direction of passage of the stock. The means for effecting this adjustment are shown in Fig. IX of the drawings. The block 29 is slideable along the slotted ways 29*a* in the idler roll housing 30, and in its movement carries with it both the idler roll 6, and the assembly (shown in Fig. IV) for advancing and retracting that roll. Any suitable means for producing the adjusting movement may be used. I show an adjusting screw 75, which is threaded in the housing 30, and which is rotatably attached at 29*b* to the slide block 29. Adjusting screw 75 carries a hand wheel 76, and as the screw is run in or out in its threaded engagement with the housing, it is followed by slide block 29, and by the assembly which that block carries.

These means for adjusting the idler roll toward and away from the pass line, and along the pass line, give the necessary pass adjustment for satisfactory operation of the machine on rounds of different diameter. This adjustment they make consistently with the automatic timed advancement and retraction of the idler roll into and away from pass-forming position.

As shown in Fig. I, the driven roll 5 is mounted on a housing 31, the drive being arranged in well understood manner. The driven roll housing 31 and the idler roll housing 30 are spaced by separators 32 and secured together by the bolts 33.

The hydraulic system for operating the mechanism above described is illustrated in Figs. VI, VII and VIII. A reservoir 34 contains a body of fluid, such as oil, for the system. A motor 35 drives a pump 36 that draws fluid from the reservoir by an intake line 37, and delivers it by way of a pressure line 38 to a four-way solenoid controlled valve 39. A return pipe 40 leads from the valve 39 back to the reservoir, and a by-pass line 42 controlled by a relief valve 43 leads from the line 38 to the reservoir. From the valve 39 delivery pipes 44 and 45 for the pressure fluid lead respectively to the top and bottom of the cylinder 10. As indicated, these lines include flexible sections 44*a* and 45*a*.

Fig. VIII shows an electrical system for automatically operating the valve 39 to actuate the roll-supporting mechanism. A magnetic master switch 49, operated by push button 48 controls the complete system. Closing the switch 49 starts the pump motor 35 to supply the hydraulic system with pressure fluid, and also closes circuit breakers in the electrical lines leading to the magnetic switch 50 that controls the hydraulic system. The operating coil in switch 50 is energized by a circuit that includes in series a limit switch 52 and a manual control station 51 having starting and stopping buttons. Both limit switch 52 and the manual control station 51 must be in circuit-closing position, to complete the circuit to magnetic switch 50 and thus close its several contacts.

When the switch 50 is closed, the solenoid of the valve 39 is energized and operates the valve to deliver fluid pressure to the line 45. The valve 39 is spring biased to deliver to line 44 when the solenoid is deenergized. In order to accomplish automatic energization and deenergization of the solenoid of valve 39, limit switch 52 has an operating lever 47 arranged at the entering end of the roll pass in such position as to be engaged by deformed portions of the stock, such as the upsets 2 and 3, and to be swung by them as the stock moves. We shall assume that push button switch 48 has been placed in position to prepare switch 49 controlling the pump motor 35 for energization of the motor. The stock as it passes the limit switch swings lever 47 from its "out" position to its "in" position, so that the cross rolls may act upon that portion of the stock which is of normal diameter. In this position (subject to the manual-control switch 51) it closes switch 50, to actuate the solenoid-operated fluid-controlling valve 39 to conduct pressure fluid through pipe 45 entering pressure cylinder 10 at the under side of its piston. This, by moving frame 15 downwardly and piston rod 11 upwardly, straighten out the idler-propelling toggles, and brings the idler roll into its operative position with respect to the driven roll.

In starting, the stock 1 is inserted into the pass with the leading upset end 2 just beyond the rolls. The lever being brought to the "in" position, shown in dotted line in Fig. VIII by insertion of the upset end 2, operation of the "start" button at station 51 will close the magnetic switch 50, energizing the solenoid of the valve 39, and operating the valve to deliver fluid by way of line 45 to the cylinder 10, moving the roll 6 to active position. As the stock 1 moves through the roll pass, it withholds lever 47 from returning to its "out" position in controlling the limit switch 52. When, however, the stock has so progressed that the rearward upset end 3 of the stock passes the lever 47, a bias spring returns the lever 47 to its "out" position. This operates switch 52 to deenergize the solenoid of the valve 39, by opening switch 50. Fluid will then be delivered to the cylinder 10 by way of line 44. This moves piston rod 11 downwardly

and frame 15 upwardly, to open the toggles and retract idler roll 6 from its operative position, thus permitting the upset end 3 of the stock to pass between the rolls.

A novel guide-supporting assembly is illustrated in Figs. I, II and III. The guide 4 is arranged beneath the pass, and extends in the direction of the pass line. The guide 4 is supported by a guide bar 52 which is adjustable both in horizontal and vertical directions. For angular adjustment, the bar 52 is pivoted at one end upon a pin 53 mounted in a guide saddle 54. The other end of the bar is provided with a slot 55 that permits both sliding and pivotal movement about a pin 56 mounted in a second guide saddle 57. The saddles 54 and 57 support the opposite ends of the bar 52, and said saddles are provided with inclined upper surfaces that slidably contact the inclined surfaces 59 of the saddles. Two carriages 60 enclose the saddles 54 and 57 and the wedge blocks 58, and guide the former in vertical paths of adjustment. The carriages 60 are slideable horizontally, and are guided by upper guides rails 62 that limit the movement of the carriages to horizontal directions transverse to the pass line.

Each of the wedge blocks 58 is horizontally moved in its carriage 60 by a screw 63 operatively engaged with the wedge block by an offset 64 and a nut 65. The screws have threaded portions 66 threaded into tapped bores 67 in the sides of the carriages 60, and are held against longitudinal movement in the carriages, so that rotation of the screws will move the wedge blocks 58 in the carriages to alter the vertical positions of the saddles. The screws 63 extend through threaded adjusting collars 68 in which threaded portions 69 of the screws are engaged. The threads of portions 69 correspond in pitch to the threads of portions 66. The adjusting collars 69 are rotatably mounted and held against longitudinal motion in casings 70 secured upon the housing 30. The screws 63 are rotated, for movement of the saddle blocks, by hand wheels one of which 71 is shown. Since vertical adjustment of the two saddle blocks should be coincident, one hand wheel may be omitted by interconnecting the screw shanks by means of a sprocket chain passed over sprockets one of which 72 is shown. The collars 68 are provided with handles 74 by means of which the collars may be rotated, longitudinally to move the respective screws 63, and thereby horizontally to adjust the positions of carriages 60. The arrangement therefore provides for adjustment of the guide bar 52 both horizontally and vertically by means of the hand wheel 71 and the collars 68.

Since the handles 74 are in any case independently movable longitudinally to move screw 63 and horizontally to slide carriages 60, unequal adjustment by means of these handles will serve to swing guide bar 52 angularly to adjust the guide 4.

My invention is thus hereinabove shown to reside in organizing a pair of cross rolls in such manner that one of the rolls is conveniently movable into and out of position to form with the other a pass line for straightening round stock while permitting upset ends of the stock freely to pass between the rolls. The embodiment of my invention as herein described provides effective and relatively simple means whereby such organization is effected and rendered automatically operable.

Corollary to the above, my invention resides in organizing with two cross rolls, cooperating to form a cross rolling pass, a stock-supporting guide, so mounted that it is movable angularly, or by simple translation, in a horizontal plane, and so mounted that it is adjustable vertically with respect to the pass line between the rolls.

Whereas the advanceable and retractable roll has been shown and described as an idler, the relatively fixed roll being driven, this being the simpler structure for use in a straightening machine in which my invention is incorporated, it is obvious that the idler roll also may be made a driven roll by application to it of driving means and connections of known sort. Numerous other additions to and changes in the structural embodiment of my invention as defined in the appended claims may be made within the boundaries of those claims.

I claim as my invention:

1. In a cross-roll machine the herein described roll moving assembly including a roll support movable into and out of cooperative pass-forming position, a stationary backing structure, toggle connection between the said stationary backing structure and the said movable roll support, and toggle actuating means organized to act on the toggle connection to move the said roll support.

2. A cross-roll machine in accordance with the definition of claim 1 in which the toggle actuating means include an electrically operated fluid pressure system, and a stock operated limit switch organized to control the electrical operation of the said fluid pressure system.

3. In a cross-roll machine comprising a frame and at least two cooperative contoured rolls, a roll mounting assembly including a support for one roll movable into and out of cooperative pass-forming adjacency to the other roll, actuating means and a stock-operable control therefor organized to move the said roll support into and out of pass-forming position, and adjusting means independent of the said actuating means organized to act on the said movable roll support to adjust the proximate position of the roll carried by it with respect to its cooperative roll in pass-forming position of the said roll support.

4. In a cross-roll machine comprising a frame and at least two cooperative contoured cross-rolls, a roll mounting assembly including a support for one roll movable into and out of cooperative pass-forming adjacency to the other roll, actuating means and a stock-operable control therefor organized to move the said roll support into and out of pass-forming position and adjusting means independent of the said actuating means organized to move the said roll support selectively in either or both of two directions to adjust the proximate position of the roll carried by it with respect to its cooperative roll in pass-forming position of the said roll support.

5. A cross-roll machine in accordance with the definition of claim 3 in which the actuating means organized to move the movable roll support into and out of pass-forming position includes an electrically operated fluid pressure system, and a stock-operated limit switch organized to control the electrical operation of the said fluid pressure system.

6. A cross-roll machine in accordance with the definition of claim 4 in which the actuating means organized to move the movable roll support into and out of pass-forming position includes an electrically operated fluid pressure system, and a stock-operated limit switch organized

to control the electrical operation of the said fluid pressure system.

7. In a cross-roll machine comprising a frame and at least two cooperative contoured rolls, a roll mounting assembly including a support for one roll movable into and out of cooperative pass-forming adjacency to the other roll, and actuating means including a toggle connection to said roll support and means for applying power thereto organized to move the roll support into and out of pass-forming position of the roll carried by the said roll support.

8. In a cross-roll machine comprising a frame and at least two cooperative contoured rolls, a roll mounting assembly including a support for one roll movable into and out of cooperative pass-forming adjacency to the other roll, actuating means including a toggle connection to said roll support and means for applying power thereto organized to move the roll support into and out of pass-forming position of the roll carried by the said roll support, and adjusting means independent of the said actuating means organized to act on the said movable roll support to adjust the proximate position of the roll carried by it with respect to its cooperative roll in pass-forming position of the said roll support.

9. In a cross-roll machine comprising a frame and at least two cooperative contoured rolls, a roll mounting assembly including a support for one roll movable into and out of cooperative pass-forming adjacency to the other roll, actuating means including a toggle connection to said roll support and means for applying power thereto organized to move the roll support into and out of pass-forming position of the roll carried by the said roll support, and adjusting means independent of the said actuating means organized to act on the movable roll support to move the said roll support selectively in either or both of two directions to adjust the proximate position of the roll carried by it with respect to its co-operative roll in pass-forming position of the said roll support.

10. A cross-roll machine in accordance with the definition of claim 7, in which the means for applying power to the toggle connection to the roll support include an electrically operated fluid pressure system, and a stock operated limit switch organized to control the electrical operation of the said fluid pressure system.

11. A cross-roll machine in accordance with the definition of claim 8, in which the means for applying power to the toggle connection to the roll support include an electrically operated fluid pressure system, and a stock operated limit switch organized to control the electrical operation of the said fluid pressure system.

12. A cross-roll machine in accordance with the definition of claim 9, in which the means for applying power to the toggle connection to the roll support include an electrically operated fluid pressure system, and a stock operated limit switch organized to control the electrical operation of the said fluid pressure system.

13. In a cross-roll machine comprising a frame and at least two cooperative cross rolls organized in the frame to form between them a cross rolling pass for round stock; a stock-supporting guide in the pass formed by the said rolls, a support for the said guide wedge-mounted and organized for swinging movement between its ends, and operating means arranged to act on the said guide support to raise and lower the said support and guide in the roll pass and angularly to adjust the guide in the said pass.

14. In a cross-roll machine comprising a frame and at least two cooperative contoured cross rolls organized in the frame to form between them a cross rolling pass for round stock; a stock-supporting guide in the pass formed by the said rolls, a guide support mounted at its ends upon horizontally movable wedging members and mounted for swinging movement between its ends, horizontally movable carriages for said wedging members and guide support at the ends of the guide support, operating means for said wedging members organized to raise and lower the guide support to adjust the level of the guide in the roll pass, and operating means for the said horizontally movable carriages organized by causing unequal horizontal movement of the carriages to swing the guide support between its ends angularly to adjust the guide in the roll pass.

15. In a cross-roll machine comprising a frame and at least two cooperative cross rolls organized in the frame to form between them a cross rolling pass for round stock; a stock-supporting guide in the pass formed by the said rolls, and a support for the said stock-supporting guide mounted for both vertical adjustment and for angular adjustment in a horizontal plane with respect to the pass formed by the cross rolls.

16. In a cross-roll machine comprising a frame and at least two cooperative cross rolls organized in the frame to form between them a cross rolling pass for round stock; a stock-supporting guide in the pass formed by the said rolls, a support for the said stock-supporting guide, a wedge mounting for the said guide support and operating means arranged to act on the said guide support and its mounting to raise and lower the said guide support and guide with respect to the pass formed by the cross rolls.

17. In a cross-roll machine comprising a frame and at least two cooperative cross rolls organized in the frame to form between them a cross rolling pass for round stock; a stock-supporting guide in the pass formed by the said rolls, and mounting and operating means for the guide support arranged to raise and lower the said guide support and the said guide with respect to the pass formed by the cross rolls.

18. In a cross-roll machine comprising a frame and at least two cooperative cross rolls organized in the frame to form between them a cross rolling pass for round stock; a stock-supporting guide in the pass formed by the said rolls, and a support for the said stock-supporting guide mounted for both vertical adjustment and horizontal adjustment with respect to the pass formed by the cross rolls.

19. In a cross-roll machine comprising a frame and at least two cooperative cross rolls organized in the frame to form between them a cross rolling pass for round stock; a stock-supporting guide in the pass formed by the said rolls, a support for the said stock-supporting guide, a wedge mounting for the said guide support, and operating means arranged to act on the said guide support and its mounting to raise and lower the said guide support and guide and to adjust them horizontally with respect to the pass formed by the said cross rolls.

20. In a cross-roll machine comprising a frame and at least two cooperative contoured rolls, a roll mounting assembly including a support for

one roll movable into and out of cooperative pass-forming adjacency to the other roll, actuating means organized to move the said roll support into and out of pass-forming position, and a control for said actuating means organized by contact thereof with the stock to cause the said actuating means to move the said roll support into pass-forming position and upon withdrawal of the stock to cause the said actuating means to move the said roll support out of pass-forming position.

21. In a cross-roll machine comprising a frame and at least two cooperative contoured rolls, a roll mounting assembly including a support for one roll movable into and out of cooperative pass-forming adjacency to the other roll, actuating means organized to move the said roll support into and out of pass-forming position, and a limit switch for said actuating means organized by contact thereof with the stock to cause the said actuating means to move the said roll support into pass-forming position and upon withdrawal of the stock to cause the said actuating means to move the said roll support out of pass-forming position.

22. In a cross-roll machine comprising a frame and at least two cooperative contoured rolls, a roll mounting assembly including a support for one roll movable into and out of cooperative pass-forming adjacency to the other roll, actuating means including an electrically operated fluid pressure system organized to move the said roll support into and out of pass-forming position, and a control for said actuating means organized by contact thereof with the stock to cause the said actuating means to move the said roll support into pass-forming position and upon withdrawal of the stock to cause the said actuating means to move the said roll support out of pass-forming position.

JOHN BLAIR SUTTON.