No. 881,376. PATENTED MAR. 10, 1908.

H. A. CARPENTER.

MECHANISM FOR CONTROLLING FLUID PRESSURE.

APPLICATION FILED DEC. 30, 1901.

3 SHEETS—SHEET 1.

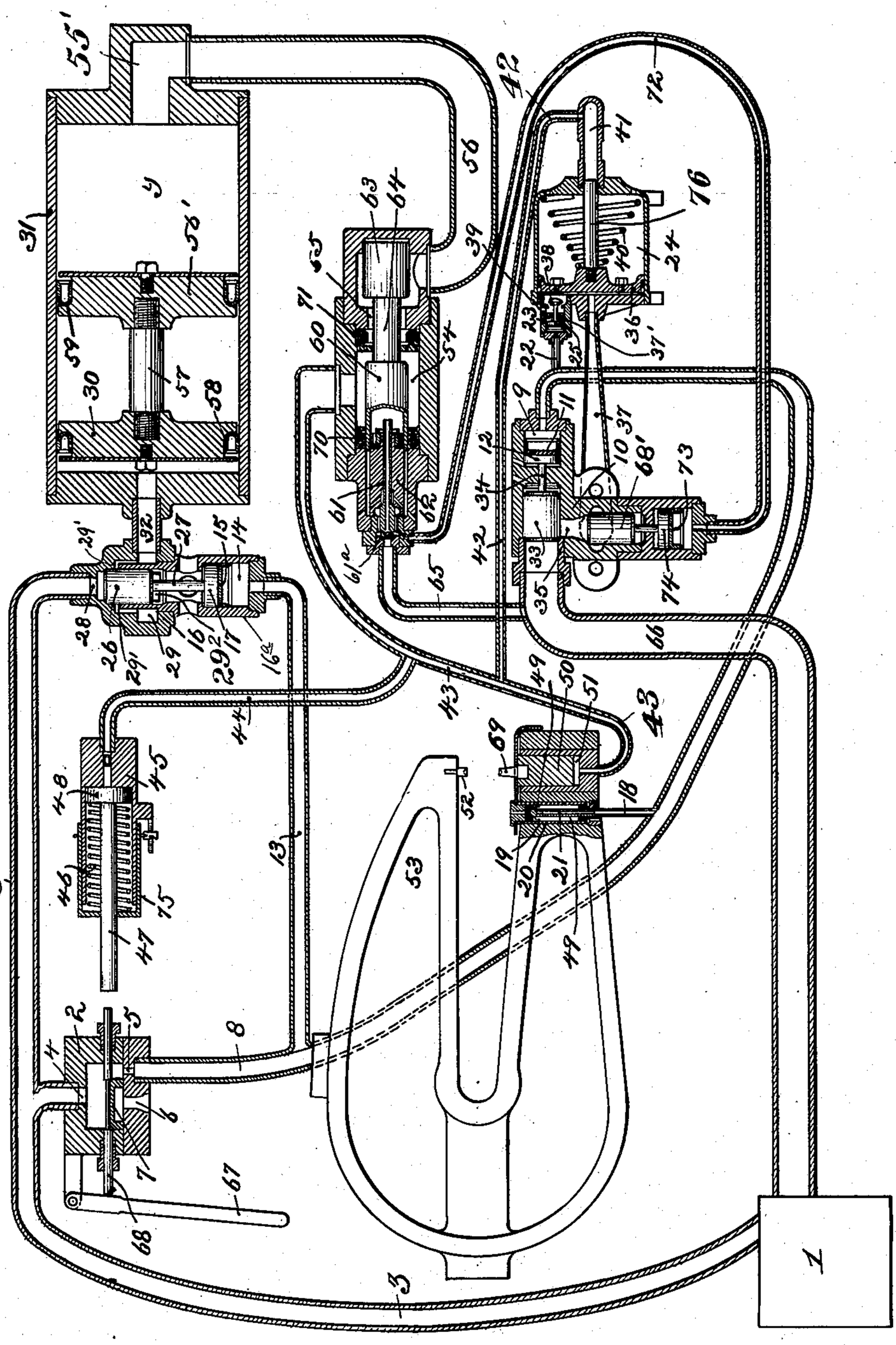

Fig. 1.

Witnesses:

C. A. Williams

James C. Herron

Inventor:

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per John H. Roney his Attorney.

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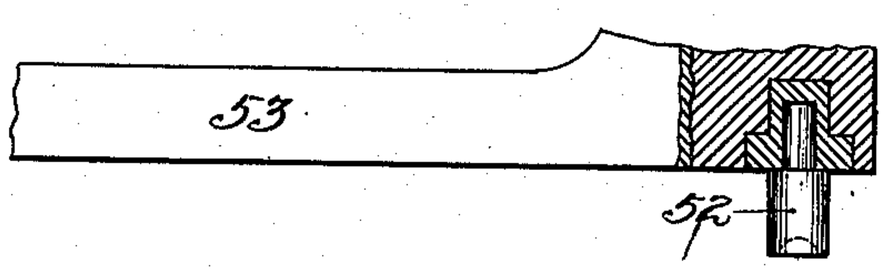

FIG. 2.

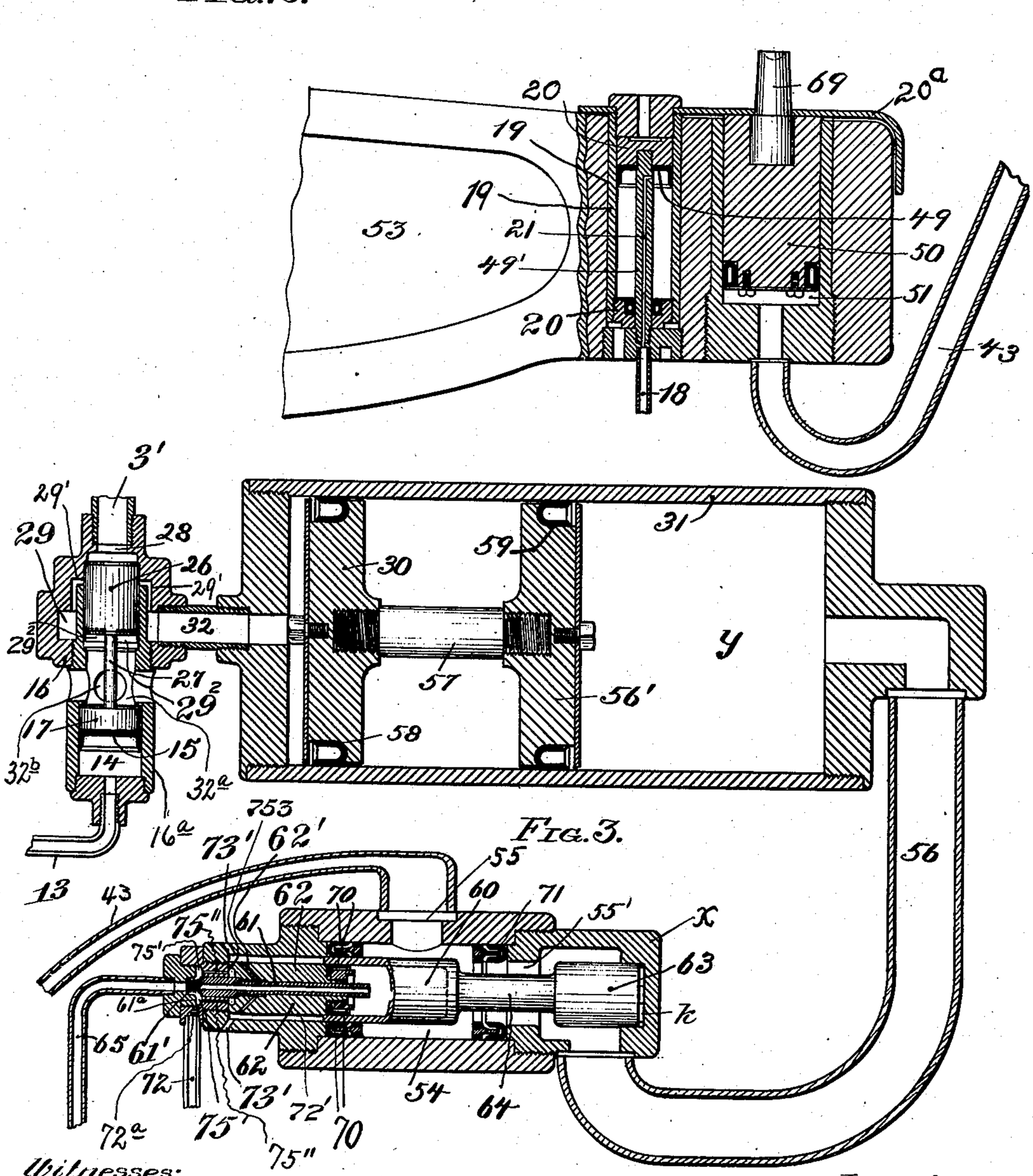

FIG. 3.

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3 SHEETS—SHEET 3.

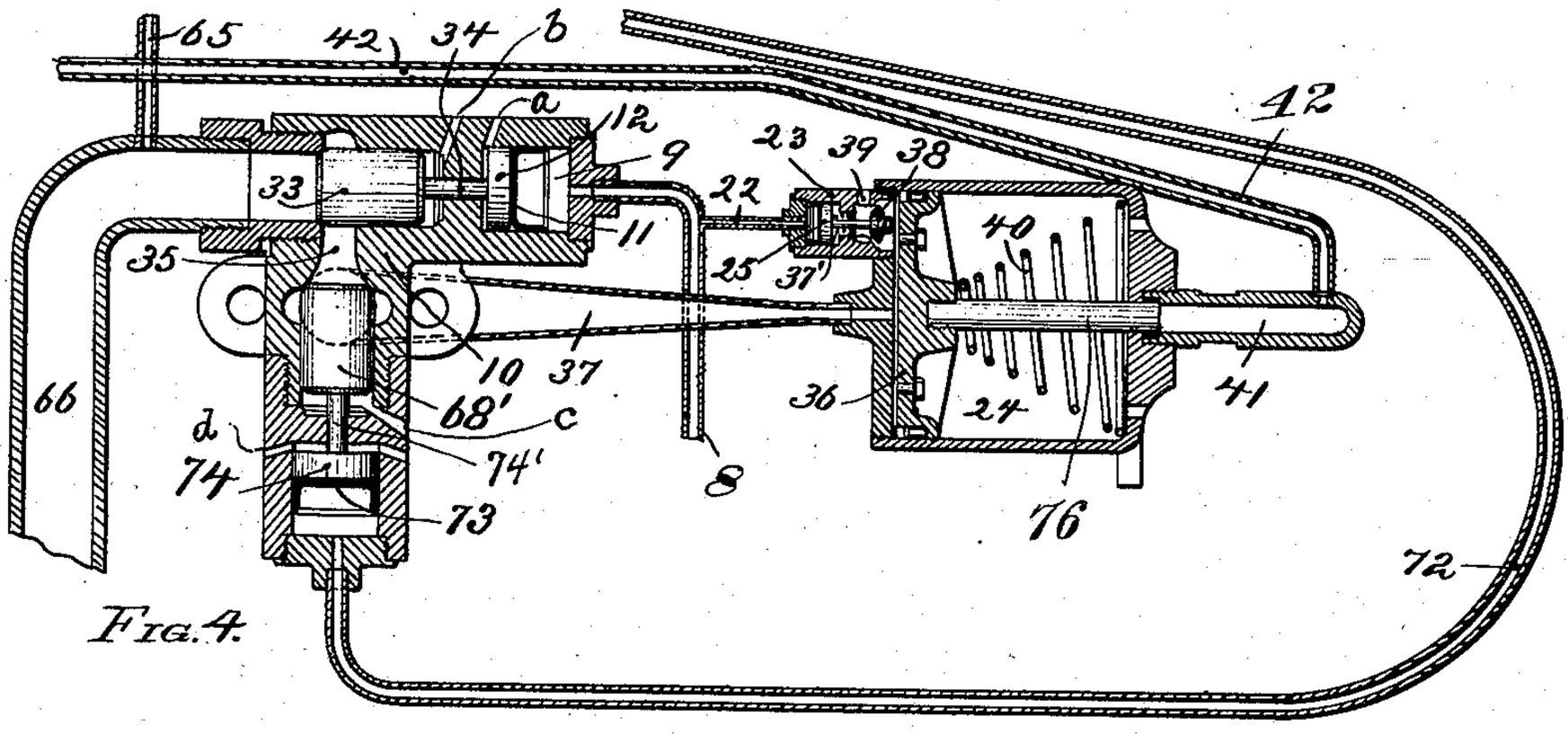

Fig. 4.

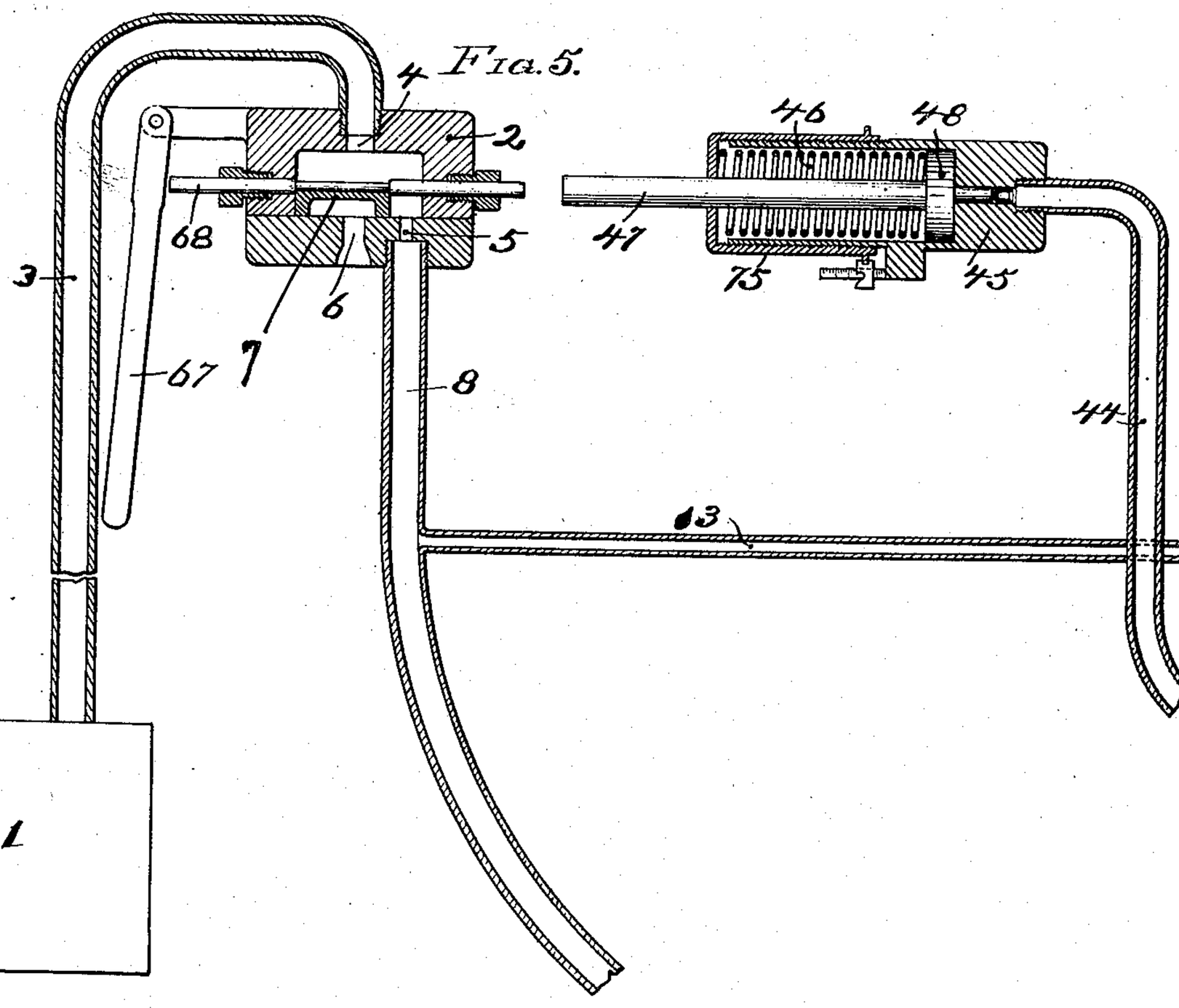

Fig. 5.

Witnesses:

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UNITED STATES PATENT OFFICE.

HENRY A. CARPENTER, OF SEWICKLEY, PENNSYLVANIA, ASSIGNOR TO RITER-CONLEY MANUFACTURING COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

MECHANISM FOR CONTROLLING FLUID-PRESSURE.

No. 881,376. Specification of Letters Patent. Patented March 10, 1908.

Application filed December 30, 1901. Serial No. 87,698.

To all whom it may concern:

Be it known that I, HENRY A. CARPENTER, a citizen of the United States, and a resident of Sewickley, in the county of Allegheny and State of Pennsylvania, have invented a certain new and useful Improvement in Mechanism for Controlling Fluid-Pressure, of which improvement the following is a specification.

My invention relates to mechanism or means for utilizing and controlling fluid pressure against one or more plungers, or a combination of plungers, to actuate presses, plate closing and riveting machines, the primary object of my invention being to combine, with this class of machines, a means to control the pressure in said machines and automatically release the same when a fixed and predetermined pressure has been attained; and to this purpose my invention consists in the novel construction, combination, and arrangement of parts hereinafter more specifically described, reference being had to the accompanying drawings, which form a part of this specification, in which—

Figure 1, is a view of my improved mechanism, diagrammatically arranged; Fig. 2, an enlarged detail view of a portion of the riveting machine, showing certain parts in section; Fig. 3, an enlarged sectional view of the low pressure cylinder and controlling valves; Fig. 4, an enlarged sectional view of the high pressure cylinder and controlling valve, and Fig. 5, an enlarged sectional view of the operating slide valve and the automatic regulating and pressure releasing mechanism.

Like reference characters indicate like parts wherever they occur.

Referring to said drawings, 1 is a source of pressure supply, adapted to communicate with a valve chamber 2 by means of the pipe 3. The said valve chamber is provided with ports 4, 5, and 6, controlled by the slide valve 7, of which port 4 is for the admission of pressure thereto, from said source of pressure, through said pipe 3; port 5 for the distribution of pressure to the various auxiliary valves and cylinders connected therewith as hereinafter set forth, and in conjunction with port 6 for exhausting pressure from said auxiliary valves and cylinders. The said port 5 registers and communicates with one end of the pipe 8, the opposite end of which is connected to and communicates with the area of chamber 9 of the duplex valve 10, covered by the packing 11, for the purpose of admitting pressure against or exhausting it from the piston 12, seated in said chamber, according to the disposition of the valve 7 with relation to the ports 4 and 5, as hereinafter set forth.

One end of the pipe 13 is connected and communicates with said pipe 8, and the opposite end thereof is connected to the lower end of the valve shell 16^a, and introduces pressure to the space 14 therein; the upper end of said shell is fitted into the casing 16, and is surrounded by the channel 29, which communicates with the pipe 32 for the purpose hereinafter specified. In the lower end of shell 16^a, a piston 17 is seated and is covered by the packing 15. Pipe 13 admits pressure against and exhausts it from piston 17 in said chamber 16^a dependent on the position of the valve 7 with relation to the ports 4, 5, and 6.

One end of the pipe 18 connects with the pipe 8, the opposite end being connected to one end of the push back cylinder 19, for the purpose of admitting pressure against the piston 20, through the port or channel 21, or exhausting pressure from said piston, dependent upon the position of the valve 7 with relation to the ports 4, 5, and 6.

22 is a pipe which connects the pipe 8 with the exhaust valve 23, which is connected to and communicates with one end of the maximum pressure cylinder 24, for the purpose of admitting pressure upon the piston 25, or exhausting it from said piston, dependent upon the position of the valve 7 with relation to the ports 4, 5, and 6. The apparatus being in the position shown in Fig. 1 of the drawings, and the valve 7 being disposed as shown with reference to the ports 4, 5, and 6 places the ports 4 and 5 in communication and closes port 6, which permits pressure to pass through pipe 8 to one end of the valve shell 16^a, through the pipe 13, and acts upon the piston 17, seated in said valve chamber, and moves the same and the piston 26, seated in the opposite end of the chamber 16^a and connected to said piston 17 by means of the stem 27. The movement thus imparted to said pistons closes the port 28 in the upper end of casing 16, closes the ports 29′—29′ which admits pressure to the annular channel 29 and opens or exposes the exhaust port 29^2, which opens

from the channel 29 below the piston 26 and thus exhausts the pressure from piston 30 seated in one end of the low pressure cylinder 31, through the pipe 32 which communicates with the channel 29, through said exhaust port 29^2 to the space 32^a between the pistons 17—26 and thence to the atmosphere through port 32^b. At the same time pressure is conveyed through said pipe 8 to the area 9 of the duplex valve 10, and acting upon the piston 12, seated in one compartment thereof, moves the same and the piston 33, which is in alinement with said piston 12 and connected thereto by the stem 34, a distance sufficient to close the port 35, and cut off pressure admitted therethrough to the piston 36, which is seated in one end of the high pressure cylinder 24, through the pipe 37. A port *a* in the inner end of the chamber in which the piston 12 is seated opens to the atmosphere and thus avoids compressing any air that may be therein. Simultaneously with this operation pressure is admitted to the valve chamber 23, through the pipe 22, and acting upon the piston 25 seated therein, compresses the spring 37′, mounted on the stem of said piston between the piston 25 and the puppet valve 38, the movement of said piston forcing the puppet valve 38 from its seat and exposing the exhaust port 39, releasing pressure from the area of said cylinder 24 in advance of the piston 36, and enabling the recoil of the spring 40, mounted on the stem 76 of said piston between the projection on the inner side of the piston and the opposite end of the cylinder 24, and the back pressure of the liquid contained in the contracted cylinder 41, in which the stem of said piston projects, to move the piston 36 into the position shown in Fig. 1 of the drawings.

After the operations just described have been accomplished, pressure is relieved in the high pressure cylinder 41, the pipe 42 connecting one end of the same with pipe 43, and also in the pipe 44 connecting said last mentioned pipe 43 with one end of the automatic cut off and pressure regulating device 45, enabling the retraction of the pressure graduated spring 46, mounted upon the stem 47 of the piston 48, seated in said automatic cut off cylinder, to push said piston into the position shown in Fig. 1 of the drawings. Substantially simultaneously with the last described operation of the mechanism, pressure admitted to the area 49, of the push back cylinder through the channel 21, acts upon the piston 20, seated therein and slidable upon the fixed centrally disposed stem 49′, moves said piston into the position shown in the drawings Fig. 1, and at the same time through the medium of plate 20^a attached to piston 20 and bearing on plunger 50 carries the riveting plunger 50, which is operatively seated in the cylinder 51, away from the die 52, secured in the outer upper member of the riveting frame 53. The pressure being, as heretofore stated, released from pipe 43, and consequently from the riveting cylinder 51, returns through said pipe 43 to the valve chamber 54, connected therewith through the port or channel 55, to the pipe 56, which connects one end of said valve chamber 54 with one end of the low pressure cylinder 31, and filling the area *y* thereof, acts upon the piston 56′ to move said piston 56′ and the piston 30, which are connected by the stem 57, into the position shown in Fig. 1 of the drawings, the said pressure being retained by the packings 58 and 59. Pressure being released from the piston 63 in cylinder 54 as heretofore described permits the pressure admitted through the tubular rod 61 which projects therein through the plug 62 seated in one end of said cylinder 54 and upon which the hollow end of the piston 60 is movably mounted to move said piston 60 and the piston 63 connected therewith by the stem 64, into the position shown in the drawings. The retraction of the spring 61′ moves the tubular rod 61 off its seat 61^a putting pipes 65 and 72 into communication through the port 72^a and the space 75′, and closing the ports which exhaust the pressure from said pipe 72 to the atmosphere, thus admitting pressure beneath the piston 74 to move said piston and the piston 68′, connected therewith, to the position shown in Fig. 1, the port *d* performing a similar function to that of port *a*. The pressure admitted to said piston 60 through the tubular piston 61, is constant, and is conveyed thereto through the pipe 65, which is connected to the source of pressure through the pipe 66.

The apparatus being in the position and condition shown in Fig. 1 of the drawings, and as heretofore described; *i. e.*, the position and condition of the apparatus after each successive pressing operation; when it is necessary or desirable to operate the riveting plunger or similar abutment against metal plates to close or rivet the same, the operator, by throwing the lever 67 towards the valve chamber 2, contacts with the piston 68 attached to the slide valve 7 therein, moving the same a distance, sufficient to put the ports 5 and 6 in communication with each other and close port 5 to the pressure admitted through port 4. When in this position pressure is exhausted from the piston in the push-back cylinder, and thus permitting the press, plunger, riveting, or plate closing tool to advance, when pressure is applied thereto, as hereinafter specified, without being resisted by the pressure, normally against the push-back piston when the apparatus is in state of repose. Simultaneously the pressure is released below the piston 17 in the valve chamber 16^a, the pressure constantly admitted to the upper end

thereof through pipe 3, or a branch 3′ thereof, upon the piston 26 therein, advances said piston sufficient to close the exhaust port 29^2 and expose or open ports 29′—29′ and permit pressure from the pipe 3′ to pass through chanel 29 into pipe 32 and act upon the piston 30 in the low pressure cylinder, and, substantially simultaneously with the last mentioned operation, air is released or exhausted from the area 9, of the valve chamber 10, permitting the constant pressure, admitted against the piston 33 through the pipe 66, to advance or move said piston 33, and admit pressure through port 35 upon the piston 68′; a port *b* in the inner end of the chamber in which the piston 33 is seated opens to the atmosphere to enable the discharge of any air that may be contained therein. At the same time pressure is exhausted from the exhaust valve 23, releasing pressure against the piston 25 therein and enabling the retraction of the spring 37′ to seat or close the puppet valve 38. When the apparatus is in the position and condition described, pressure will have been admitted against the piston 30 to move the same and piston 56′ connected therewith, and compress the water, oil, or other liquid, contained in the area *y* of the low pressure cylinder, pipes 56, valve chamber 54, pipes 43, 44 and 42, and small cylinder 41, between the pistons 56′, 76, 48 and plunger 50. Due to the fact that the only resistance offered the liquid introduced into the cylinder 51 is the friction and weight of the plunger, and parts attached thereto, a small percentage only of the pressure admitted against the piston 30 and transmitted to the liquid from the cylinder 31 to cylinder 51 is sufficient to cause the plunger 50 to move forward until the die 69, attached thereto, comes in contact with either the rivet to be operated upon, or with the die 52; immediately this occurs the full pressure admitted against the plunger 30 is rapidly transmitted to cylinders 31 and 51 to meet the additional resistance of the rivet, or other materials being operated upon.

To enable the operative pressure to pass from the cylinder 31 to and through the valve chamber 54, the pistons 60 and 63 thereof must be held in the position shown in Fig. 1 of the drawings until the maximum pressure is produced as hereinafter stated and this is accomplished by pressure which is constantly admitted to the interior area of the piston 60, through the tubular rod 61, as heretofore described; immediately, however, the plunger 50 comes to a standstill with the die 69 against the rivet, and the pressure of the liquid increases to equal the maximum operating air pressure, the pressure of the air against the interior area of the piston 60 covered by the packing 70, which is initial pressure, is more than counterbalanced by the greater and increasing pressure of the liquid acting against the opposite exterior area of the piston valve 63, causing the piston 63 to move forward, its lower end closing the passage 55′ and the port 55 and forcing the said piston into contact with the packing 71, which will prevent the return of any of the liquid from the cylinder 54 to the cylinder 31. The end *x* of the valve chamber in which the outer end of the piston 63 enters is provided with longitudinal grooves which terminate in the space *k* to permit the liquid to pass to the rear of and act upon the said piston 63. The forward movement of the piston 60 eventually causes the bottom of its interior to contact with the end of the tubular rod 61, forcing it against its upper seat, and cutting off the supply of air from pipe 65 to pipe 72, and at the same time exhausting the air pressure from pipe 72 through the port 72^a to the space 75′ through the ports 75″ to the space 753 to the annular recess 72′ to the ports 62′ and thence through port 73′ to the atmosphere.

Pipe 72, at one end thereof, connects with the duplex valve 10, and when pressure is released, as heretofore described, from said pipe the pressure is released from the area 73 in said valve and acting on the piston 74 permitting the pressure, previously admitted against the piston 68′, which is connected with piston 74, by means of the stem 74′ to advance said piston, admitting air through the pipe 37 upon the piston 36 in the cylinder 24 a port *c* in the lower end of the chamber in which the valve 68′ is seated exhausts the air to the atmosphere as said valve moves to its seat. The liquid contained in cylinders 51, 41 and the pipes 42, 43, and 44, at this stage of the operation, is confined by the leather packing 71, of the valve chamber 54, at a pressure approximately that of the operating air pressure. Immediately, however, pressure is admitted against the piston 36, the pressure in said cylinder 41 and its connections with cylinder 51 and the automatic cut off 45, increases to an ultimate pressure, proportionate to the relative areas of the piston 36 and the stem 76, thereof, which acts directly upon the liquid confined in the cylinder 41. This increased pressure is transmitted to and acts upon the plunger 50 in the cylinder 51, for the purpose of upsetting the rivet, or otherwise bringing the maximum pressure of the machine to act upon the thing or object being operated upon, and upon regulating device 45 to restore the device to the position shown in Fig. 1.

The automatic cut-off and regulating device, 45, may be adjusted to any given pressure required to perform any given work. This is accomplished by adjusting the cap 75 to any given pressure, marked upon a scale upon the exterior of the cylinder, to produce, against the plunger 50, the pressure per square inch necessary to upset

the rivet, or do other work of the machine within the capacity of the same; the adjustment of the cap producing a tension upon the spring 46 equivalent to the pressure required. Immediately, however, the liquid pressure reaches or exceeds this required pressure, the excess pressure upon the piston 48 more than counterbalances the pressure of the spring and causes the piston 47 to move towards and contact with the piston 68, connected with the operating slide valve 7, moving the same into the position shown in Fig. 1 of the drawings, in which position operating pressure is exhausted and air pressure again admitted through pipe 8 to the various auxiliary valves and cylinders as heretofore described.

The area of the pistons 26, 33 and 60, on which pressure is constant, is less than that of pistons 17, 12 and 63. The piston 68′ is also of less area than piston 74.

I claim as my invention and desire to secure by Letters Patent:

1. In a mechanism for controlling fluid pressure, the combination with a source of pressure, of a valve controlling the pressure supply, a fluid pressure operated device for the performance of work, a low pressure mechanism for supplying the fluid pressure operated device with fluid pressure, a high pressure mechanism for augmenting the fluid pressure supply at a predetermined time, automatic valves controlling the operation of the low and high pressure mechanisms, and means for automatically restoring the low and high pressure mechanisms to normal position after the work has been done.

2. In a mechanism for controlling pressure, the combination with a source of pressure, of a hand-operated valve controlling the pressure supply, a pressure operated device the supply and release of pressure to which is controlled by the valve, normally inactive means adapted to automatically operate the valve to release the pressure at a predetermined degree comprising a piston having a stem adapted to engage the valve, a spring for retracting the piston, and means for placing the spring under any desired tension, and pressure supplying connections to said piston, whereby said piston is actuated automatically when the pressure reaches a predetermined degree.

3. In a mechanism for controlling fluid pressure, the combination with a source of pressure, of a valve controlling the pressure supply, a fluid pressure operated device for the performance of work, a low pressure mechanism for supplying the fluid pressure operated device with fluid pressure, a high pressure mechanism for augmenting the fluid pressure supply at a predetermined time, and means for automatically restoring the low and high pressure mechanism to normal position after the work has been done.

4. In a mechanism for controlling fluid pressure, the combination with a source of pressure, of a valve controlling the pressure supply, a fluid pressure operated device for the performance of work, a low pressure mechanism for supplying the fluid pressure operated device with fluid pressure, a high pressure mechanism for augmenting the fluid pressure supply at a predetermined time, an automatically acting pressure operated device controlling the application of the fluid from the low and high pressure mechanisms to the fluid pressure operated work device, and means for automatically restoring the low and high pressure mechanisms to normal position after the work has been done.

5. In a mechanism for controlling fluid pressure, the combination with a source of pressure, of a valve controlling the pressure supply, a fluid pressure operated device for the performance of work, a low pressure mechanism for supplying the fluid pressure operated device with fluid pressure, a high pressure mechanism for augmenting the fluid pressure supply at a predetermined time, an automatically acting pressure operated piston valve having opposite faces of different areas and controlling the application of the fluid from the low and high pressure mechanism to the fluid pressure operated work device, said automatic piston valve being operated by the fluid pressure upon one face thereof overbalancing the constant pressure on the opposite face of said piston, means for supplying said constant pressure, and automatic valves controlling the operation of the low and high pressure mechanisms.

6. In a mechanism for automatically controlling and applying maximum pressure to pressure operated devices, the combination with a valve casing, of a valve controlling the supply of fluid under pressure through said casing, one end of which is constructed and arranged to be subjected to constant pressure, means for supplying such constant pressure, the other end of said valve being arranged to be acted upon by the fluid passing through said casing a low pressure means acting on said fluid, a high pressure means to augment the pressure of the fluid controlled by said automatic controller, a pressure operated valve for said high pressure means, and means operated by said automatic controller for governing said last named valve.

7. In a mechanism for controlling fluid pressure, the combination with a source of pressure, of a valve controlling the pressure supply, a fluid pressure operated device for the performance of work, a low pressure mechanism for supplying the fluid pressure

operated device with fluid pressure, a pressure operated valve controlled by said first-named valve and controlling the low pressure mechanism, a high pressure mechanism for augmenting the fluid pressure supply at a predetermined time, an automatic valve controlling the high pressure mechanism, and an automatic controller having means for controlling the supply of low pressure from the low pressure mechanism to the fluid pressure operated device and also having means for controlling the action of the automatic valve of the high pressure mechanism.

8. In an automatic controller mechanism for pressure operated devices, the combination with a valve casing having a port for the passage of pressure, of a double piston valve, one piston of which controls the port aforesaid, a tubular slidable rod for supplying pressure to the interior area of the other piston to hold the first mentioned piston in position to keep the port aforesaid normally open, said tubular slidable rod being adapted for operation by said piston, means for supplying pressure to said tubular slidable rod, and exhaust port controlled by the tubular slidable rod and opened when the said piston operates the said tubular slidable rod.

In testimony whereof I have hereunto signed my name in the presence of two subscribing witnesses.

HENRY A. CARPENTER.

In the presence of—
CLARENCE A. WILLIAMS,
JOHN H. RONEY.