April 5, 1960 E. C. PETERSON 2,931,256

BAR TURNER

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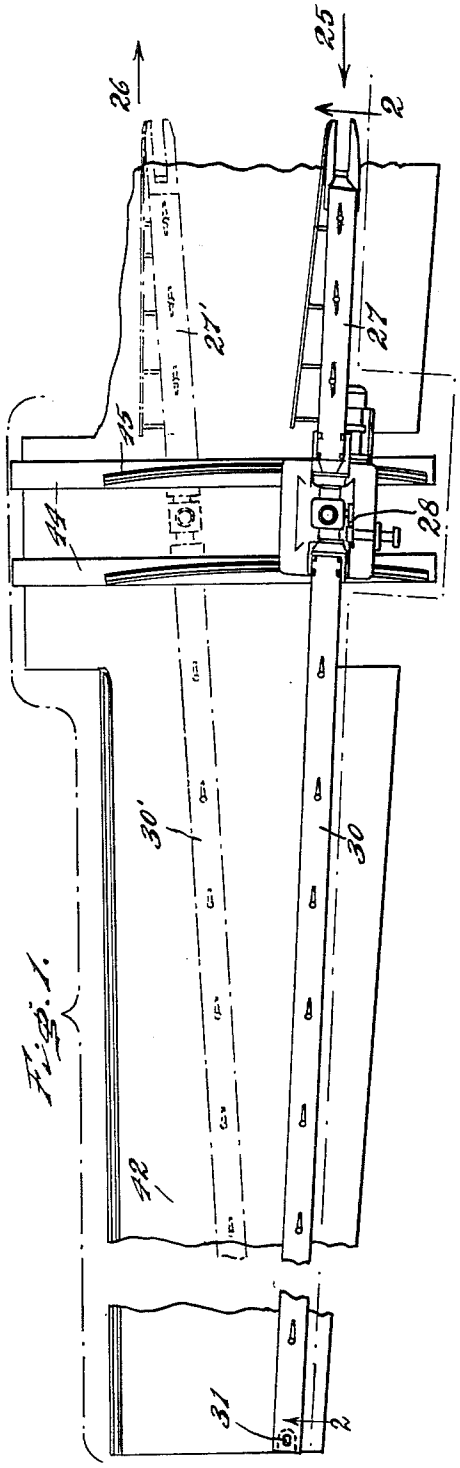


Fig. 1.

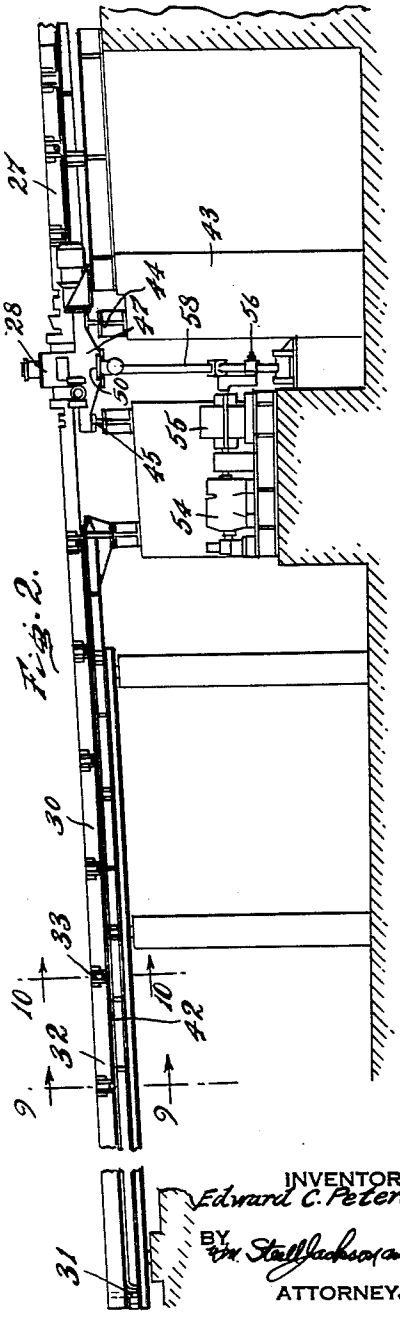


Fig. 2.

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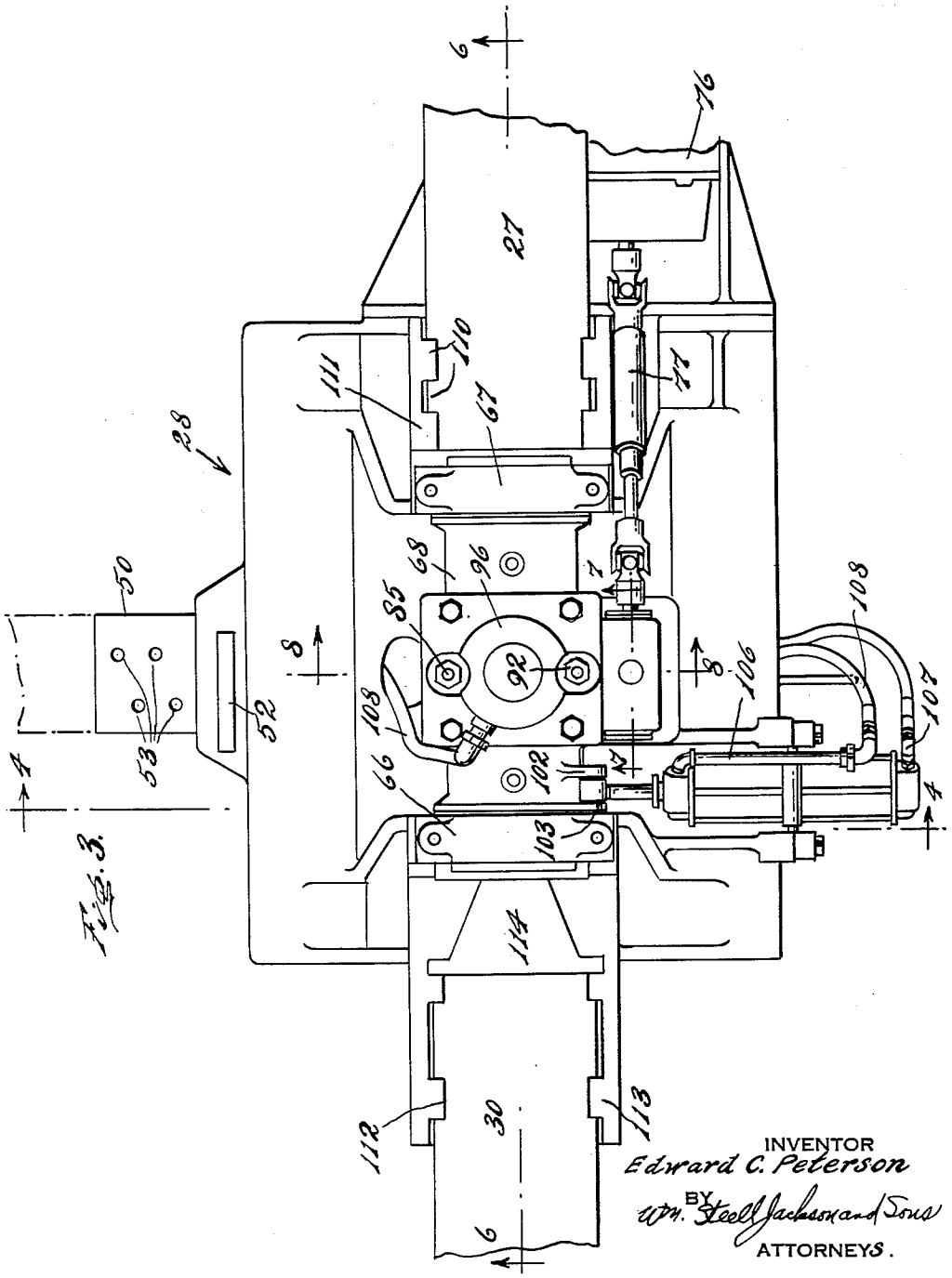


Fig. 3.

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Fig. 4.

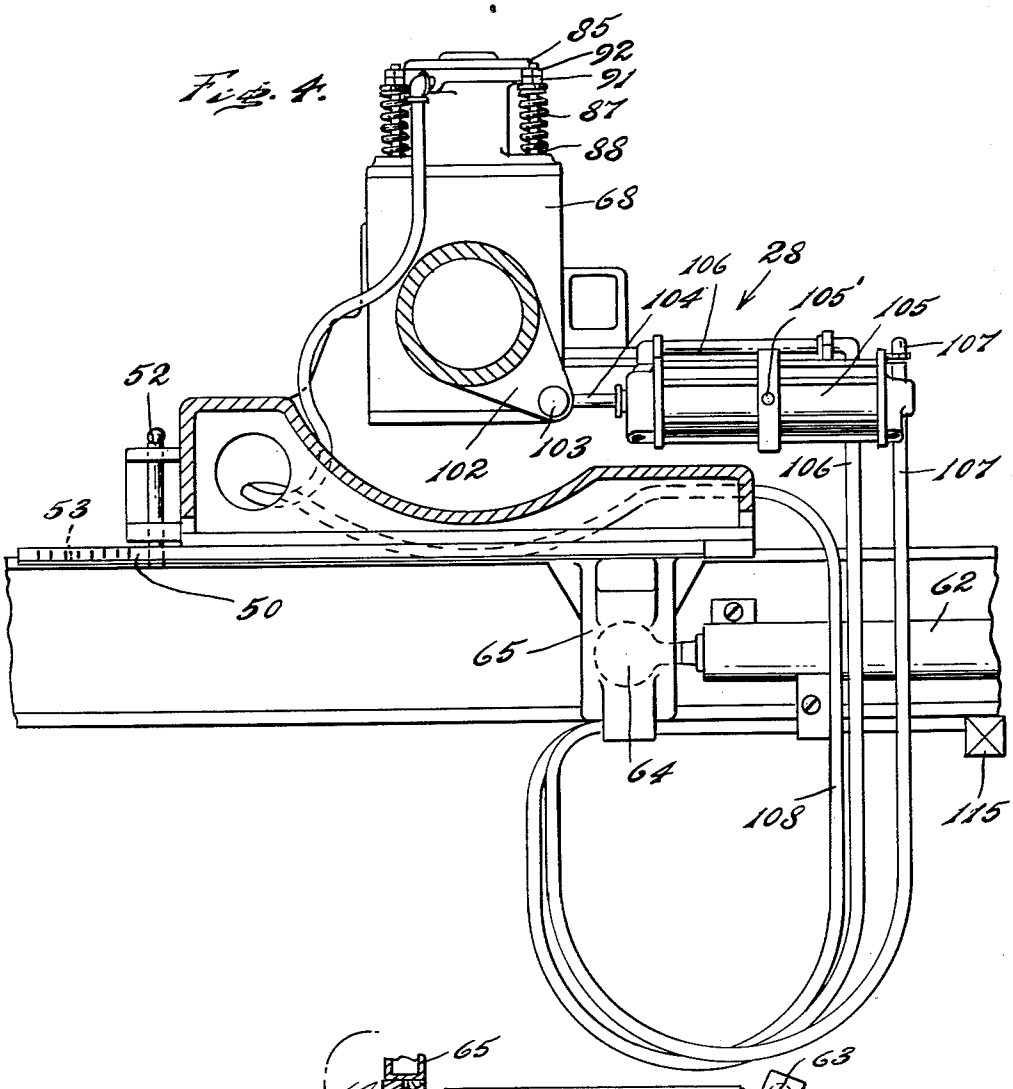
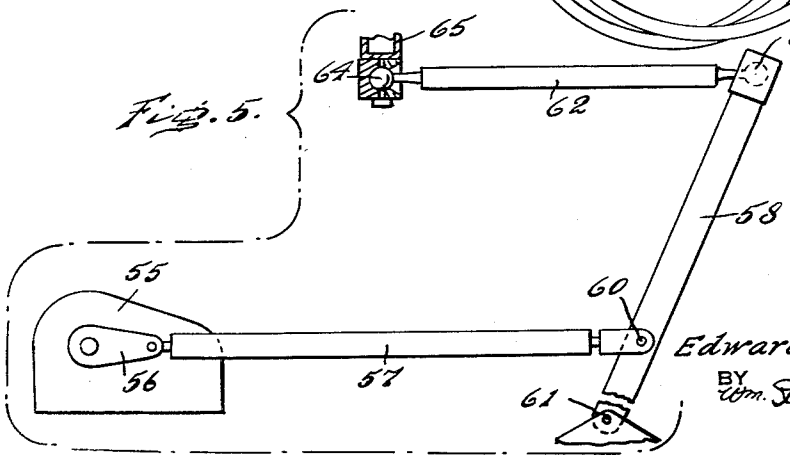


Fig. 5.



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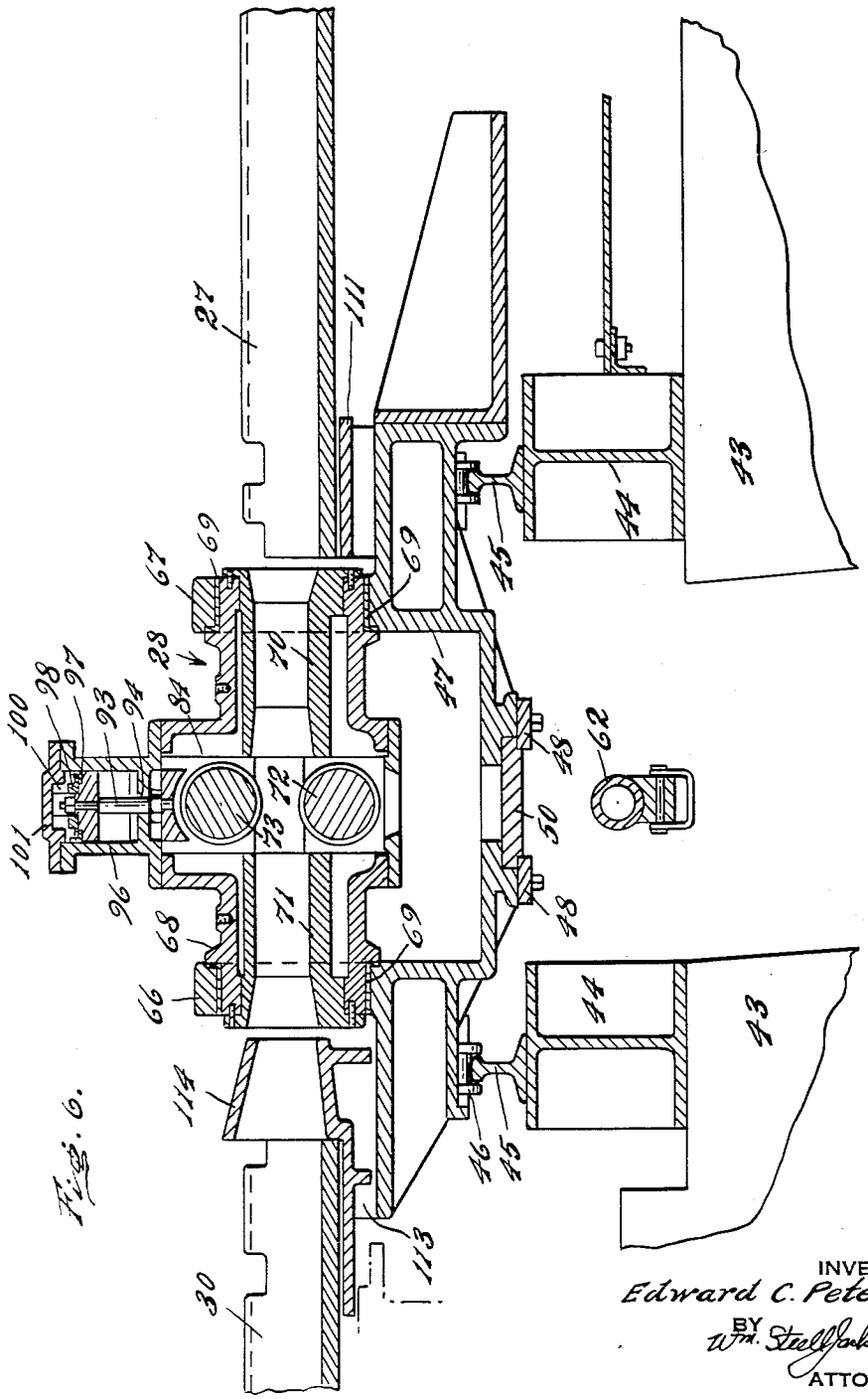


Fig. 6.

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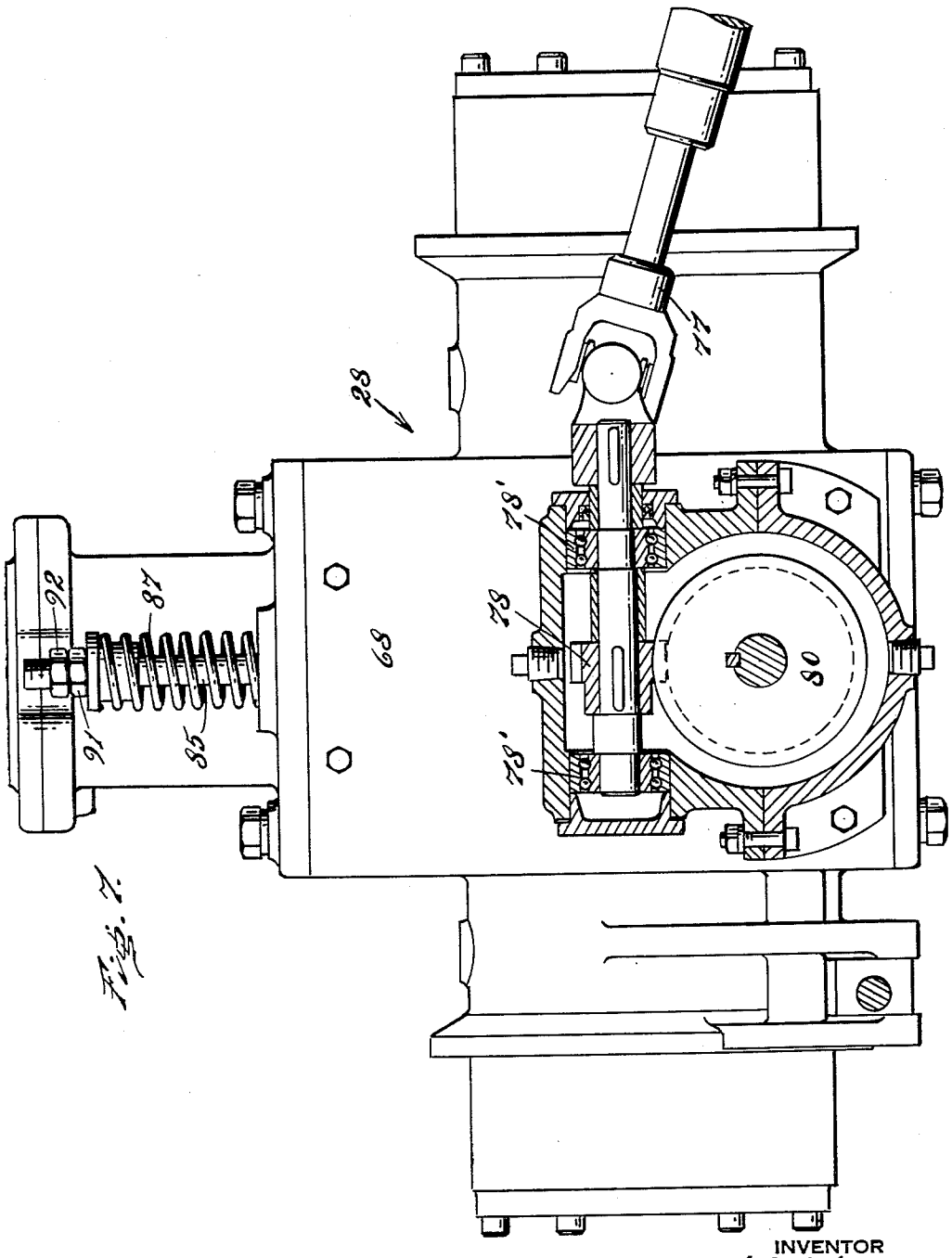


Fig. 4.

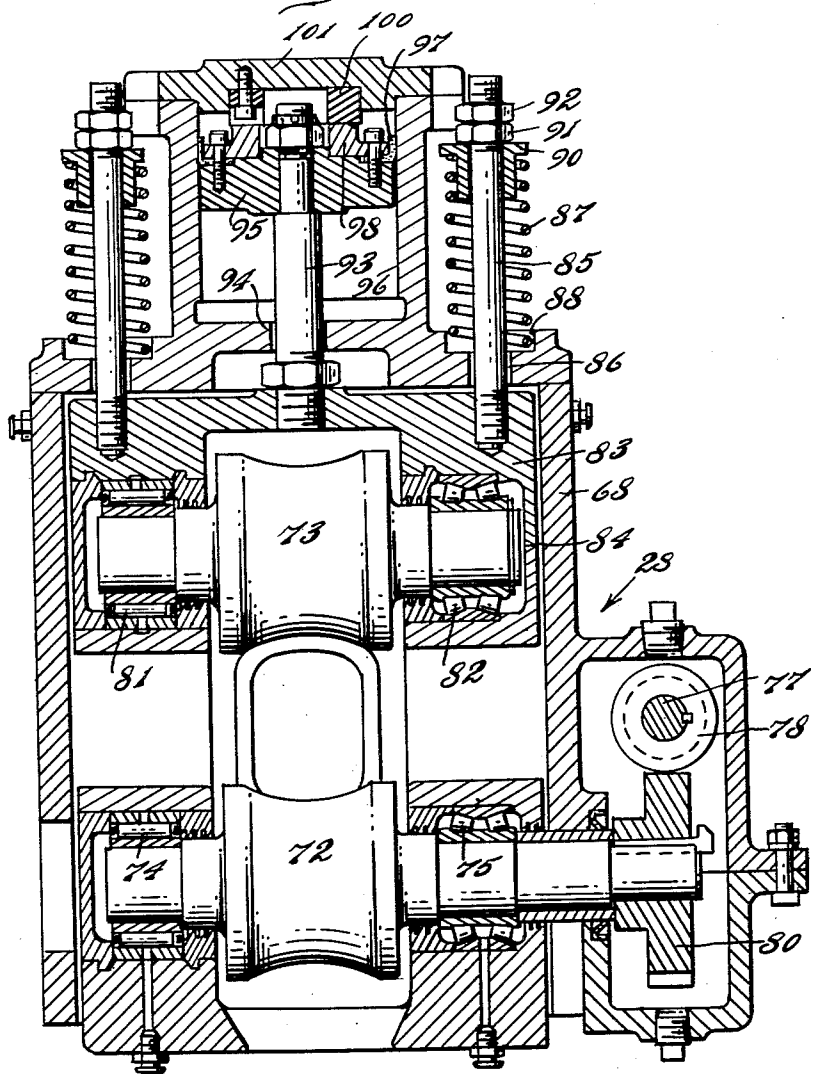
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Fig. 8.



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Fig. 9.

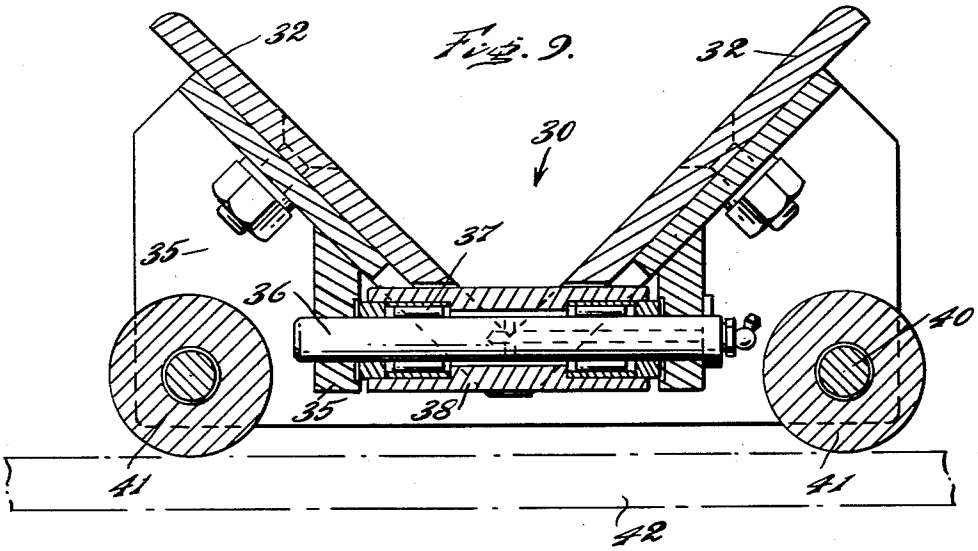
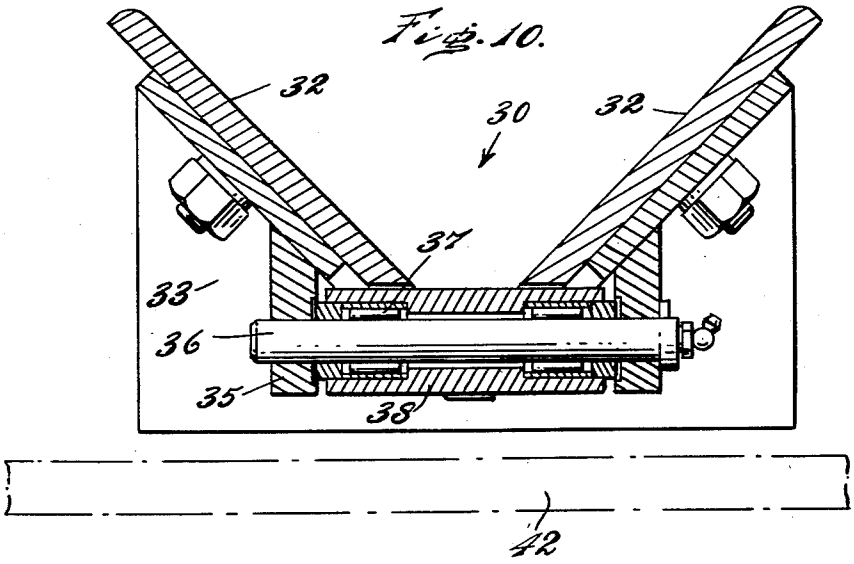


Fig. 10.



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United States Patent Office

2,931,256

Patented Apr. 5, 1960

2,931,256

BAR TURNER

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Application September 4, 1956, Serial No. 607,694

4 Claims. (Cl. 80—53)

The present invention relates to a bar turner of the type which is useful to receive the discharge of work from one rolling mill stand, turn the work and deliver it to the next rolling mill stand, or deliver the work without turning.

A purpose of the invention is to accomplish the discharge, turning and transfer of the work by relatively simple and inexpensive mechanism, avoiding the need for a conventional run-out table having individually motor driven rolls and avoiding the need for a transfer and a run-in table having individually driven rolls, and also avoiding the need for a conventional skew table.

A further purpose is to accomplish the function of longitudinally manipulating the bar during transfer by positively driving the bar turner pinch rolls, and thus avoid the necessity for driving the rolls in a transfer table or trough.

A further purpose is to provide a pivoted trough which is swung about its pivot by the lateral manipulation of the bar turner.

A further purpose is to resiliently urge the pinch rolls to the closed position, and provide a release, with means for resiliently forcing the pinch rolls open.

A further purpose is to release the pinch rolls and separate them during most of the time that the bar is running through the pinch rolls during discharge and during most of the time that the bar is running back through the pinch rolls during delivery.

A further purpose is to permit relative adjustment of the upper part of the bar turner carriage with respect to the lower portion, so as to determine the position to which the bar turner will move at the two ends of the stroke.

A further purpose is to not only turn the bar through 90° but hold it in its position on edge and positively feed it into the next roll stand.

A further purpose is to swing the bar on a carriage.

Further purposes appear in the specification and in the claims.

In the drawings I have chosen to show a few only of the numerous embodiments in which my invention may appear, selecting the forms shown from the standpoints of convenience in illustration, satisfactory operation and clear demonstration of the principles involved.

Figure 1 is a fragmentary top plan view of a transferring bar turner according to the invention.

Figure 2 is a central longitudinal section on the line 2—2 of Figure 1, showing the transferring bar turner.

Figure 3 is an enlarged fragmentary plan view of the transferring bar turner, omitting the trough.

Figure 4 is a section on the line 4—4 of Figure 3.

Figure 5 is a diagrammatic reduced section similar to Figure 4, showing the mechanism for laterally moving the transferring bar turner.

Figure 6 is an axial section through the transferring bar turner on the line 6—6 of Figure 3.

Figure 7 is an enlarged section through the transferring bar turner on the line 7—7 of Figure 3.

Figure 8 is an enlarged section of Figure 3 on the line 8—8.

Figure 9 is an enlarged section of Figure 2 on the line 9—9.

Figure 10 is an enlarged section of Figure 2 on the line 10—10.

Describing in illustration but not in limitation and referring to the drawings.

In prior art practice when rolling rods and bars of relatively small cross section, the mill operators have employed a coordinated hand routine which picks up the forward end of the stock and reverses it and enters it in the next roll stand.

With larger work, it has been customary to discharge the work on a run-out table having individually driven rolls, move the work across by a chain transfer and then enter the work into the next roll stand by a run-in table, suitably through a bar-turner having idling rolls according to Peterson U.S. Patent 2,632,246 for turning the bar on edge. In other cases a skew table is used for transfer.

In either case the equipment is very complicated and expensive.

I have developed a transferring bar turner which accomplishes transfer of the bar from one mill stand to the next, with markedly reduced cost of equipment, and improved results. The device of the invention has the great advantage that it can be made fully automatic as desired.

In accordance with the invention it is no longer necessary to use run-out tables, chain transfers or run-in tables of conventional character and it is not necessary to use a skew table. Tables of the type in which each roll is individually driven are completely dispensed with.

In the preferred embodiment of the invention, the work bar, leaving the previous roll stand, passes initially between the separated pinch rolls of the bar turner and on to a trough having idling rolls. As the work bar leaves the previous roll stand the pinch rolls engage and positively discharge the bar on to the trough. The discharge operation ceases before the work bar has left the pinch rolls, and at that point the bar turner travels laterally on its track, carrying with it the trough which is pivoted at its remote end. The trough in effect swings with the bar turner. As the transferring bar turner moves laterally, it also desirably turns through 90° to place the bar on edge. The transferring bar turner now reverses its direction of drive, and feeds the bar into the new roll stand, the bar being on edge. As soon as the bar is picked up by the new mill stand, the pinch rolls of the transferring bar turner are released and separated so that the operation of the bar is controlled by the mill stand.

Fluid actuation of the pinch rolls allows them to accommodate themselves to various thicknesses of the work bar and by a control valve the pinch rolls are released so that by spring actuation they can move apart. Thus the pinch rolls need to operate only during the short interval which constitutes the last portion of the removal of the bar from the previous roll stand, the lateral transfer and turning, and the first portion of the entry of bar into the succeeding mill stand.

As well known in the art in connection with continuous mills, the pinch roll drive is desirably matched to the speed of the particular roll stand in which the bar is also entered at the moment.

As best seen in Figure 1, work leaves the previous roll stand along the line indicated by arrow 25 and is to be returned to the next roll stand, preferably after turning on edge, along the line indicated by the arrow 26. The work bar at 25 enters connecting trough 27 which is properly interconnected with and manipulated by the

reversing transfer as later explained so that the trough 27 has an entering position 27 and a return position 27'.

Beyond the trough 27 is a transferring bar turner 28 of the present invention which interconnects with and manipulates the movable end of a bar turner trough 30.

The bar turner trough 30 has a substantially vertical pivot 31 at the end remote from the transferring bar turner 28, and includes trough sides 32 supported by cross braces 33, brackets 35 from the trough sides (Figure 9) carry pins 36 across the bottom which mount antifriction bearings 37 which journal longitudinally operating idling rollers 38 on which the work bar rides. At intervals along their length the braces 35 mount pivot pins 40 longitudinal of the length of the trough, which journal rollers 41 which rest and roll on looping floor 42 so as to support the weight of the trough and permit it to swing in an arcuate path. The looping floor desirably slopes down from the end adjoining the rolling mill as shown.

The trough 30 thus has a position 30' in line with the delivery as well as the position shown at 30 in line with the discharge from the previous roll stand.

The transferring bar turner has a foundation 43 supporting beams 44 which carry arcuate rails 45 having their center at the pivot 31 of the trough.

Mounted on the rails by rollers 46 is a carriage 47 (Fig. 6). The carriage on its lower surface between the rails has guides 48 parallel to the chord of the rails which retain an elongated slidingly adjustable drive connector 50. The drive connector 50 is secured to the carriage in any position by a pin 52 through the carriage entering any selected hole 53 on the drive connector. Thus the carriage is made to register with any desired mill pass.

The transferring bar turner is manipulated between the opposite limiting positions by a drive comprising a motor 54, speed reducer 55, crank 56, connecting rod 57 pivotally connected to the crank, lever 58 pivotally connected at 60 intermediate its ends to the opposite end of the connecting rod, the lever having a fixed pivot 61 at its lower end, and a second connecting rod 62 pivotally connected at one end at 63 to the upper end of the lever 58 and pivoted at the other end at 64 to a lug 65 on the drive connector 50.

As seen in Figure 6, the carriage has trunnion caps 66 and 67 at its opposite ends in the direction of motion of the work bar mounting trunnion bushings 69, and the trunnion bushings journal a bar turner housing 68 which includes inlet and outlet guides 70 and 71. The axis is horizontal in the direction of the radius of the track. The inlet and outlet guides are spaced and between their adjoining ends are positioned a pair of cooperating suitably grooved pinch rolls 72 and 73 best seen in Figures 6 and 8.

The lower pinch roll (in normal position) is journaled in antifriction bearings 74 and 75 in the housing and driven in either required direction from motor and speed reducer 76 on the bottom carriage through universal drive shaft 77 and pinion 78 journalled in bearings 78' in the housing, to cooperating gear 80 on the roller shaft.

The upper pinch roll 73 (in normal position) is journalled by antifriction bearings 81 and 82 in a chuck 83 which moves toward and away from the other pinch roll 72 between guide walls 84 of the housing. Guide studs 85 on the chuck 83 project through holes 86 in the top of the housing and above the housing are surrounded by helical compression springs 87 which are engaged at one end in spring sprockets 88 on the housing and at the other end receive spring retainers 90 sliding on the studs. Adjustment nuts 91 and 92 on the outer ends of the studs limit the spring tension.

From the center of the chuck 83 a piston rod 93 extends up through an opening 94 in the housing and at its outer end a piston 95 acts in a single acting fluid cylinder 96, preferably actuated by compressed air. The piston has a gasket 97 which seals against the cylinder wall. Ring 98 at the outer end in retracted position engages an elastomer cushion ring 100 held by cylinder head 101.

The housing 68 at one end carries a crank arm 102 (best seen in Figures 3 and 4) which pivotally connects at 103 with a piston rod 104 projecting from a double acting piston and cylinder combination 105 pivoted on trunnions 105', suitably energized by compressed air which is communicated to the opposite ends by hose and pipe connections 106 and 107.

A hose connection to the air cylinder 96 is provided at 108.

The entrance trough 27 is suitably connected with the transferring bar turner by slot and projection interconnection at 110 with a bench 111 secured on the bottom carriage. Likewise the trough 30 is interconnected so that it moves with the transferring bar turner by a slot and projection connection 112 (Figure 3) with a bench 113 secured to the bottom carriage and having a funnel guide 114 into the bar turner interior.

In operation of the equipment, with the transferring bar turner and its associated troughs 27 and 30 in the position of Figure 1, the work bar from the previous rolling mill stand is carried through the trough 27 and into the transferring bar turner while the fluid pressure is released by three-way valve 115 (Figure 4) which connects the cylinder 96 to atmosphere and allows the springs to retract the pinch roll 73. The work bar at this time is moving under the action of the mill rolls and enters the trough 30. At or about the time that the work bar leaves the mill rolls, as determined by the action of the operator in throwing the three-way valve 115 to admit compressed air to the cylinder 96 and cause the pinch rolls to close on the work bar, or as determined automatically in any suitable manner, whether by flag control from the action of the work bar or otherwise, the pinch rolls grip the work and at the same time the motor drive 76 energizes the pinch rolls in a manner to move the work down the trough 30 over the idler rolls 38 in the trough. As long as the work is operated by the mill, the limitation on current to the motor drive 76 prevents the motor drive from controlling the speed of the work but as soon as the work leaves the mill stand the work is withdrawn into trough 30 at a speed determined by the motor drive 76.

As soon as the work has left the mill and the end is in trough 27, while it is still engaged by the pinch rolls, the operator stops motor 76 and energizes motor 54, and through the crank, connecting rod and lever mechanism, begins to carry the transferring bar turner to the dot-and-dash position of Figure 1 and at the same time energizes air cylinder 105 in a direction to rotate the housing 90° and turn the bar up on edge.

If desired these actions can be produced automatically in any suitable way as for example by flag control responsive to the position of the work bar or otherwise.

As the transferring bar turner moves laterally, the trough 30 swings to the position 30', and when that position is reached and the bar has been turned on edge the operator merely reverses the direction of motor drive 76, feeding the work bar through trough 27' and into the next roll stand in the direction of arrow 21'.

This reversal can, if desired, be completely automatic in any suitable way.

As soon as the work bar enters the new mill stand, the drive of the mill stand takes control of the advance of the work and at or shoftly after this moment the pinch rolls are operated, by throwing three-way valve 115 to the position which will release the air pressure in the cylinder 96, and allowing the springs 87 to retract the pinch roll 73.

As soon as the work bar has left the bar turner, the bar turner is retracted by reversing the direction of motor 54 and reversing the energization of air cylinder and piston combination 105, bringing the device back to the position shown in full lines in Figure 1.

Thus it will be evident that the longitudinal manipulation of the work bar during the transfer is accomplished by the drive of the transferring bar turner and not by drive on a run-in table or a run-out table.

It will be evident that the device can, if desired, be used to transfer a bar without turning it, if the turner is not actuated.

In view of my invention and disclosure variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the structure shown, and I, therefore, claim all such insofar as they fall within the reasonable spirit and scope of my claims.

Having thus described my invention what I claim is new and desire to secure by Letters Patent is:

1. In a bar turner for receiving work from one mill stand and discharging the work after turning it to enter another mill stand, a track, a carriage mounted on the track, a bar turner housing journalled in the carriage and adapted to rotate on a generally horizontal axis, means for moving the carriage along the track, cooperating pinch rolls in the bar turner housing adapted to engage the work, means for driving one of the pinch rolls operative while the bar turner is rotating, means for rotating the bar turner housing about its axis to turn the work, fluid means for urging the pinch rolls together, release means for the fluid means establishing the predetermined pressure level, and resilient means urging the pinch rolls into relatively separated position.

2. In a bar turner for receiving work from one mill stand, turning it and discharging it to another mill stand, a track, a carriage mounted on the track, a bar turner housing journalled in the carriage and adapted to rotate on a generally hoizontal axis, means for moving the carriage along the track, cooperating pinch rolls in the bar turner housing adapted in one position to engage the work, means for releasing the pinch rolls, means for rotating the bar turner housing about its axis to turn the work, gearing in the bar turner housing driving one of

the pinch rolls, and shaft and universal means driving the gearing to turn said one of the pinch rolls when the bar turner housing is rotating.

3. In a bar turner, a support, a bar turner housing journalled in the support to rotate on a generally horizontal axis, a pair of cooperating pinch rolls mounted in the housing, resilient means pressing the pinch rolls together, gearing in the housing driving one of the pinch rolls, shaft and universal means driving the gearing while the bar turner housing rotates, and means for rotating the bar turner housing.

4. In a bar turner, a support, a bar turner housing journalled in the support and adapted to rotate on a generally horizontal axis, a pair of cooperating pinch rolls mounted in the housing, fluid means urging the pinch rolls relatively together, valve means releasing the pressure of the fluid means, resilient means relatively urging the pinch rolls apart, gearing in the housing driving one of the pinch rolls, shaft and universal means driving the gearing while the housing is rotating, and means for rotating the bar turner housing.

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