Jan. 10, 1933. G. B. COE 1,894,232

APPARATUS FOR REDUCING METAL STOCK

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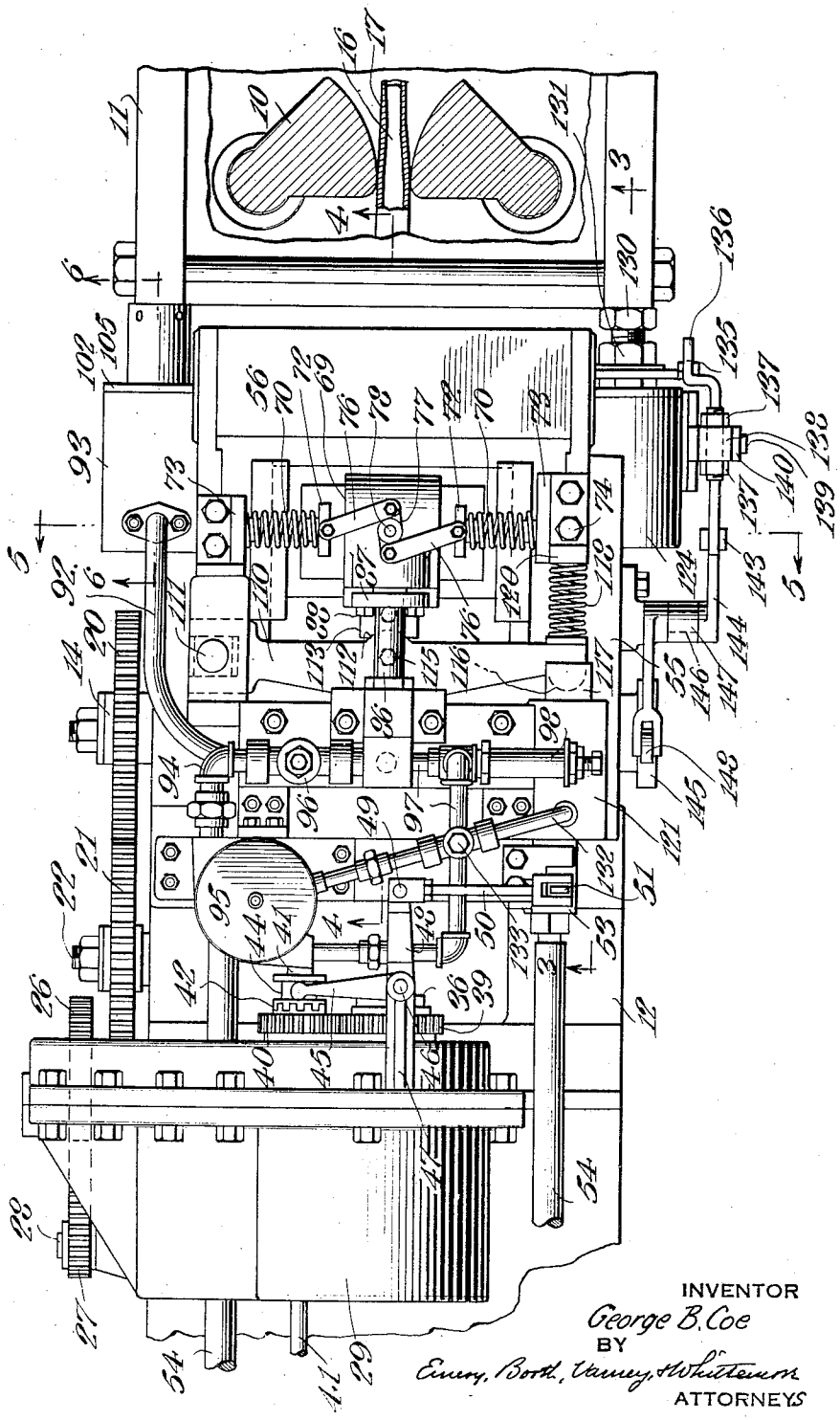

Fig. 1.

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Fig. 6.

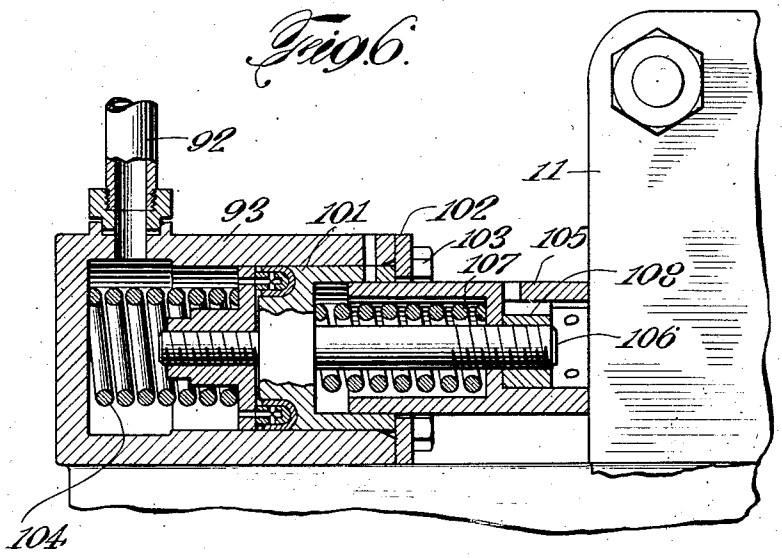
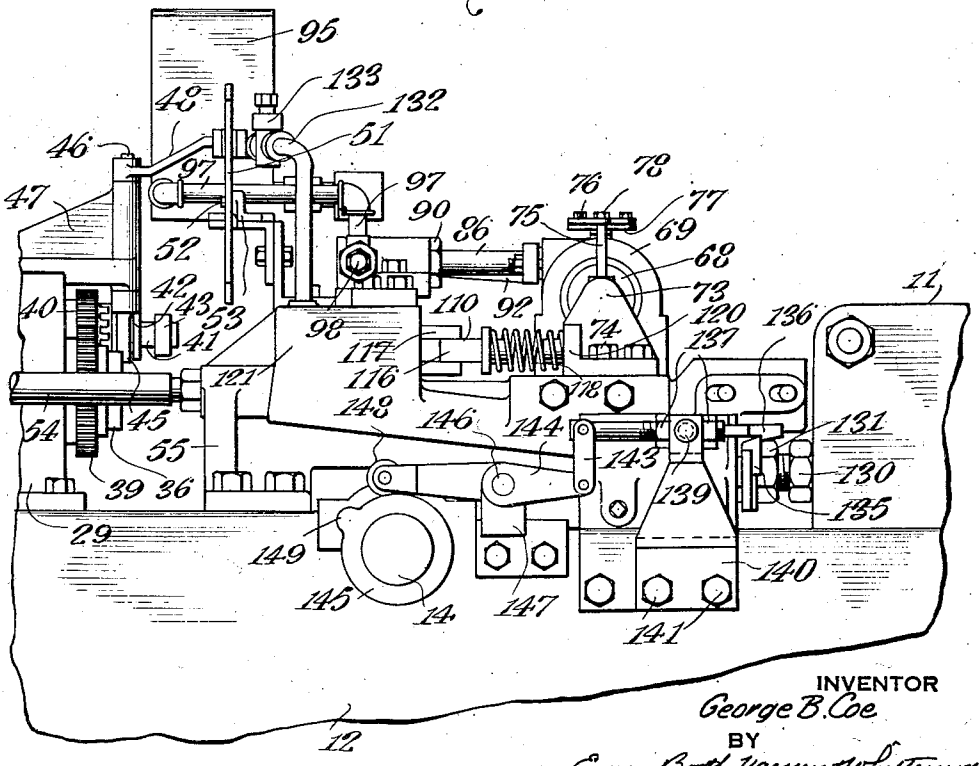


Fig. 2.



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APPARATUS FOR REDUCING METAL STOCK

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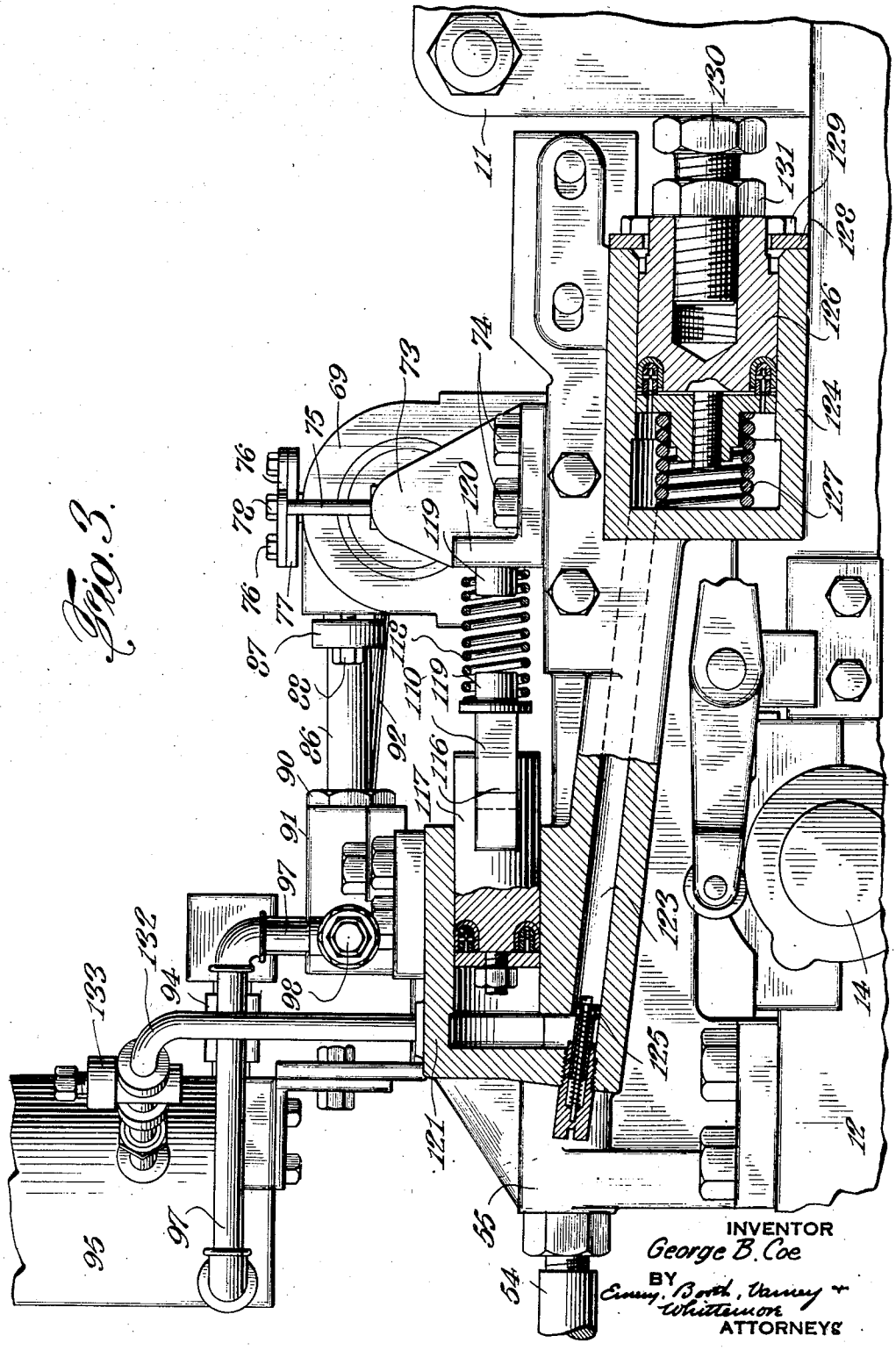
Fig. 3.



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APPARATUS FOR REDUCING METAL STOCK

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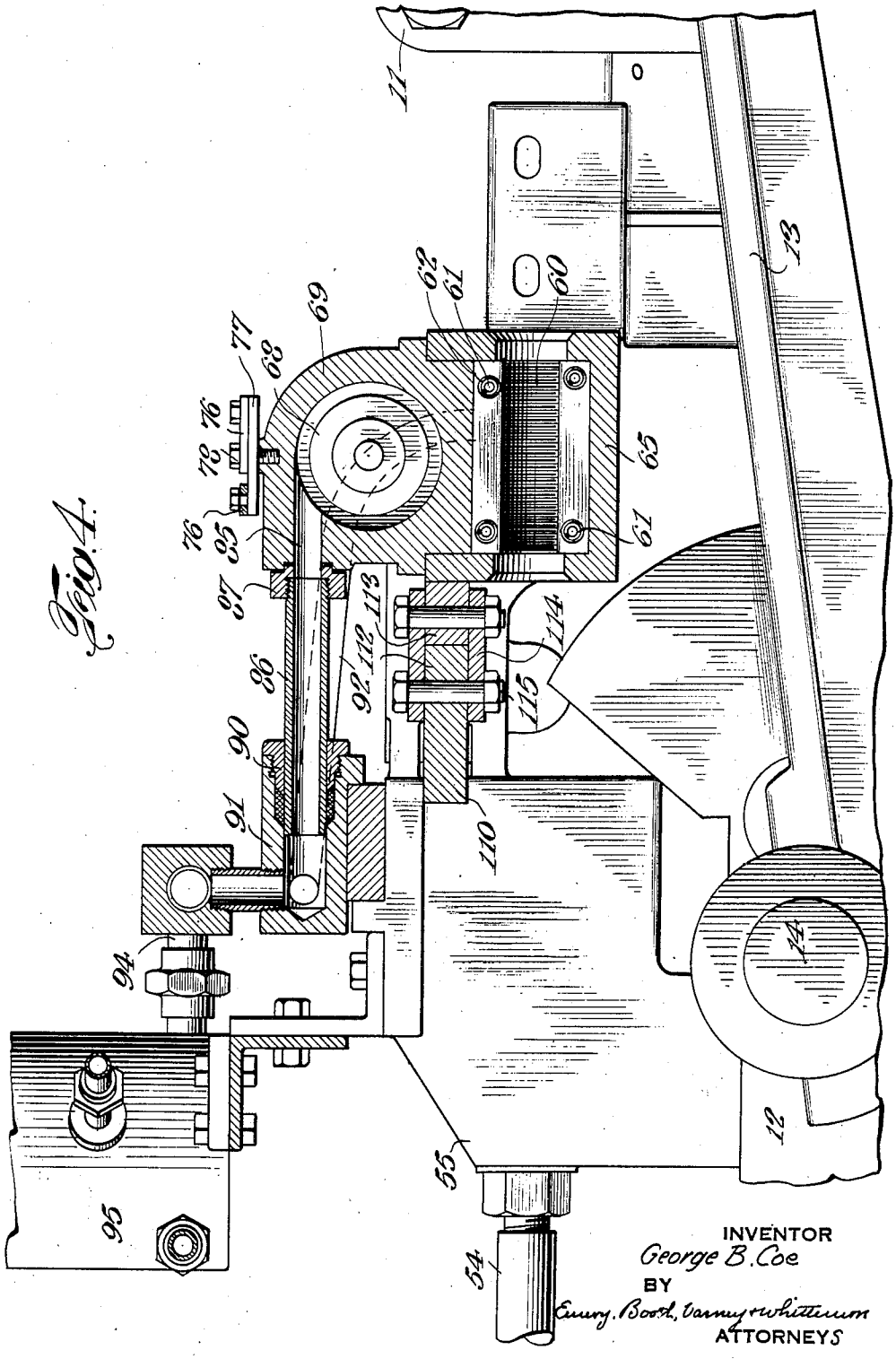

Fig. 4.

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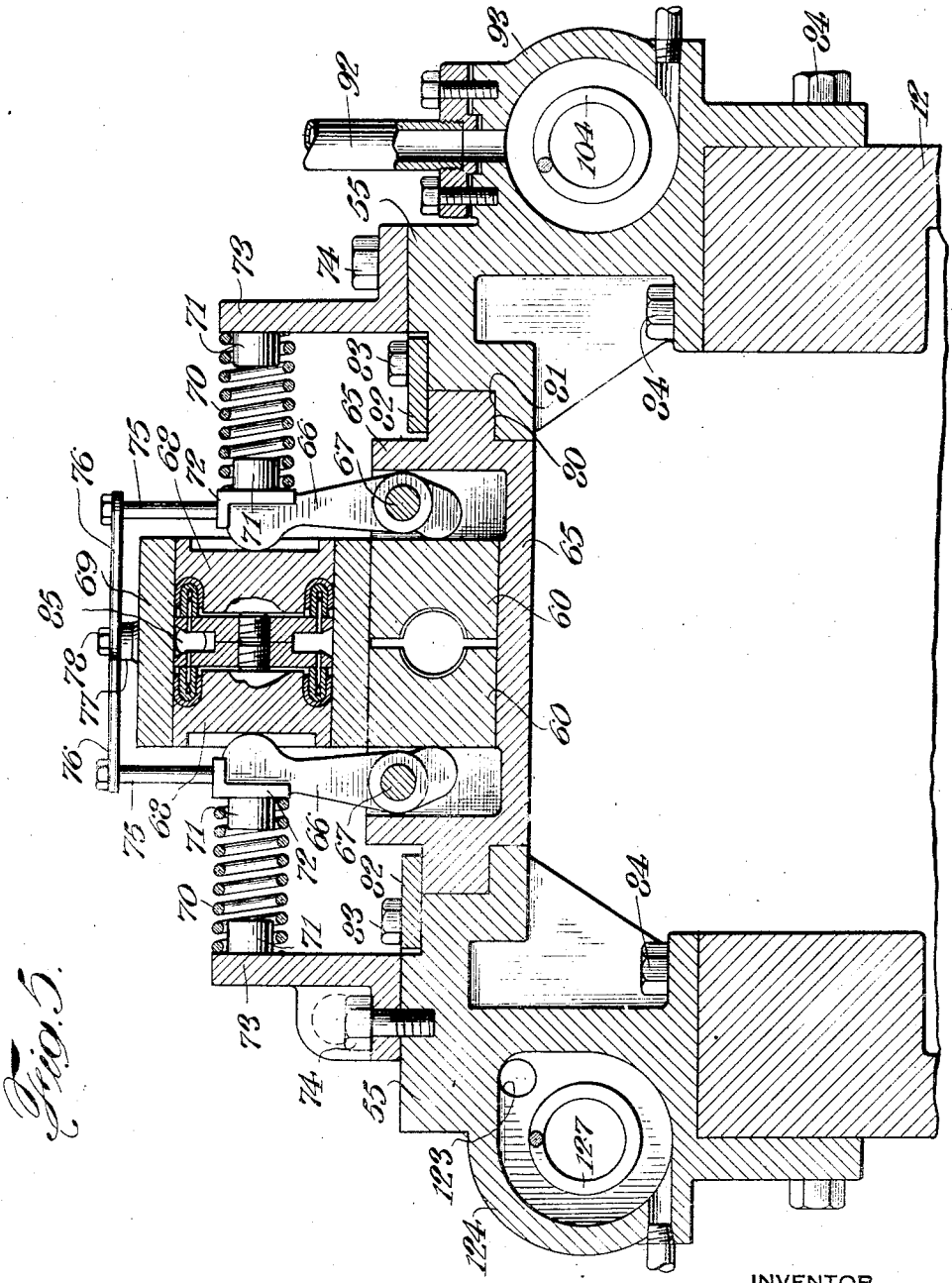

Fig. 5.

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UNITED STATES PATENT OFFICE

GEORGE B. COE, OF WATERBURY, CONNECTICUT, ASSIGNOR, BY MESNE ASSIGNMENTS, TO TUBE REDUCING CORPORATION, OF WILMINGTON, DELAWARE, A CORPORATION OF DELAWARE

APPARATUS FOR REDUCING METAL STOCK

Application filed November 15, 1930. Serial No. 495,829.

This invention relates to apparatus for reducing metal stock and in particular to apparatus for reducing the cross-sectional area of tubular stock by working it in successive increments toward the starting end of the length of stock.

The object of the invention is to provide improvements in this art; and inter alia to provide fluid operated apparatus for manipulating the stock. The nature and objects of the invention may best be understood from the following disclosure of a selected embodiment of the invention given by way of illustration. This will now be described with reference to the accompanying drawings in which:

Fig. 1 is a top plan view of apparatus embodying the present invention;

Fig. 2 is a side elevation;

Fig. 3 is a vertical longitudinal section taken on the line 3—3 of Fig. 1;

Fig. 4 is a vertical longitudinal section taken on the line 4—4 of Fig. 1;

Fig. 5 is a vertical transverse section taken on the line 5—5 of Fig. 1, the parts being shifted somewhat in position; and

Fig. 6 is a vertical longitudinal section taken on the line 6—6 of Fig. 1, the parts being in positions corresponding to Fig. 5.

The invention falls in that class of apparatus which reduces stock in successive relatively short increments by successively working the increments of length down toward the starting end of the stock. In this class of apparatus the tools which work upon the stock may be referred to collectively as swages because they act repeatedly by compression to reduce the stock. There are several known types of such tools or swages, all of which are substantially equivalent to eccentric gapped rolls, and any of which may be employed in connection with the present invention. The swages shown by way of example in Fig. 1 comprise a set of oscillating rockers 10. The rockers are journaled in a reciprocating frame or saddle 11 slidably mounted on a base frame 12. The saddle may be reciprocated by any suitable driving connection, for example by the connecting rod 13 (Fig. 4) from the main shaft 14. The rockers are constrained to have rolling movement together along their adjacent edges by any suitable means (not shown). Since the pivots of the rockers are reciprocated by and with the saddle, this means will assume the form of a device for holding the working faces of the rockers against longitudinal slippage during their rocking movements.

The present machine is adapted to reduce tubular stock so, as shown in Fig. 1, a mandrel 16 is provided for supporting the stock 17. Not all of the machine is shown but it is to be understood that the mandrel extends through the working or central axis of the front part of the machine which is shown, back to a tail stock which holds the mandrel substantially against longitudinal movement, rotates it intermittently to change the posture of the stock, and permits tubular stock to be fed into the machine over the rear end of the mandrel so as to travel to the reducing devices in end-to-end relationship continuously or in endless succession. The tail stock may be the same as that disclosed in my copending application, Serial number 448,222, filed April 29, 1930. Herein there is shown a portion of the driving mechanism for turning the stock.

This driving mechanism, as shown in Fig. 1, comprises a gear 20 on the main crank shaft 14, driving a gear 21 on a stub shaft 22, the gear 21 in turn through intermediate elliptical or eccentric gears 26, 27 driving a transverse shaft 28. Part of the turn driving mechanism is concealed within the casing 29 but it may be the same as that disclosed in my copending application, Serial number 465,364, filed July 2, 1930. It is sufficient to know that the concealed mechanism in conjunction with the eccentric gears 26 and 27 provides intermittent accelerated and decelerated movement for the turning mechanism on the machine.

The drive train emerges by the hollow shaft 36 (hollow for passage of the stock therethrough) which through a gear 39 thereon and a gear 40 drives the stock turning shaft 41 extending to the tail stock. Cooperating with the gear 40 on the shaft 41 is a clutch sleeve 42 slidably keyed on the same shaft.

The sleeve is retained by a collar 43 (Fig. 2).

The clutch sleeve 42 is provided with an annular groove 44 in which operates the bifurcated end of a clutch shift arm 45 fast on a vertical shaft 46. The shaft 46 is mounted in a bearing bracket 47. At its upper end it is provided with a rigid arm 48 connected at its outer end by a pivot pin 49 to an adjustable actuating link 50. The link is attached to a shift handle 51 journaled upon a stub shaft 52 borne by the upstanding bracket 53. By this means the turning mechanism may be thrown into or out of operation at will.

Tension rods 54 extend from the front end of the machine to the tail stock to tie the parts rigidly together. Specifically, the tie rods are attached at one end to the tail stock which holds the mandrel substantially fixed longitudinally and at the other end to the frame 55 which supports the mechanism employed for feeding the stock to the reducing devices, i. e., for sliding the stock along the mandrel.

Near the front end of the machine a base seat 56 is provided for mounting stock-holding mechanism or stock-rotating mechanism, neither of which is illustrated since it forms no part of the present invention.

The description thus far has been directed to mechanisms which have all been disclosed in others of my applications but which are described again here to show the general combination with which the herein claimed apparatus is associated. A description of the apparatus more germane to the present invention will now be given.

The stock may be fed (Figs. 4 and 5) by gripper jaws 60 which directly engage the outer longitudinal surface of the stock. The jaws are normally biased apart by springs 61 disposed in sockets formed in the jaws and guided by dowel pins 62. The jaws are interiorly roughened to engage and hold the stock. They are mounted in a feed frame 65 which directly backs up the opposite ends of the jaws but permits them to have a lateral movement for gripping and releasing the stock.

The jaws are operated by any suitable mechanism under fluid power. As shown in Fig. 5 the jaws are engaged by the rounded short ends of clamp levers 66 rotatable about journals 67 fixed in the feed frame 65. The upper long rounded ends of the levers 66 are engaged by the outer ends of pistons 68 operating in the cylinder 69 secured on the frame 65.

The pistons are forced apart by fluid pressure and are constantly urged back into the cylinder by springs 70 disposed on lugs 71 formed on riders 72 secured to the upper ends of the levers and to fixed brackets 73 attached by cap bolts 74 to the frame 55. The springs are sufficiently long to accommodate the movement of the frame which reciprocates with respect to the fixed brackets 73.

Movement of the pistons and levers and consequently of the gripper jaws may be equalized by any suitable means. As shown in Figs. 1 and 5, the riders 72 are surmounted by stud pins 75 to which are pivoted links 76. The links are pivoted at their inner ends to an equalizing lever 77 journaled at its center upon a cap bolt 78 secured to the cylinder.

The reciprocable frame 65 is provided with longitudinal ribs 80 slidable along guideways 81 provided on the fixed frame 55 and retained by plates 82 and cap bolts 83. The fixed frame 55 is retained upon the base frame 12 by bolts 84.

Means are provided for operating the pistons 68 to clamp the jaws upon the stock and for subsequently moving the frame 65 carrying the jaws to feed the stock. The means herein shown for this purpose are hydraulic means. The hydraulic devices are actuated in timed relation with the other mechanism of the machine by the rocker saddle.

Fluid is admitted to the center of the cylinder 69 (Fig. 4) by way of a central port 85 and the pipe 86 secured to the cylinder by a coupling 87 held by cap bolts 88 (Fig. 1). The pipe is telescopically received by a packing gland 90 provided on a fixed box 91. Fluid under pressure is delivered to the box 91 by way of a curved pipe 92 from a gripper cylinder 93. The cylinder and associated pipes are kept full of fluid by way of a pipe 94 from a reservoir 95. A check valve 96 is placed in the pipe 94 to keep fluid from being forced backward into the reservoir.

In order to avoid excessive pressure on the gripper jaws, the fluid pressure system, specifically the box 91, is provided with a relief pipe 97 leading back to the reservoir 95. A spring loaded relief valve 98 in the pipe 97 may be adjusted to give any desired pressure.

The details of the gripper cylinder 93 and related parts are shown in Fig. 6. A gripper piston 101 is fitted within the cylinder 93. It is retained therein by an annular ring 102 and cap bolts 103. A spring 104 constantly urges the piston out of the cylinder. A shock plunger 105 is slidably disposed on a rod 106 secured to the piston 101. It is urged off the rod by a spring 107 but is retained by a nut 108. The saddle 11 is provided with a hardened portion adapted to strike the end of the plunger 105.

The piston 101 is first moved resiliently through the action of the shock spring 107 as the saddle first strikes the plunger 105. This movement may be sufficient to cause the jaws to grip the stock. Then the plunger comes into direct contact with the piston and the action thereafter is positive, except that the pressure relief valve 98 comes into action to

avoid excessive force on the gripping jaws. By adjusting the nut 108 the time when the saddle strikes the plunger and hence the time when the jaws act may be varied.

The mechanism for reciprocating the feed frame 65 comprises (Figs. 1 and 4) a lever 110 pivoted at one end upon a pin 111. At its mid portion the lever 110 is provided with a protruding convex portion 112 acting against a concave ear 113 secured to the frame 65. The parts may be linked together by a plate 114 and bolts 115. The lever is thus enabled to move the reciprocating frame in either direction.

The other or near end of the lever 110 is provided with a rounded protuberance 116 (Figs. 1 and 3) engaging the end of a piston 117 when the end of the lever is received within the bifurcated portion of the piston. A spring 118 held upon lugs 119 formed on the lever and upon a fixed bracket 120 constantly tends to force the lever clockwise about its pivot and return the feed frame to the left. The bracket 120 may be formed integrally with one of the brackets 73.

The piston 117 which actuates the lever 110 in feeding direction is mounted in a cylinder 121 which receives fluid by way of a conduit 123 from a feed cylinder 124. An adjustable retarding valve 125 is provided for relieving the shock on the piston 117 when pressure is suddenly built up within the cylinder 124.

A feed piston 126 is disposed in the cylinder 124. It is constantly urged out of the cylinder by a coil spring 127 but is retained by an annular ring 128 and cap bolts 129.

A striker bolt 130 is threaded into the outer end of the piston 126 and held in adjusted positions by a lock nut 131. The outer end of the bolt is adapted to be struck by a hardened portion of the saddle 11. By adjusting the bolt 130 the action of the feed frame may be regulated as desired to adjust the length of the feed stroke of the feed frame.

The supply of fluid in the cylinder 121 and the chambers connected therewith is replenished from the reservoir 95 by way of a pipe 132. The pipe is provided with a check valve 133 which avoids back flow into the reservoir.

Means is provided for holding the feed piston in feeding position after the saddle has retreated from it. Normally, after gripping, the jaws will retain their gripping position as long as the feed frame is held in advanced or feeding position but if they do not their associated clamping piston may be held in clamping position by means similar in all respects to that now to be described for the feeding piston.

On its outer side (Figs. 1 and 2) the feed piston is provided with a catch 135 cooperating with a latch 136. The latch is adjustably secured by nuts 137 in a block 138 pivoted at 139 to a bracket 140 secured to the main frame by bolts 141. This adjustment provides for holding the piston at whatever point it may be carried by the saddle, depending on the feed adjustment of the bolt 130.

The latch is actuated through a link 143 and cam lever 144 by a release cam 145 fast on the main shaft 14. The lever is mounted upon a pivot 146 carried by a bracket 147 and is provided with a cam roller 148 cooperating with the cam lug 149 for lifting the latch from the catch. Any suitable means may be employed to cause the latch to be biased toward the catch.

In operation, assuming that the main shaft 14 is rotating and that the saddle 11 is reciprocating, the latter will strike the auxiliary shock plunger 105 as it nears the rear end of its stroke. This may not immediately move the gripper piston 101 but does so after the saddle has moved somewhat further. Through the action of the piston 68, receiving fluid under pressure from piston 101, the gripper jaws 60 are closed upon the stock. The relief valve 98 in the pipe 92 prevents excessive pressure being imposed upon the gripping jaws. At about the time that full gripping action is brought upon the stock, the saddle has moved into engagement with the striker bolt 130 of the feed piston 126. The exact time will depend upon the adjusted position of the striker bolt. The feed piston creates pressure in the cylinder 121 and moves piston 117 forward. This moves the lever 110 and pushes the entire feed frame 65 forward. The feed frame carries with it the gripper jaws and the stock which they engage. The amount of feed will depend upon the adjustment of the striker bolt 130. As the saddle returns forwardly after reversing its direction of travel the feed piston is held rearwardly by the latch 136 until the cam 145 releases the latch upon continued rotation of the main shaft 14. The auxiliary gripper plunger 105 which was first to engage the saddle will be last to disengage it, hence there will be a tendency for the gripper jaws to maintain their holding engagement with the stock until the latch has been disengaged. There is adjustment of the auxiliary plunger to assist this, but if it is not enough latch means may also be provided for the gripper mechanism as heretofore mentioned. After the gripper and feed pistons have been released they are forced forward by their springs to draw liquid in behind them in preparation for the next action. The stock may be turned when the saddle is at the front end of its stroke.

While one embodiment of the invention has been described in detail for purposes of illustration, it is to be understood that various modifications and changes may be made within the scope of the subjoined claims.

I claim as my invention:

1. Apparatus for reducing stock progressively in relatively short increments of length, comprising in combination, a stock reducing device, stock gripping jaws, a slidable feed frame carrying said jaws, a fluid operated device on said frame for actuating said jaws, a piston and cylinder mounted at a fixed position for supplying fluid to said jaw-actuating device, fluid operated means for reciprocating said feed frame, a piston and cylinder mounted at a fixed position for supplying fluid to said frame-reciprocating means, and means carrying the stock reducing device for striking the jaw-actuating and frame-reciprocating pistons for causing them to actuate their respective mechanisms for gripping said stock and subsequently feeding an increment of length thereof to the reducing devices.

2. Apparatus for reducing stock progressively in relatively short increments of length, comprising in combination, stock reducing devices, a reciprocable saddle carrying said devices, stock gripping jaws, a saddle feed frame carrying said jaws, a fluid operated device for actuating said jaws, a fluid operated device for actuating said feed frame, and means actuated by said saddle for controlling the pressure of fluid for said devices and thereby controlling the gripping and feeding of the stock.

3. Apparatus for reducing stock progressively in relatively short increments of length, comprising in combination, stock reducing devices, feed jaws for gripping the stock, a reciprocable feed frame for shifting the stock forward toward said reducing devices, a frame supporting said feed frame, said supporting frame and said reducing devices having a reciprocable movement relative to each other, fluid operated devices for actuating said gripping jaws and feed frame, and means struck at each relative reciprocatory stroke of said supporting frame and reducing devices for controlling the pressure of fluid for said devices and thereby controlling the gripping and feeding of the stock.

4. Apparatus for reducing stock progressively in relatively short increments of length, comprising in combination, stock reducing devices, jaws for gripping the stock, reciprocating means for producing relative reciprocatory movement between said stock and said reducing devices, a fluid operated device for actuating said gripping jaws, and means struck at each stroke by said reciprocatory means for creating fluid pressure for operating said fluid operated device.

5. Apparatus for reducing stock progressively in relatively short increments of length, comprising in combination, stock reducing devices, a reciprocatory saddle carrying said reducing devices, jaws for gripping the stock, and fluid operated means for actuating said jaws, said means including a piston which is struck at each stroke of the saddle for compressing fluid to operate the jaws.

6. Apparatus as set forth in claim 5 which further includes in combination, resilient means disposed between the piston and saddle.

7. Apparatus as set forth in claim 5 which further includes in combination, resilient means disposed between the piston and saddle, and means for adjusting the resilient means.

8. Apparatus as set forth in claim 5 which further includes in combination, a relief valve to limit the pressure of the fluid to avoid injuring the stock by said jaws.

9. Apparatus as set forth in claim 5 which further includes in combination, a reservoir and conduit for replenishing the fluid for said fluid operated means, and a check valve for preventing back flow through said conduit to said piston.

10. Apparatus for reducing stock progressively in relatively short increments of length, comprising in combination, stock reducing devices, a reciprocatory saddle carrying said reducing devices, a reciprocatory feed frame for advancing the stock intermittently to said reducing devices, and fluid operated means for reciprocating said feed frame, said means including a piston which is struck at each stroke by said saddle for compressing fluid to operate said feed frame.

11. Apparatus as set forth in claim 10 which further includes in combination, an adjustable member disposed between said saddle and piston for varying the stroke of said feed frame.

12. Apparatus as set forth in claim 10 which further includes in combination, a flow check valve for absorbing the shock when the saddle strikes said piston.

13. Apparatus as set forth in claim 10 which further includes in combination, a reservoir and conduit for replenishing the fluid for said fluid operating means, and a check valve for preventing back flow of fluid through said conduit to said reservoir.

14. Apparatus as set forth in claim 10 which further includes in combination, a latch for holding said piston in the position to which it is carried by said saddle, and means for releasing said piston from said latching means.

15. Apparatus for reducing stock progressively in relatively short increments of length, comprising in combination, jaws for gripping the stock, a feed frame carrying said jaws, a fluid operated device mounted on said frame for actuating said jaws and a telescopic pipe connection for conveying pressure fluid to said fluid operated device.

16. Apparatus for reducing stock progressively in relatively short increments of

length, comprising in combination, a pair of feed jaws for gripping the stock, means for actuating said jaws, and means for equalizing the movement of said jaws relative to the longitudinal axis of the stock.

17. Apparatus as set forth in claim 16 in which said equalizing means comprises, levers engaging the jaws, links connected to said levers, and a centrally pivoted equalizing lever to which said links are attached.

18. Apparatus for reducing stock progressively in relatively short increments, comprising in combination, gripping jaws, a reciprocable feed frame carrying said jaws, means on said frame for actuating said jaws in one direction and coil springs attached at one end to a part on said frame and at the other end to a fixed part for actuating said jaws in the opposite direction.

In testimony whereof, I have signed my name to this specification this 14th day of November, 1930.

GEORGE B. COE.