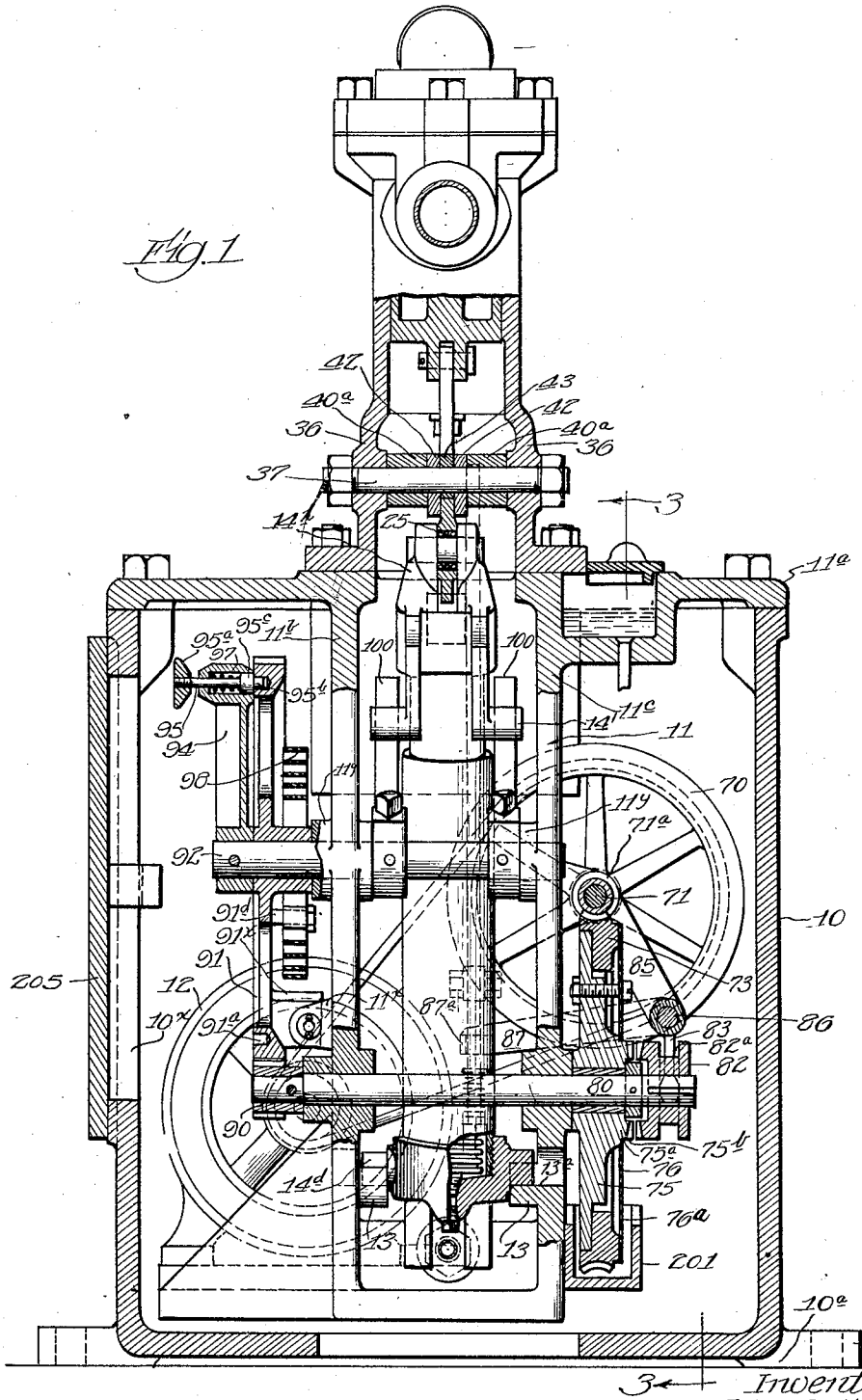
Nov. 26, 1929. J. C. HANNA 1,737,010

TIMING AND REVERSING MECHANISM

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Fig. 1

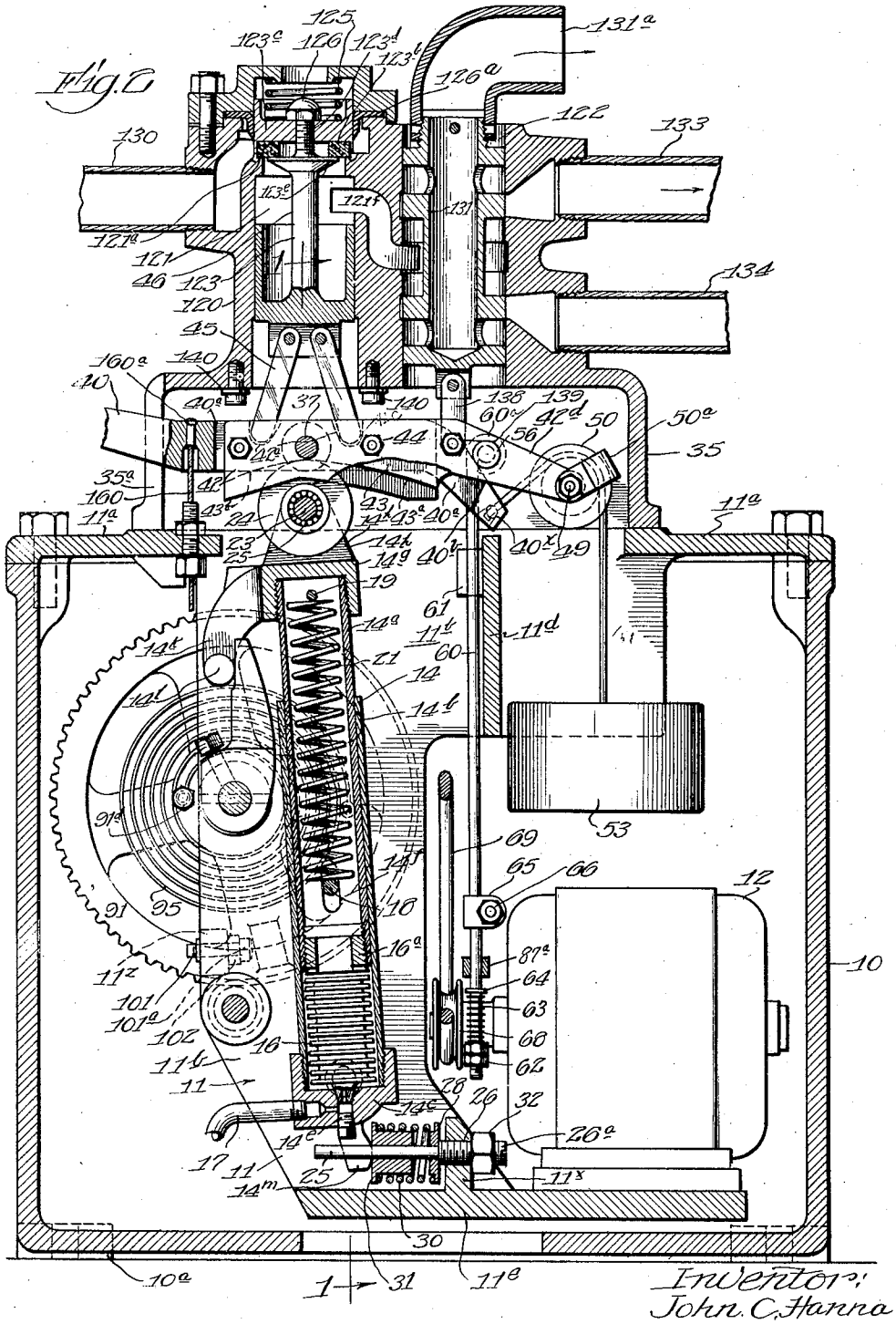


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TIMING AND REVERSING MECHANISM

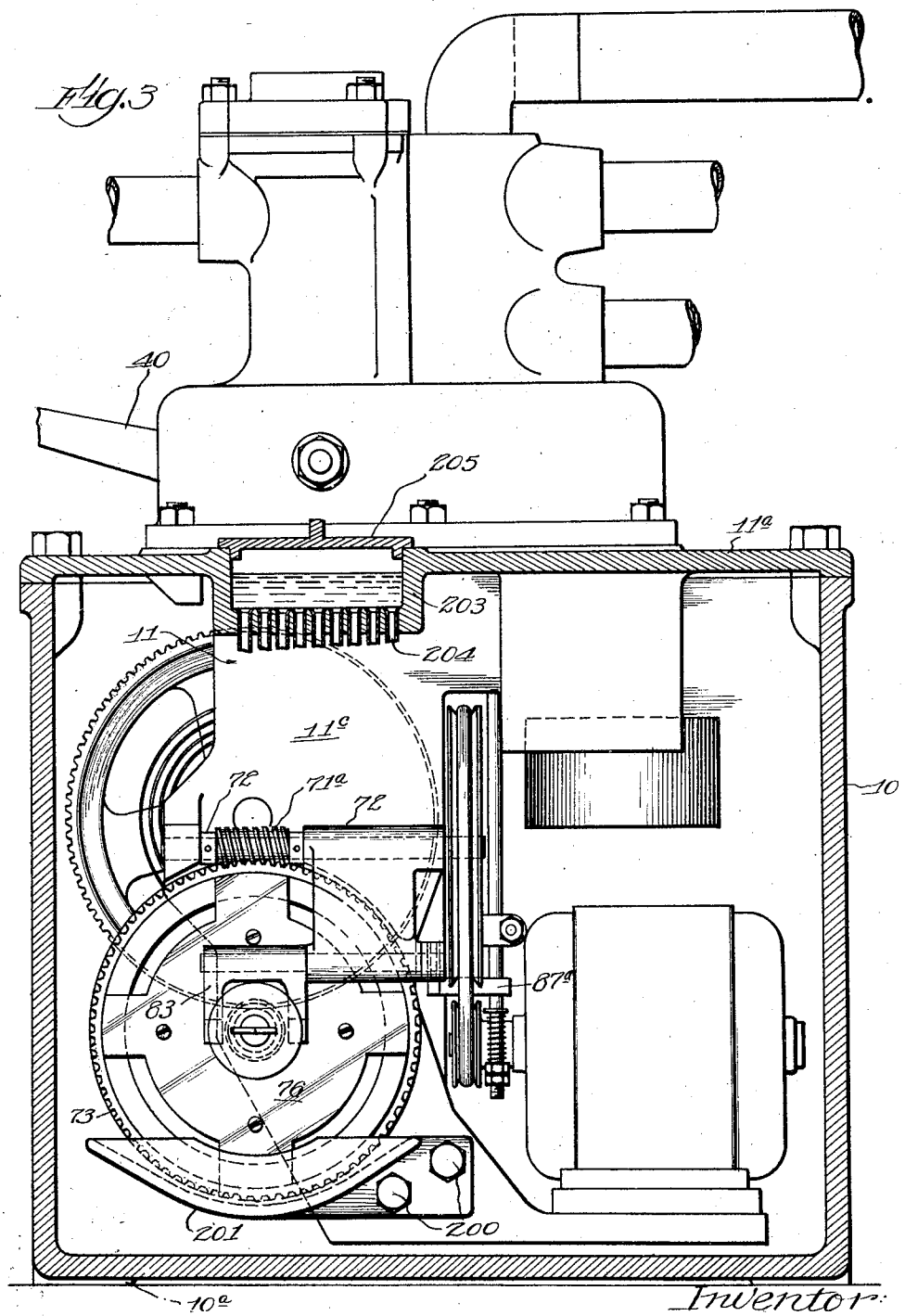
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TIMING AND REVERSING MECHANISM

Filed Oct. 31, 1924 4 Sheets-Sheet 3



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TIMING AND REVERSING MECHANISM

Filed Oct. 31, 1924 4 Sheets-Sheet 4

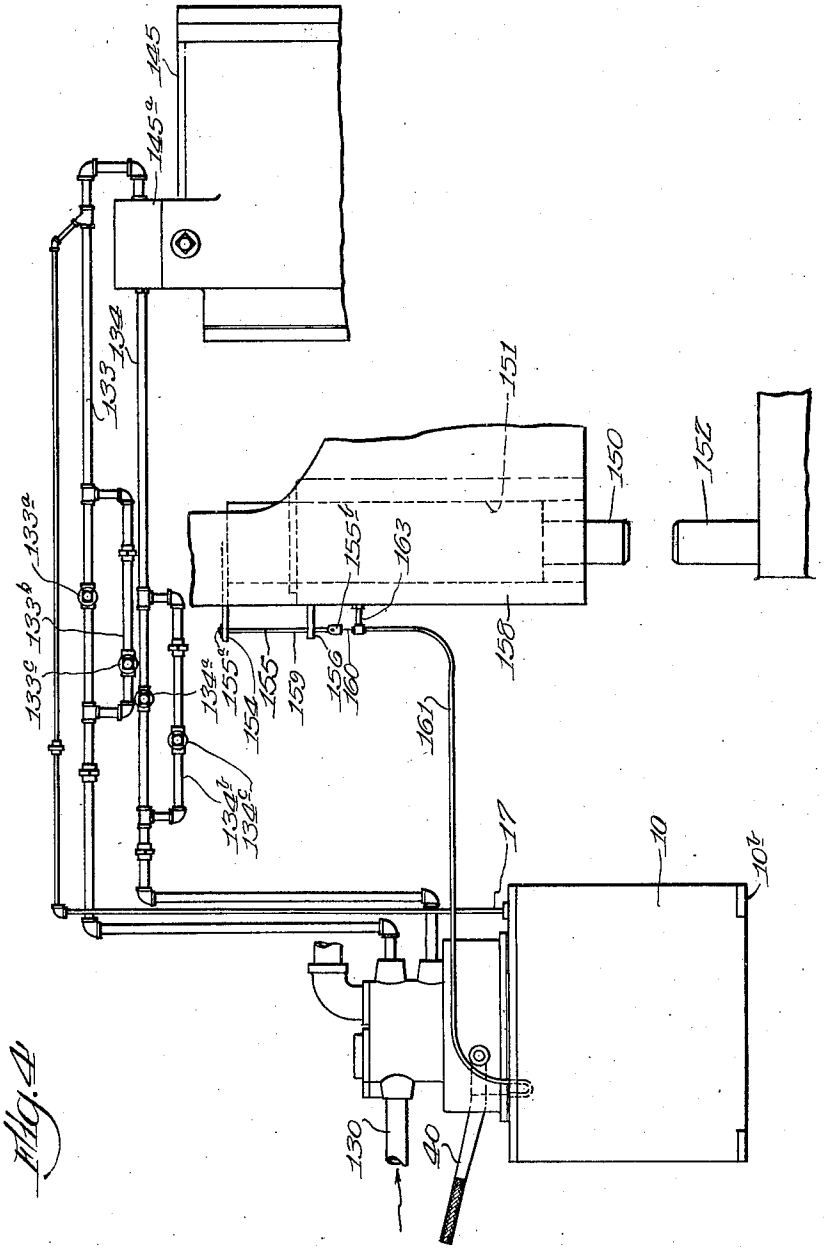


Fig. 4

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Patented Nov. 26, 1929 1,737,010

UNITED STATES PATENT OFFICE

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TIMING AND REVERSING MECHANISM

Application filed October 31, 1924. Serial No. 746,952.

This invention relates to improvements in timing and reversing mechanism, and has for its object to provide a mechanism especially adapted for use in conjunction with a riveting or similar type of machine.

It is well known that in pressure riveting operations, especially where the operator is paid on a piece-work basis, that the tendency is to hurry the work and allow insufficient time for the rivet to set under the riveting pressure. In other words, the operator is inclined to hurry the return stroke of the riveting die before the rivet has had sufficient time to set. This results in defective riveting and necessitates calking to prevent leakage along the riveted joint.

My present invention consists of a mechanism which will function to control flow of actuating fluid to the riveting or other machine with which the mechanism is used in such wise that upon depression of the operating lever the machine will commence its riveting or working stroke. As soon as resistance to this stroke has caused the pressure of the actuating fluid in the cylinder to build up to a desired point, this built up pressure is transmitted to my timing mechanism, and control of the machine for the balance of its cycle is removed from the operator to the mechanism. The latter may be set to permit a certain time to elapse after the riveting or other operation is initiated before the working tool is returned to initial position ready for repetition of its cycle of operations.

Other objects reside in the details of my mechanism and the operative connection to the working machine. These objects will be more fully described in the following specification and shown in the accompanying drawings, in which—

Fig. 1 is a vertical section along line 1—1 of Fig. 2.

Fig. 2 is a similar section taken at right angles to the section of Fig. 1.

Fig. 3 is a vertical section along the line 3—3 of Fig. 1.

Fig. 4 is a diagrammatic view illustrating the adaptation of my mechanism to a riveter, the jaws and sides thereof being drawn to a larger scale than the balance of the illustrated apparatus.

Like numerals refer to the same elements throughout the drawings. 10 designates a box or casing having the base portions 10^a and the supporting feet 10^b apertured for insertion of fastening bolts or the like to secure the casing to the floor or foundation. A supporting frame, generally indicated by numeral 11, extends into the casing 10, being supported by its flanges 11^a which are bolted to the side walls of casing 10 and form a cover therefor. This frame is provided with the spaced walls 11^b and 11^c, between which extends the connecting portion 11^d (see Fig. 2). At the bottom the walls 11^b and 11^c are connected by the base plate 11^e, which is extended at one side to form a supporting base for an electric motor, generally indicated my numeral 12. Near the lower extremities of the walls 11^b, 11^c, are provided supporting lugs 13, each having a concaved arcuate seat 13^a therein, these lugs being in opposed alignment. An expansible head, generally indicated by numeral 14, is provided, this being formed of two telescoping tubes 14^a and 14^b. The larger tube 14^b is provided with an enlarged head portion 14^c threaded thereon and having the laterally projecting trunnion portions 14^d mounted in the seats of supporting lugs 13 described above. This head 14^c is provided with the angular duct 14^e which connects at one end with the interior of a metallic cylindrical bellows member 16 and at the other end with the fluid supply duct 17, which extends upwardly through the casing, as shown in Fig. 4 for example. This tube 17 is either constructed of sufficient flexibility or has a flexible section interposed to accommodate the rocking motion of the telescopic tube 14 on its trunnions 14^d. At its upper end the member 16 is provided with a head 16^a threaded into engagement with the lower end of inner tube 14^a. The latter is slotted near its lower portion as indicated by numeral 14^f, and a pin 18 extends through said slot, being anchored at its ends in the outer tube 14^b. Slots 14^f permit relative movement of the inner tube 14^a with respect to the outer tube 14^b. Extending across the

tube 14^a at the upper end thereof is the fixed pin 19, and between pins 18 and 19 extends a coiled spring 21 under compression. At the upper end of tube 14^a is provided a head 14^g threaded thereto, this head being provided with the spaced upwardly extending lugs 14^h between which extends the shaft 23 carrying the roller 24 and ball bearings and container 25 mounted upon the shaft 23 between the lugs 14^h (see Figs. 1 and 2). Projecting outwardly and downwardly from the head 14^g are the fingers 14^k, having the angularly disposed lugs 14^l at their lower extremities, as shown in the drawings. Projecting downwardly from the lower head 14^e is the apertured boss 14^m, through which is inserted the laterally projecting pin 25 carried by the threaded stud 26 and threaded into suitable aperture in the small lug 11^x extending upwardly from base flange 11^e (see Fig. 2 for example). The stud 26 is larger in diameter than the pin 25 and the shoulder is formed in this manner, against which abuts the disc 28 shouldered to form a seat for one end of the coiled compression spring 30, the other end of which engages the sliding plug 31 on the pin 25, this plug being slidable on the pin and also shouldered for accommodation of the coiled spring 30. This plug presses against its boss 14^m. The force exerted against this boss may be varied by adjusting the position of the stud 26, which is provided with the slot 26^a in one end for engagement by a screw driver or the like for locking in adjusted position by the lock nut 32. Mounted upon the top of the cover flange 11 is the auxiliary casing 35, having the side walls 36, through and between which extends the bolt 37. At one end the casing 35 is slotted at 35^a to accommodate the operating handle 40, which is pivoted intermediate its extremities upon the bolt 37. This operating handle 40 is bifurcated to form the spaced arms 40^a, the outer end of one of which is provided with the inwardly directed lug 40^b (see Fig. 2). Located between the arms 40^a are a pair of spaced guide plates 42, between which is secured a cam plate 43 by the bolts 44 or the like. This cam plate 43 is provided with a double curve, one portion 43^a of which is contacted by the roller 24 during the riveting stroke, the other portion illustrated in dotted lines in Fig. 2 and designated by numeral 43^b, is acted upon by such roller to reverse the control of the machine. The guide plates 42 and cam plate 43 are also pivoted upon the bolt 37. The cam plate 43 is provided with the spaced sockets 42^c in the upper portion thereof. In each of these sockets is seated one rounded end of a link 45, these links being pivoted at their other ends to the lower extremity of cut-off valve 46. It will be apparent that by this construction, upon either direction of movement of the operating handle 40 about the bolt 37, one of the links 45 will be raised and the valve 46 lifted from its seat thereby.

The guide plates 42 are extended laterally, as indicated by numeral 42^d, and between such extremities extends the pin 49, upon which is rotatably carried the pulley 50, partially around which extends the cord or cable 51, the latter being prevented from leaving the groove and pulley 50 by the guard 50^a (see Fig. 2). The lug 40^b on the extended end of operating handle 40 underlies one of these plate extensions 42^d, and has secured to it at 40^x one end of the cord 51. At the other end of the cord is secured the weight 53. At one side of one of the plate extensions 42^d is secured a stud 56, around which is bent one end 60^a of a clutch operating rod 60. At its lower end rod 60 is provided with the lock nuts 62 threaded thereon. A coiled spring 63 extends upwardly from such lock nuts, and a collar 64 is mounted thereabove to slide on rod 60. Spaced from the spring and located thereabove is the clip 65 split and bolted in adjusted position to the rod by the bolt and nut 66.

On the shaft of motor 12 is secured a sheave or pulley 68, around which is mounted the belt 69 also running around the drive pulley 70, which is carried upon shaft 71. To this shaft is secured a worm 71^a meshing with the worm gear ring 73. This ring is frictionally held against the outer clutch of the gear disc 75 by means of spring portions 76^a of a second disc 76. This construction permits slipping of the gear ring 73 should the mechanism driven thereby encounter an unusual resistance.

The gear disc 75 is rotatably mounted upon the shaft 80, and is provided at its hub portions 75^a with clutch teeth 75^b. Splined to and slidable upon the shaft 80 is a clutch 82 grooved at 82^a to accommodate the ends of shifter fork 83. Extending downwardly and outwardly from one of the lugs 72 is the arm 85, at the lower end of which is journaled the rod 86, to which is secured the clutch shifter 83 adjacent one end. Adjacent the other end is the actuating arm 87 likewise secured to such rod and provided with the angularly disposed finger 87^a (see Figs. 1 and 3), this finger being apertured to permit insertion therethrough of the clutch rod 60, this finger 87^a being contactable by the spring washer 64 or the clip 65, depending upon the direction of movement of the rod. It will thus be apparent that the rod 60 may be actuated to shift the clutch 82 into or out of mesh with the clutch teeth 75^b of worm gear disc 75. At its other end the rod 80 is provided with a pinion 90 secured thereto, this pinion meshing with the gear 91, having on its outer rim a plurality of holes 91^a spaced at calculated intervals. This gear 91 is rotatably mounted upon the shaft 92 journaled in bosses 11^y of walls 11^b and 11^c. To one end of the shaft 92

is secured a handle 94, in the end of which is slidably mounted the pin 95 having a knob 95^a at one end and a projecting tip 95^b at the other, adapted to be inserted in any one of the holes 91^a. The large shoulder 95^c limits the entry of this pin into the holes and also serves to receive the thrust of compression spring 97, this construction functioning to normally maintain the pin in engagement with the selected hole in the gear 91. From one spoke of the gear 91 extends the pin 91^d, to which is secured one end of the coiled spring 98, the other end thereof being anchored to the side wall 11^b, this spring being constructed of tempered metal functioning in a manner similar to that of a clock spring. A pair of spaced striker arms 100 are secured to the shaft 92, these arms being located and arranged to strike the fingers 14^l in their orbit of travel.

It will be apparent that when the shaft 80 is clutched to gear 75, the pinion 90 will rotate gear 91 against the action of spring 98 which will be wound up. The rotation of gear 91 is in turn transmitted to shaft 92 and thus to the striker arms 100, which will be rotated until they strike the fingers 14^l. The de-clutching of the shaft 80 after such movement will result in the gear 91 being returned to normal position by the coiled spring 98. A lug 11^x projects from the wall 11^b from the casing and is provided with a pin 101 extending therethrough, having the head 101^a at one end (see Fig. 2). A collar or washer 102 of rubber or other resilient material is interposed between the head 101^a and the lug 11^x. Projecting from one spoke of the gear 91 is the projecting lug 91^x, which will contact with the cushion head 101^a of pin 101 to determine the normal or rest position of gear 91.

Extending upwardly from the casing 35 is the valve block 120 in which are provided the valve chambers 121 and 122. In the former is provided a seat 121^a upon which normally seats the soft collar 123^b carried on the valve 123. In the upper portion of the chamber 121 is provided a coiled compression spring 125 extending between the end of the chamber and the sliding cap 123^c secured to the valve 123 by the nut 126 threaded on a threaded extension 123^d of valve 123. This cap 123^c thus serves to maintain the soft collar 123^b clamped to the valve stem 123 against enlarged flange 123^e thereof, and acts as a guide for the valve. This valve is normally maintained in closed position by the compression of spring 125. A washer 126^a of leather or the like is provided to co-act with the cap 123^c to prevent leakage of operating fluid. An operating fluid supply pipe 130 leads to the valve chamber 121, while therefrom leads the duct 121^f to the second valve chamber 122, in which is mounted the balanced piston valve 131 of conventional construction having the exhaust elbow 131^a. From the valve chamber 122 lead the ducts 133 and 134, the former being arranged to supply actuating fluid for the riveting stroke for example, the latter supplying actuating fluid for the exhaust stroke, these ducts also serving for exhaust from the respective ends of the cylinder. Extending downwardly from the lower end of valve 131 and pivotally attached thereto is the link 138 pivoted at its other end on the bolt 139 extending between the guide plates 42. By this construction pivotal movement of the operating handle 40 in one direction will function to supply actuating fluid to one end of the machine cylinder permitting exhaust from the other end, and movement of the operating handle in the opposite direction will reverse these flows.

Projecting downwardly from the top of casing 35 are the stop studs 140, limiting the pivotal movement of the operating handle 40 in each direction.

In Fig. 4 I have designated the machine cylinder by the numeral 145, the same being provided with an actuating fluid chest 145^a to which the fluid is supplied from the valve chamber. 150 indicates the movable die carried by the die plunger 151, while therebeneath is located the stationary die 152. Projecting outwardly from the upper end of plunger 151 and movable therewith is the plate 154 apertured to accommodate the rod 155 which is provided with the head 155^a at its upper end. This rod 155 is slidably extended through a second fixed plate 156, projecting outwardly from the fixed jaw 158 of the machine. At its lower end the rod 155 carries the link 155^b to which is attached the end of Bowden wire 160, which is reciprocable in a flexible tube 161 of well known construction. One end of this tube is anchored in the bracket 163 and the other end is carried to and secured to the cover flange 11^a (see Fig. 2). The corresponding end of Bowden wire 160 is provided with a securing button 160^a attached to the operating handle 40.

It will be apparent with this construction that when the mechanism is in the position shown in Fig. 4, for example, with the plunger 151 and die 150 retracted from riveting position that the operating handle 40 may be depressed without interference from the Bowden wire control, as the stem 155 will rise vertically with respect to plate 154. Lift of handle 40, however, is prevented by the head 155^a on stem 155, so that the control valve may not be moved to reverse position which would result in waste of air. When the die has completed a riveting stroke, the sliding engagement of plate 154 with stem 155 will permit relative movement without affecting the position of the wire 160. As will be explained later, the operating handle is moved to reverse position or upwardly from normal position on the return stroke, and is returned to nor-

mal position shown in Figs. 2 and 4, for example, by the upward movement of the plunger 151 and plate 154, thus bringing the delay and timing mechanism to neutral position. Check valves 133[a] and 134[a] are inserted in the respective pipes 133 and 134 and by-pass pipes 133[b] and 134[b] extend therearound respectively. In these by-pass pipes are provided the reversely actuating check valves 133[c] and 134[c] respectively to permit by-pass and exhaust of air from that end of the cylinder to which the actuating fluid is not being admitted. The purpose of this by-pass and check valve construction is to permit flow of actuating fluid in one direction through the main pipe, the check valve 133[a] or 134[a] opening to permit such flow, and the check valve 133[c] or 134[c] closing to prevent flow through the by-passes. Reverse flow in either line is prevented through the main pipe by the check valves 133[a] and 134[a] closing and forcing the flow through the by-pass pipes, the check valves 133[c] and 134[c] therein opening to permit such flow. By this means I am enabled to regulate the flow in the two directions in each line by properly selecting or adjusting the orifice in the check valves. For instance, flow through the check valves 133[a] or 134[a] may be actuating flow of the fluid under pressure which may be relatively restricted, while flow through either of the by-passes will be exhaust flow and will be relatively unrestricted to permit free exhaust.

Secured by bolts 200 or the like to the side wall 11[c] of the frame is the oil trough 201 (see Figs. 1 and 3, for example), through which rotates the worm gear 73, the same being thereby constantly lubricated.

Depending from the cover flange 11[a] is an oil reservoir 203, from which lead a plurality of lubricating pipes 204 to the various bearings and other elements requiring constant lubrication. A cover 205 is provided for this reservoir to permit refilling from time to time as required.

In the operation of the machine, assuming the pipe 130 to be attached to a source of actuating fluid under pressure and the parts in normal position, as illustrated in the drawings, the operation is as follows: The operator depresses the operating handle 40 whereby the same is pivoted about the bolt 37. A lift will be thereby exerted upon the extension 42[d] of guide plate 42 through the finger 40[b], which will result in a partial rocking of the guide plates and cam plate 43 about the bolt 37. A lift will be thereby imparted by the right hand link 45 as viewed in Fig. 2 to the valve stem 123, thereby permitting flow of fluid under pressure to the valve chamber 122 through duct 121[f]. This same movement of the guide plates 42 lifts the control valve 131 through the medium of link 138 to position in which actuating fluid will flow through duct 133 to the machine cylinder 145 to effect the working stroke of the riveting die 150. The same movement of valve 131 opens the duct 134 to the atmosphere through elbow 131[a] and permits exhaust from the opposite end of cylinder 145. The rocking of the cam plate 43 alters the relation of the arcuate surface 43[a] with respect to the roller 24, and the coil spring 30 acting on the lower end of the telescopic expansible member 14 swings the same around its trunnions 14[d] to a right hand position from that viewed in Fig. 2. The compression of spring 21 serves to maintain the roller 24 in contact with the cam during this movement. As the piston in cylinder 145 moves from the right hand end of such cylinder on operative stroke, the pressure in member 16 will not be appreciably raised due to the angle of the connection of supply pipe 17 to pipe 133, as shown in Fig. 4. As the die 150 encounters resistance from the rivet, for example, the pressure in cylinder 145 will build up, and such pressure is transmitted back through pipe 17 to the member 16, which expands and in effect locks the cam and roller in right hand position as soon as the pressure in the member is sufficient to overcome the downward pull of weight 53 acting on the extension 42[d] of guide plate 42. As explained above, this movement of the operating handle or lever 40 is not interfered with by Bowden wire 160 owing to the sliding engagement of stem 155 with plate 154. As soon as the pressure in member 16 has built up to a predetermined point, as for example 55 pounds which I find sufficient for use with a line pressure of 100 pounds to the square inch, the operating handle 40 may be released as movement upwardly thereby will not affect the position of cam 43 due to the locking or resistance by the telescopic member 14 just described. It will be appreciated that the time required for the pressure in the sylphon to build up to this point is very slight, but this construction and arrangement permits the operator to reverse the riveting die 150 should he so desire before the die encounters resistance, but the resistance builds up so rapidly after the rivet is contacted by the die as to almost immediately lock the cam and roller in their right hand position.

The electric motor 12 is running constantly at a comparatively high rate of speed, and during the non-operation of the mechanism the rotation which is transmitted to the large pulley 70 is of no effect, as such rotation is transmitted through shaft 71 and worm 71[a] to gear 73 which will rotate on and relative to shaft 80. When the operating handle 40 is depressed, however, the upward movement of the right hand end of guide plate 42 is transmitted through clutch rod 60 and the spring collar 64 is brought into contact with lug 87[a] at the end of le-

ver 87, and the latter is partially rotated to mesh clutch 82 with the toothed hub 75ª of gear disc 75, the spring 63 exerting a yielding force upon the lever 87 so that should the clutch teeth not mesh at first, partial slip will be permitted until mesh occurs. As soon as the clutch members have meshed the rotation of worm gear 72 is transmitted to shaft 80 and thereby to pinion 90, which in turn rotates gear 91. It will be appreciated that this gear train greatly reduces the speed which, for example, in the proportions shown is reduced from 1750 R. P. M. at the motor to 1 R. P. M. at shaft 92.

The arm 94 has previously been set at a point corresponding to a desired delay, this delay being obtained by the amount of rotation required of shaft 92 before striker arms 100 encounter lugs 14ª and return telescopic member toward normal position. When the arm 94 is in engagement with gear 91 rotation of the latter will be transmitted to shaft 92, and thereby to the striker arms 100, against the resistance of coiled spring 98.

As soon as the weight 53 acting upon the guide plates 42 and cam 43 is sufficient to overcome the upward thrust of the telescopic member 14, due to its shortening torque arm, the guide plates and cam together with the operating handle 40 will be reversely rocked, thus assisting the return of the telescopic member 14 toward neutral position. There being no restraint upon operating handle 40 from Bowden wire 160 due to the previous downward movement of plate 154, the rollers and telescopic member will be moved past normal or rest position to the left thereof, and left hand link 45 will raise the valve stem 123, which has been moved to closing position under the action of spring 125 as the guide plates and cam reach neutral position. At the same time through the medium of link 138, the control valve 131 is moved downwardly through and past normal or rest position shown in Fig. 2 for example, which results in the opening of duct 134 to the passage of the fluid under pressure, and at the same time duct 133 is open to exhaust through elbow 131ª. Since there is no resistance save the friction of the moving machine parts on return stroke this stroke is relatively rapid. As plate 154 in its upward return movement picks up head 155ª, the Bowden wire 160 will act upon the operating lever 40 to return the same to normal position.

During the same period the pressure in the member 16 is exhausting and the upward thrust upon the cam and guide arms is being lessened until it reaches normal. This return movement of lever 40 is transmitted through finger 40ᵇ to the guide plates 42 and cam 43 and the apparatus is returned to normal position, obviously moving control valve to such position and permitting closure of main cut off valve 123ᵇ.

To limit the movement of the guide plates and lever in either direction, I provide stop studs 140 indicated thereabove at either side of the links 45.

During the return of the guide plates from right hand position, the clutch rod 60 is moved downwardly and clip 65 will contact finger 87ª to, obviously de-clutch the gear disc 75 from the driving mechanism, whereupon positive drive of gear 91 is terminated and the coiled spring 95 acts to reversely rotate the gear 91 until the cushioned stop pin 101ª is encountered.

Should anything occur due to the fault of the mechanism or other cause to delay the de-clutching of gear 75, the friction connection between the gear disc and the gear ring 73 will permit slip and prevent breakage of the driving means.

It will be apparent that a certain fixed period of time must elapse between the inception of the riveting action and the return of the parts to normal, even when the arm 94 is set in position for minimum delay. This period of time, however, is constant and is so relatively small as to permit a minimum of delay should it be described to dispense with the delay function of the mechanism. A plurality of holes 91ª are provided at definite intervals about the rim of gear 91, and these holes may be located to provide certain definite periods of delay, as for example one for each second of delay desired.

An access opening 10ˣ is provided at one side of the casing for access to the timing mechanism for resetting. This is normally closed by means of a cover 205 which may be padlocked or otherwise secured in place, to prevent interference with the setting of the machine except by those authorized to do so.

It will be apparent that the operator having started the riveting stroke may not interfere with the same after the rivet is contacted by the die, so that it is impossible for him to shorten or interfere with the time for setting of the rivet. It is merely necessary for him to press the operating lever 40, and as soon as the rivet is contacted by the die he may release the handle and the riveting operation will be completed, and after the first delay period has elapsed, the control and operating mechanism will be returned to normal or rest position ready for a new stroke. This insures accurate operation at maximum rapidity, consistent with the required delay period.

It will be obvious that my invention is susceptible to modification, and I do not wish to be restricted to the form shown and described, except as defined in the appended claims.

What I claim is:

1. In combination, a riveter comprising a reciprocating die, a fluid actuated means

to reciprocate the same, a control mechanism comprising a valve to control flow of such actuating fluid, operating means operatively associated therewith and manually movable to move said valve to position to effect riveting stroke of said die, and mechanism controlled by said operating means to effect reversal of said valve and thereby said fluid actuated means and said die after a desired period of time.

2. In combination, a riveter comprising a reciprocating die, a fluid actuated means to reciprocate the same, a control mechanism comprising a valve to control flow of such actuating fluid, operating means operatively associated therewith and manually movable to move said valve to position to effect riveting stroke of said die, mechanism controlled by said operating means to effect reversal of said valve and thereby said fluid actuated means and said die after a desired period of time, and means associated with said riveter to return said operating means to normal position upon completion of said die reversal.

3. In combination, a riveter comprising a reciprocating die, a fluid actuated means to reciprocate the same, a control mechanism comprising a valve to control flow of such actuating fluid, a lever and a cam operatively associated therewith and manually movable to move said valve to position to effect riveting stroke of said die, and mechanism controlled by said lever and cam to lock for a period of time and thereafter reverse said valve and lever and cam and thereby said fluid actuated means and said die.

4. In combination, a riveter comprising a reciprocating die, a fluid actuated means to reciprocate the same, a control mechanism comprising a valve to control flow of such actuating fluid, operating means operatively associated therewith and manually movable to move said valve to position to effect riveting stroke of said die, mechanism controlled by said operating means to effect reversal of said valve and thereby said fluid actuated means and said die after a desired period of time, and means associated with said riveter to return said operating means to normal position upon completion of said die reversal, said last named means comprising a Bowden wire and casing.

5. In combination, a riveter comprising a reciprocating die, a fluid actuated means to reciprocate the same, a control mechanism comprising a valve to control flow of such actuating fluid, a lever and cam operatively associated therewith and manually movable to move said valve to position to effect riveting stroke of said die, mechanism actuated by said lever and cam to effect reversal of said valve and thereby said fluid actuated means and said die after a desired period of time, and means associated with said riveter to return said lever and cam to normal position upon completion of said die reversal, said last named means comprising a Bowden wire and casing, said wire being operatively connected to said die.

6. In combination, a riveter comprising a reciprocating die, a fluid actuated means to reciprocate the same, a control mechanism comprising a valve to control flow of such actuating fluid, operating means operatively associated therewith and manually movable to move said valve to position to effect riveting stroke of said die, mechanism controlled by said operating means to effect reversal of said valve and thereby said fluid actuated means and said die after a desired period of time, and means associated with said riveter to return said operating means to normal position upon completion of said die reversal, said last named means comprising a Bodwen wire and casing, said wire being provided with a stem member, an apertured plate operatively attached to said die, said stem being headed and slidable in the aperture of said plate, the head of said stem being engageable by said plate adjacent one limit of travel.

7. In combination, a chambered valve body and riveting cylinder, a duct to supply actuating fluid to one end of said cylinder, a second duct to supply actuating fluid to the other end thereof, said ducts leading from the chamber in said valve body, a valve operable to throw either of said ducts into communication with a source of supply or an exhaust passage or to close both said ducts when in normal position, a third duct attached to said first duct at an angle thereto, operating means and delay mechanism comprising a locking member actuatable by fluid from said third duct to lock said operating means in operating position for a desired period of time.

8. In combination, a main cut off valve and a control valve, means to supply actuating fluid to said control valve upon opening of said cut off valve, operating means comprising a manually operable member and a co-acting actuating member, said co-acting member being actuatable in one direction on movement of said manually operable member in a corresponding direction, said co-acting member being operatively attached to said control valve to move the same simultaneously therewith, said co-acting member being also operatively attached to said cut off valve to move it to open position on movement in either direction, means to normally maintain said operable member and said co-acting member in operative adjustment, means operable to lock said co-acting member after movement by said manually operable member for a desired period of time.

9. In combination, a main cut off valve and

a control valve, means to supply actuating fluid to said control valve upon opening of said cut off valve, operating means comprising a manually operable member and a co-acting actuating member, said co-acting member being actuable in one direction on movement of said manually operable member in a corresponding direction, said co-acting member being operatively attached to said control valve to move the same simultaneously therewith, said co-acting member being also operatively attached to said cut off valve to move it to open position on movement in either direction, means to normally maintain said operable member and said co-acting member in operative adjustment, means operable by fluid pressure after movement of said control valve to one position to lock said co-acting member against movement by said manually operable member.

10. In combination, a main cut off valve and a control valve, means to supply actuating fluid to said control valve upon opening of said cut off valve, operating means comprising a manually operable member and a co-acting actuating member, said co-acting member being actuatable in one direction on movement of said manually operable member in a corresponding direction, said co-acting member being operatively attached to said control valve to move the same simultaneously therewith, said co-acting member being also operatively attached to said cut off valve to move it to open position on movement in either direction, means to normally maintain said operable member and said co-acting member in operative adjustment, means operable to lock said co-acting member after movement by said manually operable member, means to withdraw said locking means from locking relation after a desired period of time.

11. In combination, a main cut off valve and a control valve, means to supply actuating fluid to said control valve upon opening of said cut off valve, operating means comprising a manually operable member and a co-acting actuating member, said co-acting member being actuatable in one direction on movement of said manually operable member in a corresponding direction, said co-acting member being operatively attached to said control valve to move the same simultaneously therewith, said co-acting member being also operatively attached to said cut off valve to move it to open position on movement in either direction, means to normally maintain said operable member and said co-acting member in operative relation, means operable by fluid pressure after movement of said control valve to one position to lock said co-acting member against movement by said manually operable member, means to withdraw said locking means from locking relation.

12. In combination, a main cut off valve and a control valve, means to supply actuating fluid to said control valve upon opening of said cut off valve, operating means comprising a manually operable member and a co-acting actuating member, said co-acting member being actuatable in one direction on movement of said manually operable member in a corresponding direction, said co-acting member being operatively attached to said control valve to move the same simultaneously therewith, said co-acting member being also operatively attached to said cut off valve to move it to open position on movement in either direction, means to normally maintain said operable member and said co-acting member in operative adjustment, means operable by fluid pressure after movement of said control valve to one position to lock said co-acting member against movement by said manually operable member, means to withdraw said locking means from locking relation, said maintaining means being operable after said withdrawal to actuate said operating means to reverse the position of said control valve.

13. In combination, a control valve, an operating lever, a cam member movable with said lever, an expansible member in contact with said cam member, means to swing said expansible member on movement of said cam member in one direction from normal or rest position to position maintaining said cam and thereby said valve in open valve position.

14. In combination, a control valve, an operating lever, a cam member movable with said lever, said operating member being provided with means to move said cam member in one direction of travel, an expansible member in contact with said cam member, means to swing said expansible member on movement of said cam member in one direction from normal or rest position to position maintaining said cam and thereby said valve in open valve position.

15. In combination, a control valve, an operating lever, a cam lever movable with said lever, an expansible member in contact with said cam member, means to swing said expansible member on movement of said cam member in one direction, from normal or rest position to position maintaining said cam and thereby said valve in open valve position, a bellows member associated with said expansible member to be expanded and maintain said cam member in said open position, said valve being actuatable by said cam member.

16. In combination, a control valve, an operating lever, a cam lever movable with said lever, an expansible member in contact with said cam member, means to swing said expansible member on movement of said cam member in one direction from normal or rest position to position maintaining said cam

and thereby said valve in open valve position, means co-acting with said expansible member to lock said cam member in said open position, said valve being actuatable by said cam member.

17. In combination, a control valve, an operating lever, a cam lever associated therewith, an expansible member in contact with said cam member, means to swing said expansible member on movement of said cam member in one direction, means co-acting with said expansible member to lock said cam member in said position at one limit of travel, said valve being actuatable by said cam member, a delay mechanism comprising means to engage and return said expansible member to normal position.

18. In combination, a control valve, an operating lever, a cam lever associated therewith, an expansible member in contact with said cam member, means to swing said expansible member on movement of said cam member in one direction, means co-acting with said expansible member to lock said cam member in said position at one limit of travel, said valve being actuatable by said cam member, a delay mechanism comprising means to engage and return said expansible member to normal position, and electrically actuated means to actuate said last named means.

19. In combination, a control valve, an operating lever, a cam lever associated therewith, an expansible member in contact with said cam member, means to swing said expansible member on movement of said cam member in one direction, means co-acting with said expansible member to lock said cam member in said position at one limit of travel, said valve being actuatable by said cam member, a delay mechanism comprising means to engage and return said expansible member to normal position, an electrically actuated means to actuate said last named means, means actuatable on movement of said cam member in said direction of travel to throw said electrically actuated means into operation.

20. In combination, a control valve, an operating lever, a cam lever associated therewith, an expansible member in contact with said cam member, means to swing said expansible member on movement of said cam member in one direction, means co-acting with said expansible member to lock said cam member in said position at one limit of travel, said valve being actuatable by said cam member, a delay mechanism comprising means to engage and return said expansible member to normal position, an electrically actuated means to actuate said last named means, means actuatable on movement of said cam member in said direction of travel to throw said electrically actuated means into operation, means resisting movement of said cam member from normal position.

21. In combination, a control valve, an operating lever, a cam lever associated therewith, an expansible member in contact with said cam member, means to swing said expansible member on movement of said cam member in one direction, means co-acting with said expansible member to lock said cam member in said position at one limit of travel, said valve being actuatable by said cam member, a delay mechanism comprising means to engage and return said expansible member to normal position, an electrically actuated means to actuate said last named means, means actuatable on movement of said cam member in said direction of travel to throw said electrically actuated means into operation, means resisting movement of said cam member from normal position and normally maintaining said operable member in operable engagement therewith.

22. In combination, an operating lever, a cam member movable in one direction by said operating lever, said cam being provided with a curved concaved contact surface, the curve thereof comprising arcs joined at a neutral point, a roller contacting therewith, means to shift said roller on said cam surface from said neutral point upon movement of said cam by said operating lever, said means being operable to hold said cam through the medium of said roller in shifted position.

23. In combination, an operating lever, a cam member movable in one direction by said operating lever, said cam being provided with a curved concaved contact surface, the curve thereof comprising arcs joined at a neutral point, a roller contacting therewith, means to shift said roller on said cam surface from said neutral point upon movement of said cam by said operating lever, means co-acting with said roller to lock said cam in one position after movement of said cam and roller.

24. In combination, an operating lever, a cam member movable in one direction by said operating lever, said cam being provided with a curved concaved contact surface, the curve thereof comprising arcs joined at a neutral point, a roller contacting therewith, means to shift said roller on said cam surface from said neutral point upon movement of said cam by said operating lever, means co-acting with said roller to lock said cam in one position after movement of said cam and roller, said last named means comprising a fluid actuated member.

25. In combination, an operating lever, a cam movable in one direction thereby, provided with a curved concaved contact surface, said surface being formed of a pair of arcs joined at a neutral point, a roller contactable with said surface, an expansible member carrying said roller, said member being mounted to swing about an axis, the

curves of said cam normally diverging inwardly from the orbit of said roller to resist movement from neutral thereof.

26. In combination, an operating lever, a cam movable in one direction thereby, provided with a curved concaved contact surface, said surface being formed of a pair of arcs joined at a neutral point, a roller contactable with said surface, an expansible member carrying said roller, said member being mounted to swing about an axis, the curves of said cam normally diverging inwardly from the orbit of said roller to resist movement from neutral thereof, means co-acting with said lever and cam to resist movement of the latter by the former.

27. In combination, an operating lever, a cam movable in one direction thereby, provided with a curved concaved contact surface, said surface being formed of a pair of arcs joined at a neutral point, a roller contactable with said surface, an expansible member carrying said roller, said member being mounted to swing about an axis, the curves of said cam normally diverging inwardly from the orbit of said roller to resist movement from neutral thereof, means co-acting with said lever and cam to resist movement of the latter by the former, said means being also constructed and arranged to maintain said cam in operative relation to said lever.

28. In combination, an operating lever, a cam movable in one direction thereby, provided with a curved concaved contact surface, said surface being formed of a pair of arcs joined at a neutral point, a roller contactable with said surface, an expansible member carrying said roller, said member being mounted to swing about an axis, the curves of said cam normally diverging inwardly from the orbit of said roller to resist movement from neutral thereof, means co-acting with said lever and cam to resist movement of the latter by the former, said means being also constructed and arranged to maintain said cam in operative relation to said lever, said means being also constructed and arranged to resist movement of said roller and expansible member from neutral position in one direction.

29. In combination, an actuating member, a manually operable member co-acting therewith to move the same to an operating position, means to lock said actuating member in such position, means to withdraw said locking means from locking position, said last named means comprising a withdrawing member, an electric motor, and means to transmit rotation from said motor to said withdrawing member, means actuated simultaneously with the movement of said operating member to throw said motor into operative relation with said withdrawing member.

30. In combination, an actuating member, manually operable member co-acting therewith to move the same to operating position, locking means to lock said member in such position, means to withdraw said locking member from locking relation, said last named means comprising a withdrawal member, an electric motor, means to transmit rotation of said motor to said withdrawal member, said last named means comprising clutching means movable into driving relation upon movement of said actuating member to said position, and out of driving relation on return movement thereof.

31. In mechanism of the class described, manually operable actuating means, means to lock said first named means in one position, means to withdraw said locking means from locking relation, said last named means comprising a delay mechanism, said delay mechanism comprising a rotatable arm, a gear rotatable therewith, and means associated with said gear to normally return the same to a rest position.

32. In mechanism of the class described, manually operable actuating means, means to lock said first named means in one position, means to withdraw said locking means from locking relation, said last named means comprising a delay mechanism, said delay mechanism comprising a rotatable arm, a gear rotatable therewith, means associated with said gear to normally return the same to a rest position, a stop, and stop means carried by said gear to contact said stop at rest position.

33. In combination with a riveter comprising a reciprocating die and fluid actuated means to move said die to and from riveting position, a control valve, a manually operable member operatively attached to said valve and movable to open and close the same, means to automatically lock said member in open valve position, means to release said locking means after a desired period of time, the actuation of said locking means being initiated by movement of said member, and means to return said member and valve to closed valve position after release of said locking means.

34. In combination with a riveter comprising a reciprocating die and fluid actuated means to move said die to and from riveting position, a control valve, a manually operable lever having a cam surface and operatively attached to said valve to move the same to and from open position, means to automatically lock said member in open valve position including an expansible member pivotally mounted and contacting with said cam surface, means to release said locking member after a desired period of time, and means to return said member and valve to closed valve position after such release.

35. In combination with a riveter comprising a reciprocating die and fluid actuated

means to move said die to and from riveting position, a control valve, a manually operable lever having a cam surface and operatively attached to said valve to move the same to and from open position, means to automatically lock said member in open valve position including an expansible member pivotally mounted and contacting with said cam surface, other means to supply extending fluid pressure to said member upon opening of said valve whereby the said member will move along said cam surface and lock said lever in open valve position, means to release said locking member after a desired period of time, and means to return said member and valve to closed valve position after such release.

In witness whereof, I hereunto subscribe my name to this specification.

JOHN C. HANNA.