Jan. 6, 1931. F. J. RODE 1,787,996

CUSHION FOR SHEET METAL PRESSES

Filed May 25, 1929 4 Sheets-Sheet 1

Fig. 1.

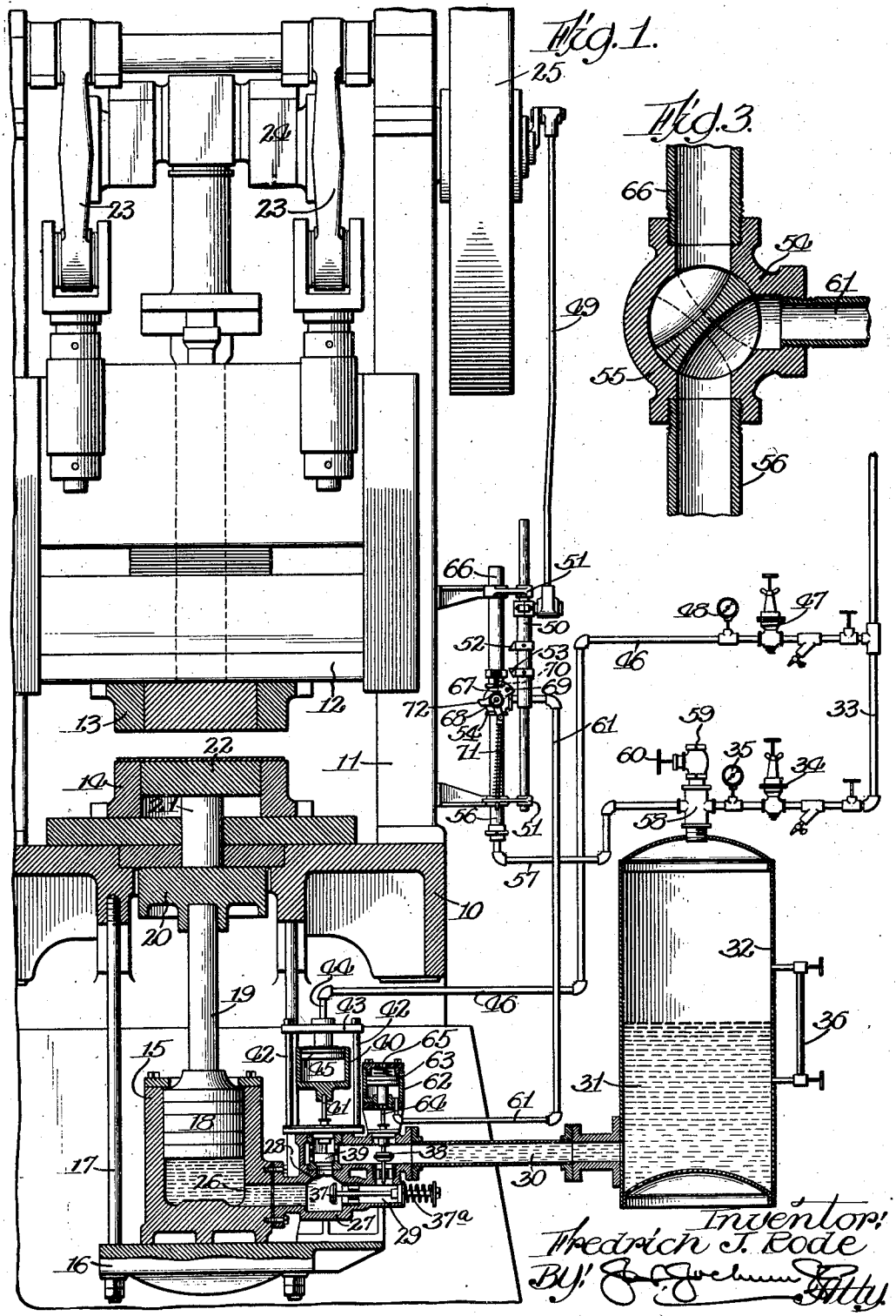


Fig. 3.

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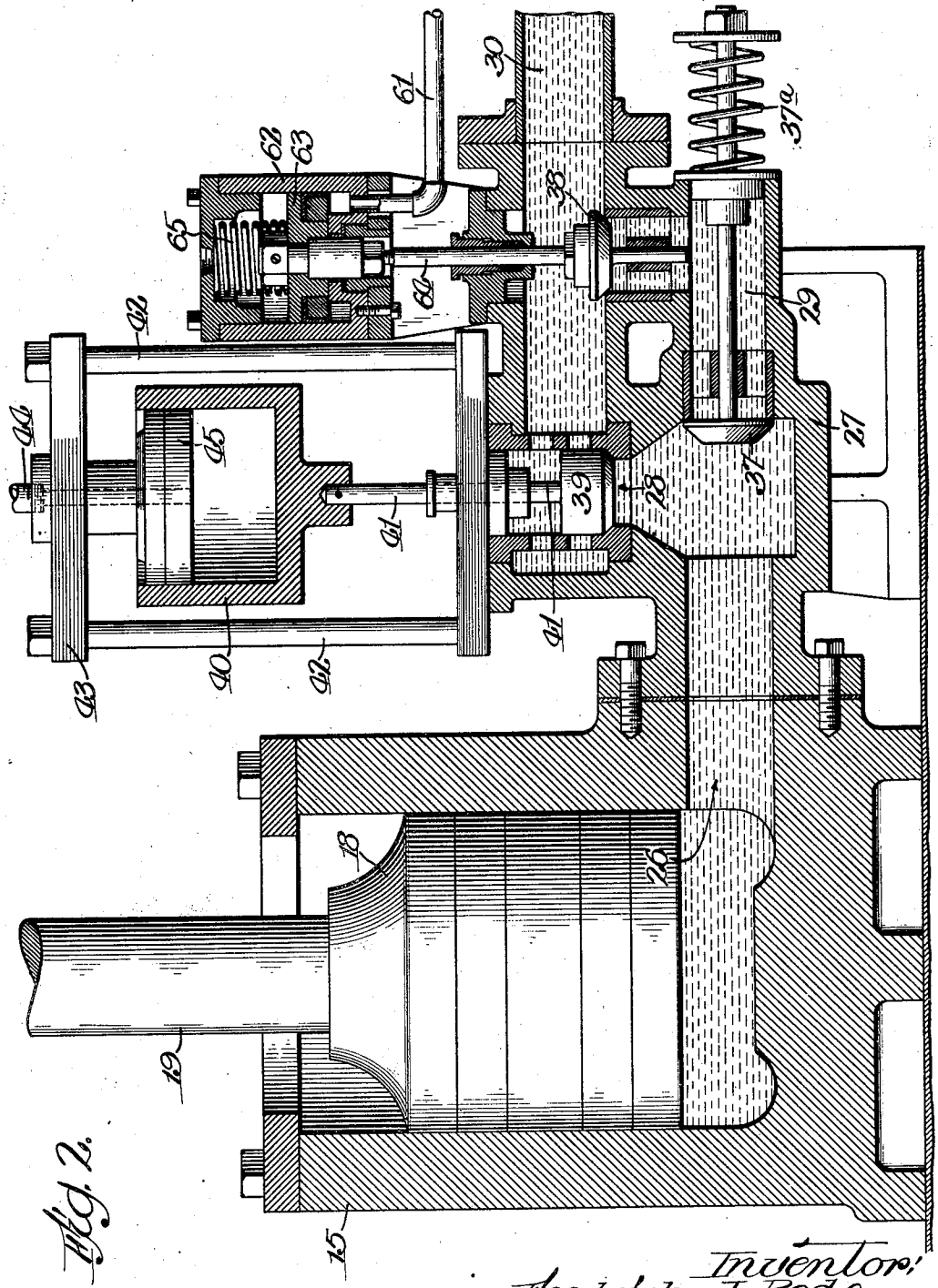


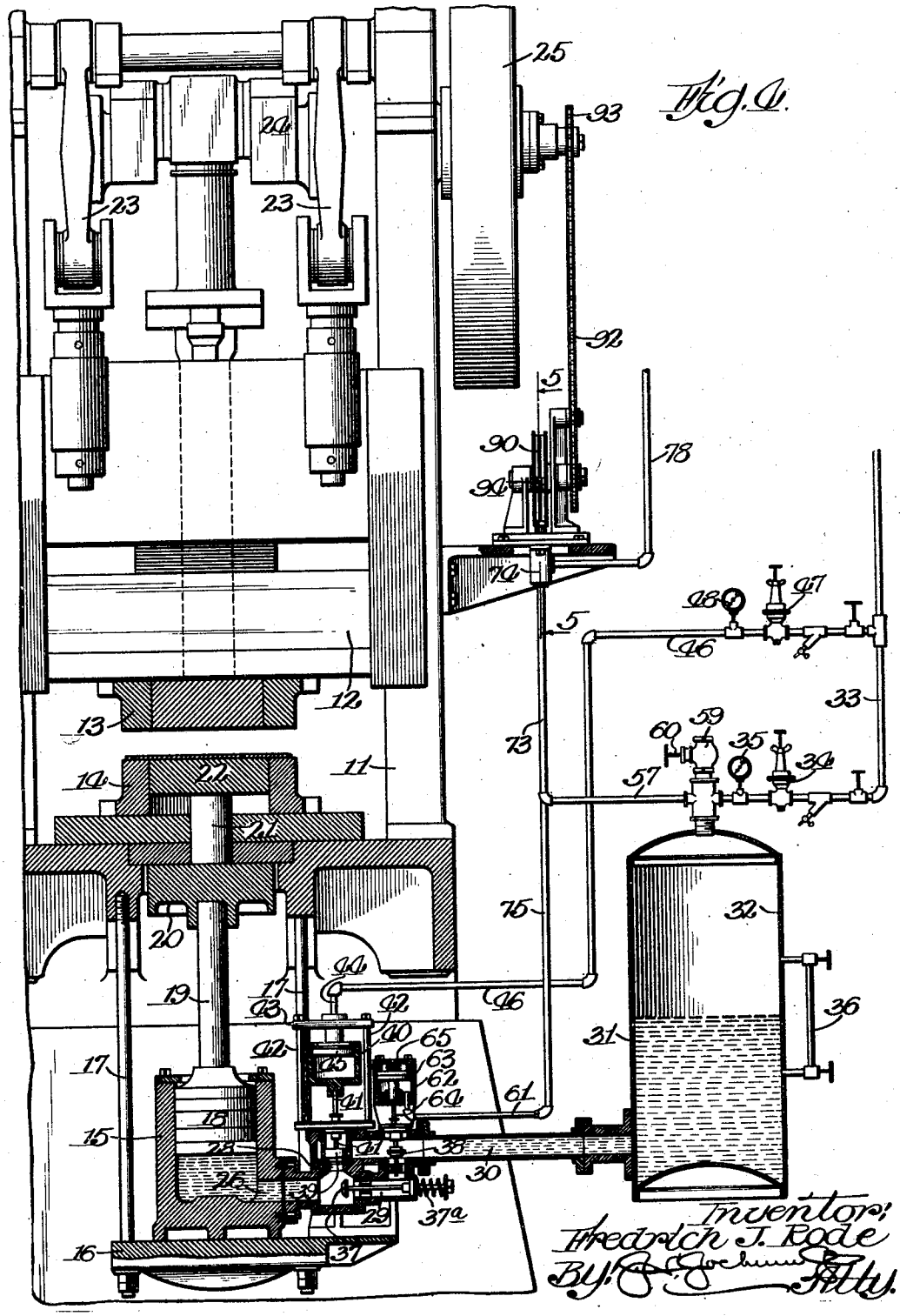
Fig. 2.

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CUSHION FOR SHEET METAL PRESSES

Filed May 25, 1929 4 Sheets-Sheet 3

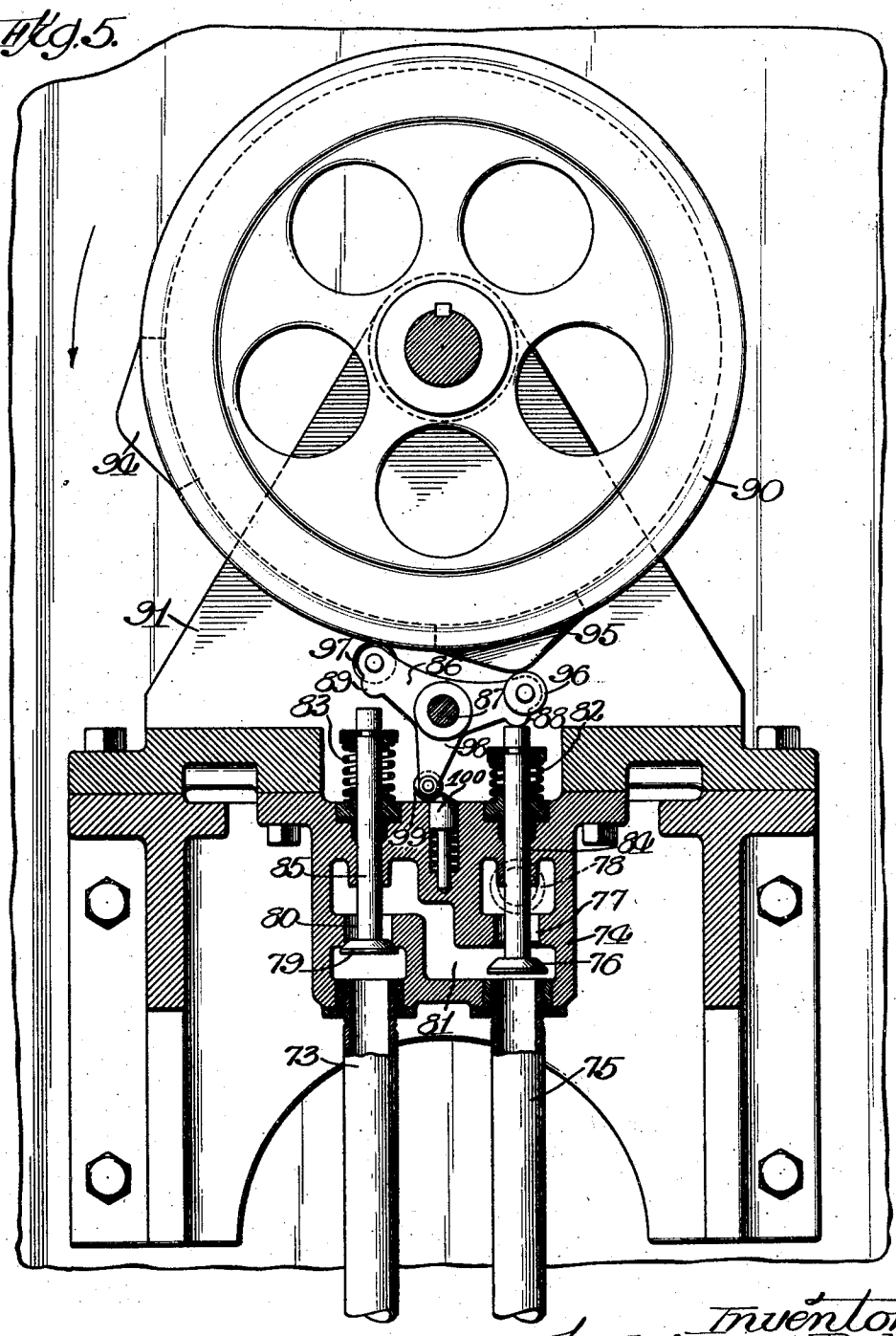


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CUSHION FOR SHEET METAL PRESSES

Filed May 25, 1929 4 Sheets-Sheet 4

Fig. 5.



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UNITED STATES PATENT OFFICE

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CUSHION FOR SHEET-METAL PRESSES

Application filed May 25, 1929. Serial No. 365,961.

This invention relates in general to cushioning devices for presses of the character in which the metal is shaped by means of co-operating dies, one of which is reciprocable toward and away from the other, the work being clamped or held by means of a blank or work holding element which co-operates with the reciprocable die member, the blank or work holder being resisted in its movement in one direction by a pressure pad, the latter being resisted by the said cushion, and one of the objects of the invention is to provide improved means for controlling the return of the pressure pad whereby the latter may be prevented from directly returning with the ram of the press or the co-operating die, when the latter starts to move away from the work.

A further object is to provide improved means for controlling the return of the pressure pad from a movable part of the press.

To the attainment of these ends and the accomplishment of other new and useful objects as will appear, the invention consists in the features of novelty in substantially the construction, combination and arrangement of the several parts hereinafter more fully described and claimed and shown in the accompanying drawings illustrating this invention, and in which

Figure 1 is a view partly in elevation, partly in section and partly broken away of a cushioning device of this character constructed in accordance with the principles of this invention.

Figure 2 is an enlarged detail view of a portion of the controlling means showing the parts in a different position from that shown in Figure 1.

Figure 3 is an enlarged detail sectional view of a controlling valve.

Figure 4 is a view similar to Figure 1 of a modified form of the invention.

Figure 5 is an enlarged detail sectional view with parts omitted, taken on line 5—5, Figure 4.

Referring more particularly to the drawings the numeral 10 designates the supporting base of the press, 11 uprights, 12 a reciprocable ram, 13 a reciprocable die which co-operates with a die or work holding element 14, the latter being mounted upon the bed of the press.

Beneath the press is arranged a cushion embodying a cylinder 15 mounted upon a suitable support 16, which latter in turn is supported preferably from the bed of the press by means of hangers 17. Within the cylinder 15 is a reciprocable piston 18 to which a piston rod 19 is connected, and the piston rod in turn is connected with a pressure pad 20 upon which a pin or projection 21 rests, and which pin or projection passes through the bed plate and is connected with a co-operating blank or work holding element 22. Any number of these pins or projections 21 may be provided.

The ram 12 is reciprocable preferably by means of links 23 connected with a crank shaft 24 and connected to the shaft is a fly wheel 25.

All of the above referred to parts are of the ordinary and well known construction.

The cylinder 15 is provided with an outlet opening 26 preferably arranged adjacent the bottom thereof and communicating with this opening is a valve casing or chamber 27 which is provided with an opening 28 which serves as an outlet for the liquid from the cylinder 15 and the casing 27 is also provided with an opening 29 which serves as an inlet for the liquid to the cylinder.

Communicating with the opening 28 is a pipe 30 which receives a supply of liquid 31 from a container or receptacle 32. A fluid supply pipe 33 has communication with the container 32 preferably adjacent the top thereof and in the pipe 33 is arranged a pressure regulating valve 34 of any desired construction and a pressure indicating gauge 35.

The fluid enters the container 32 above the liquid 31, the height of the liquid being indicated by the indicator gauge 36, and forces the liquid from the container through the pipe 30 and through the opening 29 into the cylinder 15 through the opening 26.

The opening 29 has communication with the pipe 30 and a spring controlled valve 37 is provided for closing the opening 29 to prevent the liquid from flowing out of the cylinder 15 and into the pipe 30, as shown more

clearly in Figure 2, but will open to permit the liquid to flow from the pipe 30 into the cylinder 15, as shown in Figure 1.

A valve 38 is provided for closing the point of communication between the opening 29 and the pipe 30 so that when the valve 38 is unseated as shown in Figure 1, liquid under pressure in the container 32 will flow into the cylinder 15, past the valve 38, through the opening 29 to raise the piston 18.

When, however, the valve 38 is seated as shown in Figure 2, liquid cannot flow into the cylinder 15 when the opening 28 is closed.

A valve 39 is provided for controlling the opening 28 so that when the opening 28 is closed and the piston 18 is lowered, a pressure will be created on the liquid in the cylinder, the tendency of the pressure being to force the liquid out of the cylinder back into the container 32. This will be prevented, however, by reason of the fact that the valve 37 will be closed under such pressure and also under the pressure of the spring 37^a, and the liquid can only flow back into the container 32 through the opening 28 when the valve 39 is unseated.

So long as this valve 39 is seated, pressure will be built up on the fluid in the cylinder 15 and when such pressure exceeds the pressure by means of which the valve 39 is seated, the valve 39 will be opened under such excess pressure and the liquid will escape from the cylinder back into the container.

In order to vary or control the pressure against which the valve 39 is unseated, there is provided a cylinder 40 which is connected with the stem 41 of the valve 39. Supported by the valve casing by means of members 42 is a cross head or member 43 in which a pipe 44 is anchored. To one end of the pipe 44 is connected a piston 45 which operates in the cylinder 40. The pipe 44 opens through the piston 45 to deliver fluid between the piston and the bottom of the cylinder.

To the pipe 44 is connected a pipe 46 through which fluid under any desired pressure is conveyed from any suitable source of supply. Within the pipe 46 is a pressure regulating valve 47 and a pressure indicating gauge 48.

As the fluid pressure is admitted into the cylinder 40 through the piston 45 the cylinder will be moved with respect to the piston and the valve 39 will be seated to be held against such seat by the fluid pressure in the cylinder.

Therefore, in order to vary the pressure against which the valve 39 is seated, it is only necessary to vary the fluid pressure through the pipe 46 and in the cylinder 40.

Assuming the piston 18 in the cylinder 15 to be descending from its uppermost position and the valve 39 being seated at a predetermined pressure, it will be manifest that when the piston descends the valve 37 will be closed and the pressure upon the liquid in the cylinder 15 created by the piston 18 will be exerted upon the valve 39.

When the pressure in the cylinder 15 overcomes the pressure in the cylinder 40 the valve 39 will be unseated and the liquid will flow through the pipe 30 back into the container 32, assuming the valve 38 to be closed.

After the piston has reached the limit of its lowermost movement and when the pressure in the cylinder 15 is overcome by the pressure in the cylinder 40, the valve 39 will be seated and the piston 18 will remain in its lowermost position until the liquid from the container 32 is again forced back into the cylinder 15 through the opening 26. This will occur when the valve 38 is opened. Assuming the valve 38 to be open, as shown in Figure 1, and the valve 39 is closed, it will be manifest that the liquid will flow from the pipe 30, past the valve 38, through the opening 29, past the valve 37, through the opening 26 into the cylinder 15 to raise the piston.

The admission of the liquid into the cylinder 15 to raise the piston 18 may be controlled at any predetermined point in the cycle of operation of the press, but the valve 38, which controls the return of the piston 18, is preferably operated at a time in the cycle of operation of the press as to prevent the piston 18 and the pressure pad 20 from immediately following the ram and die 13 when the latter start to ascend. In other words, so that the piston 18 will be retained for a predetermined period of time at the limit of its lowermost stroke. This is accomplished by controlling the operation of the valve 38.

It has been found that in some instances the space in which the mechanism for controlling the operation of the valve 38 is located is very limited and therefore it is necessary to provide a compact operating mechanism which will be effective in its operation.

In the form of the invention shown in Figure 1 of the drawings, this valve 38 is controlled from a movable part of the press, such as the crank shaft 24, through the medium of a rod or link 49 which is connected to the crank and has connected to its other end a reciprocating member 50, which latter is movable in bearings 51.

This member 50 is provided with spaced tappets or projections 52—53 secured to the member 50 at any desired point with respect to each other.

Arranged adjacent the path of movement of the member 50 is a valve casing 54 having a rotatable valve 55 therein.

Connected with the valve casing 54 is a pipe 56 which in turn is connected by means of a pipe 57 with the supply pipe 33, preferably through the medium of a coupling 58.

This coupling 58 has communication with the interior of the container 32 and is provided with an open end 59 through which liquid may be supplied to the tank 32. A valve 60 controls the opening 59 so that the air supplied to the container 32 will not escape.

Leading also from the valve casing 54 is a pipe 61 which has communication with a cylinder 62 supported preferably by the valve casing 27. Within this cylinder 62 is arranged a piston 63 having a piston rod 64 connected with and forms the stem of the valve 38.

Also within the cylinder 62 is a spring 65 which tends normally to seat the valve 38.

With this improved construction it will be manifest that when the valve 55 is in the position shown in Figure 3, the pipe 56 which receives a supply of air from the pipe 57 will be opened so that the air will flow through the pipe 56, past the valve 55 into the pipe 61, to be delivered into the cylinder 62 on the side of the piston 63 opposite to the side on which the spring 65 is located, with the result that when the pressure admitted into the cylinder 62 through the pipe 61 is greater than the pressure of the spring 65, the valve 38 will be unseated.

When, however, the valve 55 is turned to the position shown in dotted lines in Figure 3, the pipe 61 leading from the cylinder 62 will be placed in communication with the atmosphere through the medium of an exhaust pipe 66, with the result that the supply of fluid through the pipe 61 to the cylinder 62 will be cut off and the spring 65 will act through the medium of the piston 63 to seat the valve 38, the air on the bottom side of the piston 63 in the cylinder 62 escaping to atmosphere.

Thus it will be seen that during the cycle of operation of the press the valve 55 will be alternately operated so as to unseat the valve 38 and also to permit the valve 38 to be seated.

In order to control the operation of the valve 55 a rocker arm 67 may be provided which is pivotally mounted as at 68 and is provided with projections 69—70 on opposite sides of the arm one each arranged in the path of movement of the respective projections 52 and 53 on the member 50. A spring 71 co-operates with the rocker arm and valve and tends normally to assist in causing the valve to have a quick action, a stop 72 being provided for preventing the operation of the valve beyond a predetermined point.

It will thus be seen that as the member 50 is moved in one direction, that is when it is lowered from the position shown in Figure 1, the projection 52 will engage the projections 69 on the rocker arm 67 and move the valve in one direction. When, however, the member 50 is moved in the opposite direction the projection 53 on the member 50 will engage the projection 70 on the rocker arm and move the valve in the opposite direction.

Obviously by adjusting the projections 52 and 53 on the member 50 the time of operation of these devices may be varied.

In the form of the invention shown in Figures 4 and 5, a different form of operating mechanism is provided for admitting pressure into the cylinder 62 to unseat the valve 38 and to permit such pressure to escape.

In this form of the invention a pipe 73 is connected with the pipe 57 and leads to a valve casing 74. Another pipe 75 leads from the valve casing 74 to the cylinder 62.

A valve 76 is provided in the casing 74 to control a passage 77 and which passage 77 has communication with an exhaust pipe 78.

A valve 79 is also provided in the valve casing 74 and this valve 79 controls a passage 80 which has communication with the fluid supply pipe 75 through a passage 81 in the casing 74.

Springs 82—83 respectively co-operate with the valve stems 84—85 and tend normally to seat the respective valves 76 and 79.

A rocker member 86 is pivotally mounted intermediate its ends as at 87 upon a fixed support and is provided with projections 88—89 adapted to alternately engage the valve stems 84—85 when the member 86 is rocked to open and also permit the respective valves to close.

The member 86 is rocked in any suitable manner preferably by means of a rotatable member 90 mounted upon a suitable support 91 and which rotatable member is adapted to be actuated from any suitable part of the press, preferably through the medium of a drive chain 92 which passes over a pulley or sprocket 93 secured for rotation with the fly wheel 25.

Connected with the rotatable member 90 are tappets 94—95 preferably in the form of cams which respectively engage anti-friction rollers 96—97 on the ends of the rocker member 86. Thus as the member 90 is rotated the tappets 94—95 will engage the respective rollers 96—97 and rock the member 86. The cams or projections 95 are arranged out of alinement with each other as are also the anti-friction rollers 96—97.

An arm 98 is carried by the member 86 and connected with the arm is a roller 99 adapted to co-operate with a spring controlled projection 100. This projection or member 100 tends to assist in causing the member 86 to continue to travel in the same direction after it has been moved by the cam 95 and also serves as a means for holding the member 86 in a position that it will be engaged by the respective members 94.

When the parts are in the position shown in Figure 5, the valve 76 being open and the valve 79 being closed, the air in the cylinder 62 will escape through the pipe 75 through

the passage 77 and to the atmosphere through the exhaust pipe 78 to permit the spring 65 to close the valve 38.

When, however, the valve 76 is positioned to close the passage 77 to close the exhaust outlet 78, the valve 79 will be opened and the air will then flow through the pipe 73 through the passage 80 in the valve casing 74, through the passage 81, through the pipe 75 to the cylinder 62 to unseat the valve 38 against the stress of the spring 65.

Thus, as the valves 76 and 79 are alternately opened and closed, the operation of the valve 38 will be controlled.

While the preferred forms of the invention have been herein shown and described, it is to be understood that various changes may be made in the details of construction and in the combination and arrangement of the several parts, within the scope of the claims, without departing from the spirit of this invention.

What is claimed as new is:—

1. In a press, a pressure pad, an hydraulic cushion for resisting the movement of the pad in one direction and embodying a cylinder and piston movable relatively one with respect to the other, a passage for supplying liquid to the cushion, an outlet through which the liquid is discharged from the cushion, variable resistance pressure creating means for controlling said outlet, valve mechanism for controlling the supply of liquid to the cushion, and fluid pressure controlled means for controlling the last said valve mechanism.

2. In a press, a pressure pad, an hydraulic cushion for resisting the movement of the pad in one direction and embodying a cylinder and piston movable relatively one with respect to the other, a passage for supplying liquid to the cushion, an outlet through which the liquid is discharged from the cushion, variable resistance pressure creating means for controlling said outlet, valve mechanism for controlling the supply of liquid to the cushion, mechanical means tending normally to move the valve in one direction, and fluid pressure controlled means for moving the valve in the opposite direction.

3. In a press, a pressure pad, an hydraulic cushion for yieldingly resisting the movement of the pad in one direction, a passage for supplying fluid to the cushion, an outlet for discharging the fluid from the cushion, variable resistance pressure creating means for controlling said outlet, an inlet valve for controlling the delivery of fluid to the cushion, fluid pressure means for controlling said inlet valve, a valve for controlling said fluid pressure means, and means automatically operable at a predetermined time in the cycle of operation of the press for controlling the last recited valve.

4. In a press, a pressure pad, an hydraulic cushion for yieldingly resisting the movement of the pad in one direction, a passage for supplying fluid to the cushion, an outlet for discharging the fluid from the cushion, variable resistance pressure creating means for controlling said outlet, an inlet valve for controlling the delivery of fluid to the cushion, fluid pressure means for controlling said inlet valve, a valve for controlling said fluid pressure means, and means responsive in its operation to a movable part of the press for controlling the operation of the last recited valve.

5. In a press, a pressure pad, a cushion for yieldingly resisting the movement of the pad in one direction, variable resistance pressure creating means for the cushion, means for supplying fluid to the cushion and embodying a valve, fluid pressure means for controlling the valve, means embodying a valve for controlling the said fluid pressure means, and means operatively connected with a movable part of the press for alternately moving the said valve in opposite directions.

6. In a press, a pressure pad, a cushion for yieldingly resisting the movement of the pad in one direction, variable resistance pressure creating means for the cushion, means for supplying fluid to the cushion and embodying a valve, fluid pressure means for controlling the valve, means embodying a valve for controlling the said fluid pressure means, and means responsive in its operation to a movable part of the press for moving the said valve in one direction to supply fluid to the said fluid pressure means and for moving the valve in another direction to permit the fluid to escape from said fluid pressure means.

7. In a press, a pressure pad, a cushion for yieldingly resisting the movement of the pad in one direction, variable resistance pressure creating means for the cushion, means embodying a valve for controlling the supply of fluid to the cushion, fluid pressure means for controlling the valve, the last said means embodying a passage for the fluid, an exhaust, a source of fluid supply, valve mechanism for connecting said passage with said supply and with said exhaust and means for automatically controlling the last said valve.

8. In a press, a pressure pad, a cushion for yieldingly resisting the movement of the pad in one direction, variable resistance pressure creating means for the cushion, means embodying a valve for controlling the supply of fluid to the cushion, fluid pressure means for controlling the valve, the last said means embodying a passage for the fluid, an exhaust, a source of fluid supply, valve mechanism for connecting said passage with said supply and with said exhaust, and means responsive to the operation of a movable part of the press for automatically controlling the last said valve.

9. In a press, a pressure pad, a cushion for yieldingly resisting the movement of the pad in one direction, variable resistance pressure

creating means for the cushion, means embodying a valve for controlling the supply of fluid to the cushion, fluid pressure means for moving the valve in one direction, means for actuating the valve in the opposite direction, the first said means also embodying a passage for the fluid, an exhaust, a source of fluid supply, valve mechanism for connecting said passage with said exhaust and also with said source of fluid supply, and means for automatically controlling the last recited valve mechanism.

10. In a press, a pressure pad, a cushion for yieldingly resisting the movement of the pad in one direction, variable resistance pressure creating means for the cushion, means embodying a valve for controlling the supply of fluid to the cushion, fluid pressure means for moving the valve in one direction, means for actuating the valve in the opposite direction, the first said means also embodying a passage for the fluid, an exhaust, a source of fluid supply, valve mechanism for connecting said passage with said exhaust and also with said source of fluid supply, said valve mechanism embodying a pair of spring controlled valves, means embodying a rocker member for alternately actuating the valves, and means responsive in its operation to a movable part of the press for rocking said member.

11. In a press, a pressure pad, a cushion for yieldingly resisting the movement of the pad in one direction, variable resistance pressure creating means for the cushion, means embodying a valve for controlling the supply of fluid to the cushion, fluid pressure means for moving the valve in one direction, means for actuating the valve in the opposite direction, the first said means also embodying a passage for the fluid, an exhaust, a source of fluid supply, valve mechanism for connecting said passage with said exhaust and also with said source of fluid supply, said valve mechanism embodying a pair of spring controlled valves, means embodying a rocker member for alternately actuating the valves, means responsive in its operation to a movable part of the press for rocking said member, and means for assisting in rocking said member and for maintaining said member in its rocked position.

12. A press, a cushioning device, means for supplying fluid to the cushion, a valve for controlling said supply, fluid pressure means for controlling the valve, said fluid pressure means embodying a cylinder and piston relatively movable, a passage for supplying fluid to the cylinder and for discharging the fluid therefrom, a source of fluid supply, an exhaust, a valve for connecting said passage with the source of supply and also with said exhaust, and means automatically operable at a predetermined time in the cycle of operation of the press for controlling the operation of the last said valve.

13. A press, a cushioning device, means for supplying fluid to the cushion, a valve for controlling said supply, fluid pressure means for controlling the valve, said fluid pressure means embodying a cylinder and piston relatively movable, a passage for supplying fluid to the cylinder and for discharging the fluid therefrom, a source of fluid supply, an exhaust, a valve for connecting said passage with the source of supply and also with said exhaust, an actuator for the last said valve mechanism, and means operatively connected with a movable part of the press for operating said actuator.

14. In a press, a cushioning device, a passage for supplying fluid to the cushion, a valve for controlling the passage, fluid pressure means for controlling the valve and embodying a passage for supplying fluid, an exhaust for exhausting the fluid, valve mechanism for connecting said passage with the source of supply and said exhaust, a rocker member for actuating the valve mechanism, a rotatable member for actuating said rocker member, and means operatively connecting said rotatable member with a movable part of the press.

15. In a press, a cushioning device, a passage for supplying fluid to the cushion, a valve for controlling the passage, fluid pressure means for controlling the valve and embodying a passage for supplying fluid, an exhaust for exhausting the fluid, valve mechanism for connecting said passage with the source of supply and said exhaust, a rocker member for actuating the valve mechanism, and a cam device operatively connected with a movable part of the press for actuating said rocker member.

16. An apparatus of the character described embodying a casing having two passages therein, spring controlled valves individual to said passages for controlling them, an exhaust outlet, a supply pipe and an additional pipe all communicating with said casing, a rocker member for alternately actuating said valves for connecting said additional pipe with said supply pipe and exhaust outlet through said casing, and means for rocking said member.

17. An apparatus of the character described embodying a casing having two passages therein, spring controlled valves individual to said passages for controlling them, an exhaust outlet, a supply pipe and an additional pipe all communicating with said casing, a rocker member for alternately actuating said valves for connecting said additional pipe with said supply pipe and exhaust outlet through said casing, means for rocking said member, and means for assisting in rocking said member and for maintaining said member in its rocked position.

18. An apparatus of the character described embodying a casing having two passages therein, spring controlled valves individual to said passages for controlling them, an exhaust outlet, a supply pipe and an additional pipe all communicating with said casing, a rocker member for alternately actuating said valves for connecting said additional pipe with said supply pipe and exhaust outlet through said casing, a rotatable member, and formations on said rotatable member for alternately engaging and rocking said rocker member in opposite directions.

19. An apparatus of the character described embodying a casing having two passages therein, spring controlled valves individual to said passages for controlling them, an exhaust outlet, a supply pipe and an additional pipe all communicating with said casing, a rocker member for alternately actuating said valves for connecting said additional pipe with said supply pipe and exhaust outlet through said casing, means for rocking said rocker member, an arm on said rocker member and a resiliently yielding element engaging and cooperating with said arm for yieldingly holding the rocker member in its rocked position.

20. An apparatus of the character described embodying a casing having two passages therein, spring controlled valves individual to said passages for controlling them, an exhaust outlet, a supply pipe and an additional pipe all communicating with said casing, a rocker member for alternately actuating said valve for connecting said additional pipe with said supply pipe and exhaust outlet through said casing, a rotatable member, and cam projections on said rotatable member for alternately engaging and rocking said rocker member in opposite directions, said cam projections being laterally offset from each other.

In testimony whereof I have signed my name to this specification, on this 1st day of May, A. D. 1929.

FREDRICH J. RODE.