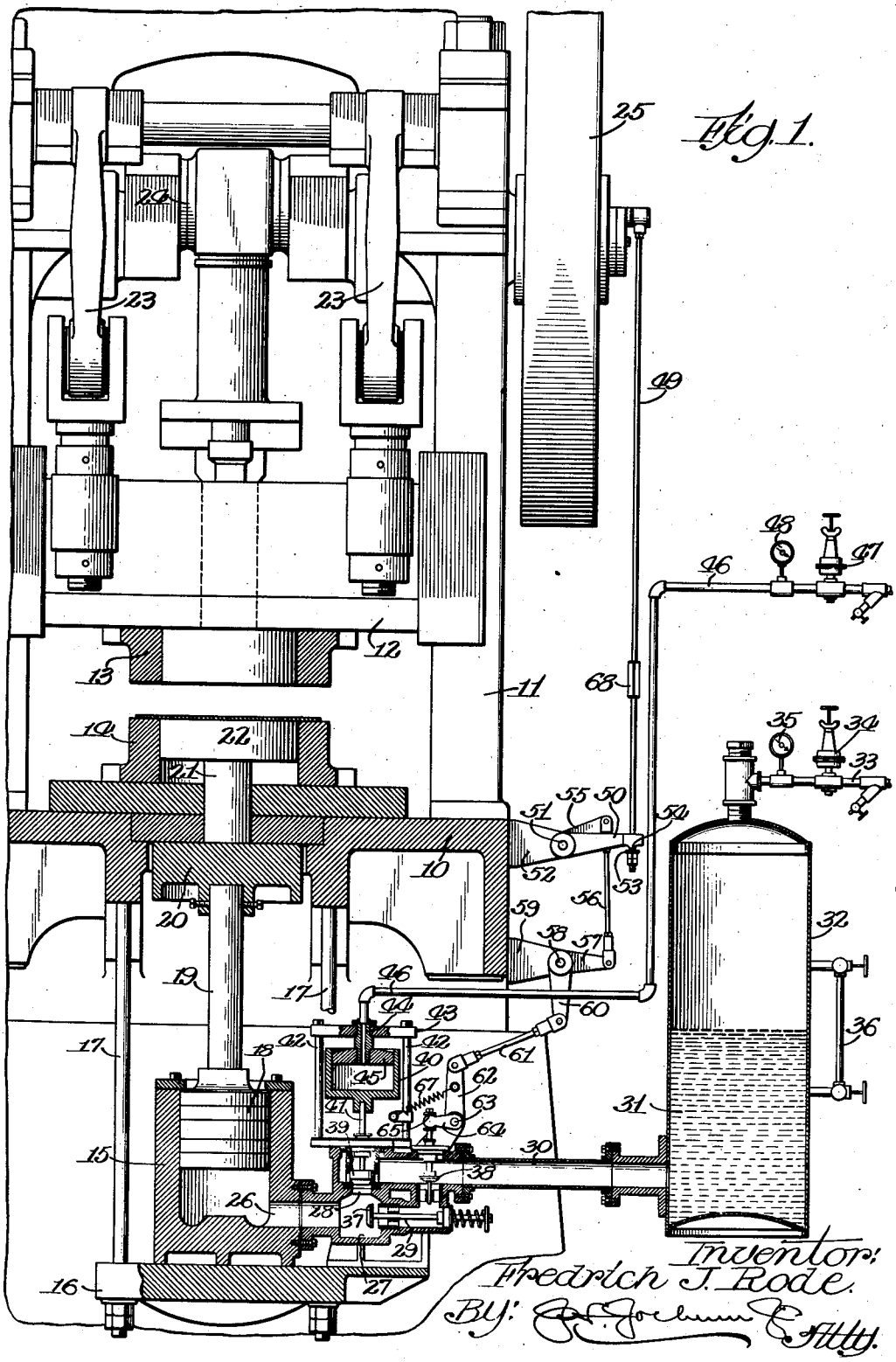
May 6, 1930. F. J. RODE 1,757,737

CUSHION FOR SHEET METAL PRESSES

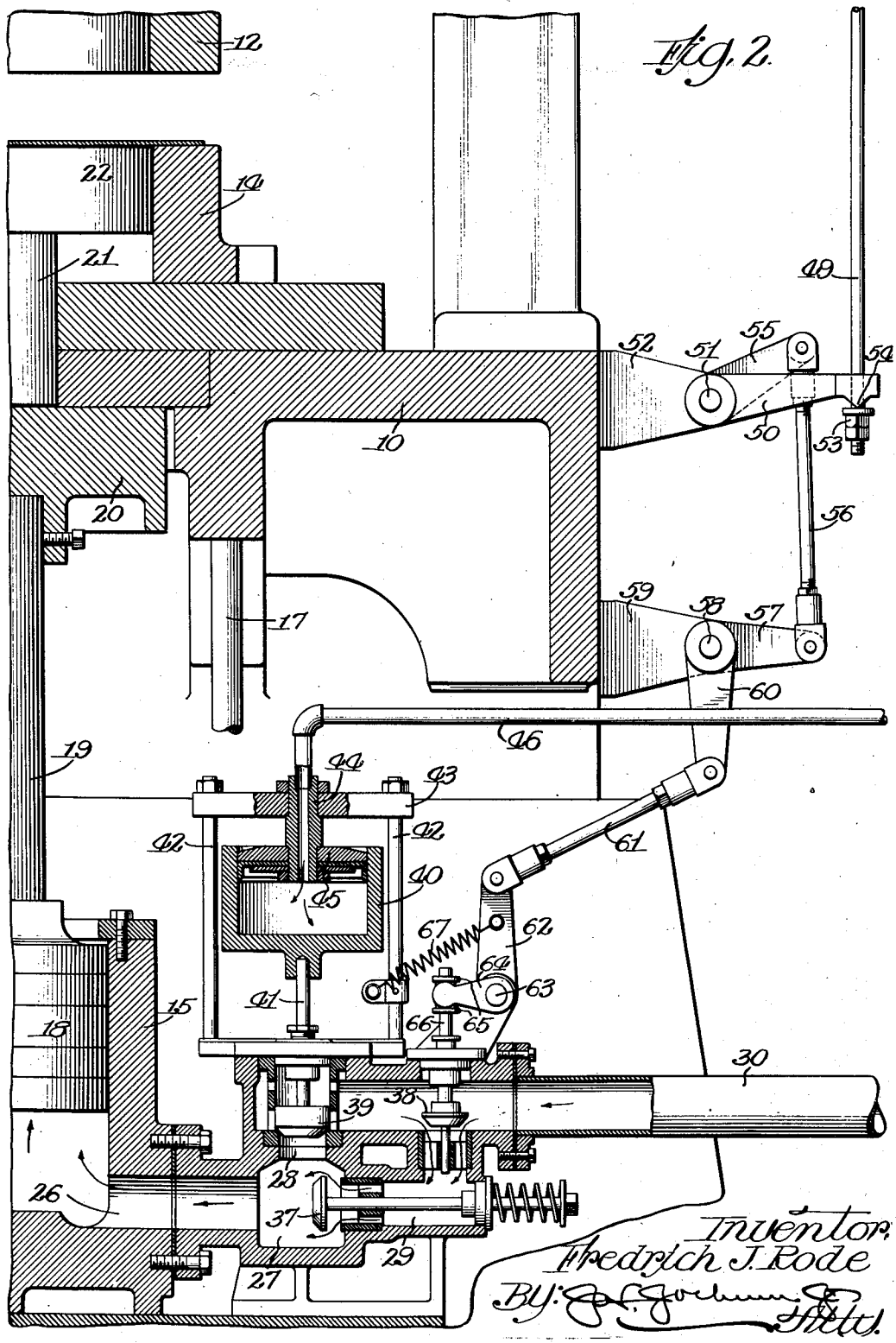
Filed Feb. 9, 1929 3 Sheets-Sheet 1



May 6, 1930. F. J. RODE 1,757,737

CUSHION FOR SHEET METAL PRESSES

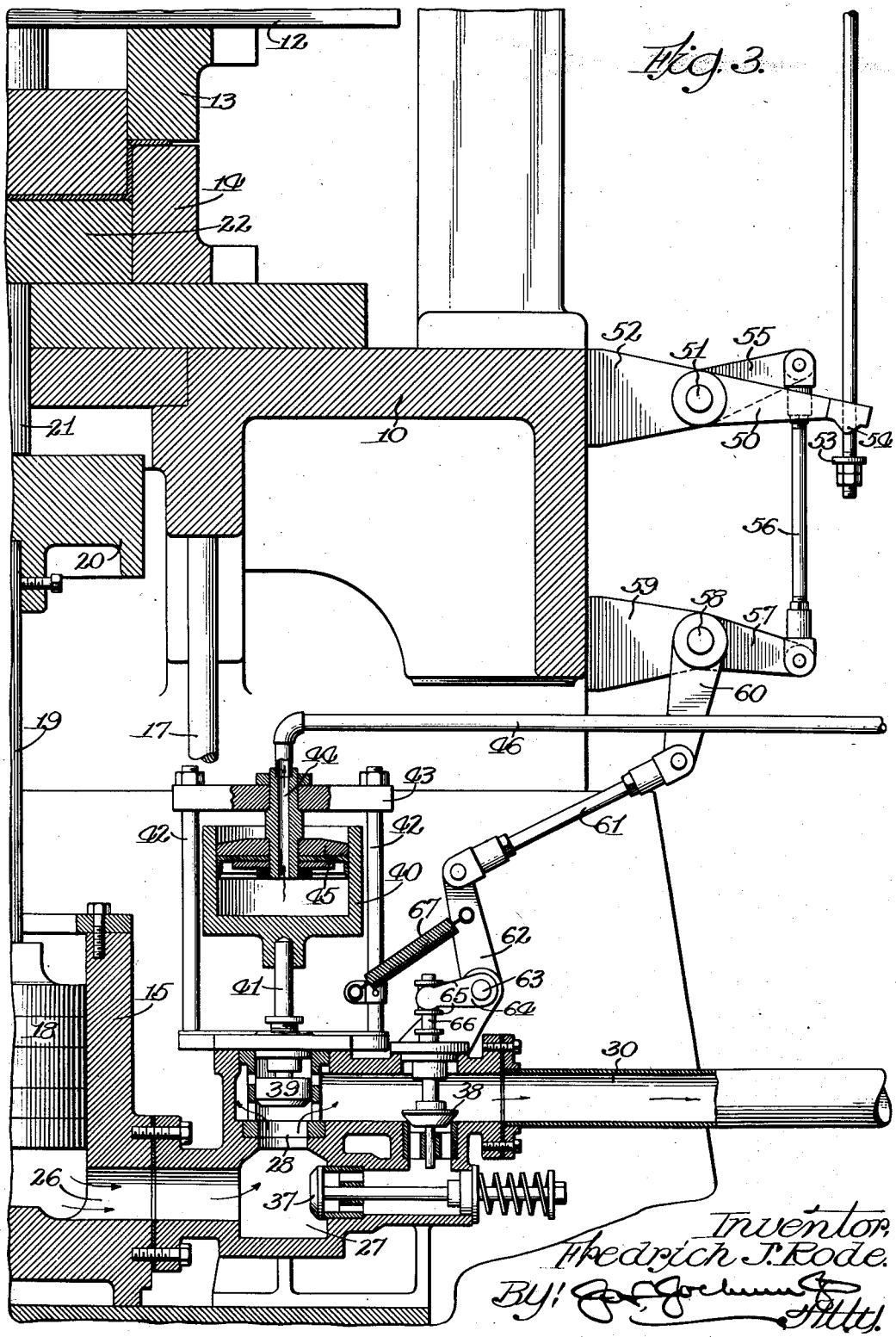
Filed Feb. 9, 1929 3 Sheets-Sheet 2



May 6, 1930. F. J. RODE 1,757,737

CUSHION FOR SHEET METAL PRESSES

Filed Feb. 9, 1929 3 Sheets-Sheet 3



Patented May 6, 1930 1,757,737

UNITED STATES PATENT OFFICE

FREDRICH J. RODE, OF CHICAGO, ILLINOIS, ASSIGNOR TO MARQUETTE TOOL & MFG. COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS

CUSHION FOR SHEET-METAL PRESSES

Application filed February 9, 1929. Serial No. 338,816.

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 that 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 a detail view partly in elevation, partly in section, partly broken away, and with parts omitted, showing the position of the parts of the cushion when the ram is in a raised position.

Figure 3 is a view similar to Figure 2, showing the position of the parts when the ram is lowered.

Referring more particularly to the drawings the numeral 10 designates the supporting base of a press, 11 uprights, 12 the reciprocable ram, 13 a reciprocable die which co-operates with the 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 is in turn 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 the pressure pad 20 upon which pins or projections 21 rest, and which pins pass through the bed plate and are connected with the co-operating blank or work holding element 22.

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 inlet and an outlet for liquid to and from the cylinder 15 and the casing 27 is also provided with an opening 29 which serves as an inlet for 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 an 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 liquid from flowing out of the cylinder 15 and into the pipe 30, as shown in Figure 3, but will open to permit the liquid to flow from the pipe 30 and into the cylinder 15, as shown in Figure 2.

A valve 38 is provided for controlling the

point of communication between the opening 29 and the pipe 30 so that when the valve 38 is unseated as shown in Figure 2, liquid under pressure in the container 32 will flow into the cylinder, past the valve 38, through the opening 29 to raise the piston 18.

When, however, the valve 38 is seated as shown in Figure 3, liquid cannot flow into the cylinder 15 when the opening 28 is closed.

A valve 39 is provided for the opening 28 so that when the opening 28 is closed and the piston 18 is lowered, a pressure will be created upon the liquid in the cylinder 15, 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 the liquid can only flow back into the container 32 through the opening 28 when the valve 39 is unseated.

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

Therefore, in order to vary or control the resistance pressure of the liquid in the cylinder 15 against which the piston 18 and pressure pad 20 must act to resist the movement of the die or work holding element 22, means are provided for varying the pressure exerted upon the valve 39 to hold the latter seated.

In the present form of the invention such means embodies 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 40.

Therefore, in order to vary the pressure against which the valve 39 must be unseated, 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 2, and the valve 39 to be 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 18.

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 so 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. In the present form of the invention this valve 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 passes loosely through an arm 50 connected with a shaft 51 that is journaled in a suitable bracket 52. On the end of the rod 49 is an adjustable collar 53 with which a portion 54 of the arm 50 is adapted to engage.

Connected also with the shaft 51 is another arm 55 and this arm is connected by means of a link 56 with an arm 57 of a bell crank lever, the latter being pivotally supported as at 58 to a bracket 59. The other arm 60 of the bell crank lever is connected by means of a link 61 to an arm 62 on a rock shaft 63. Connected with the rock shaft 63 is an arm 64 that engages between spaced shoulders or collars 65 on the stem 66 of the valve 38. A spring 67 is connected by one end with the arm 62 and is anchored to a fixed support by its other end. The normal tendency of the spring 67 is to move the valve 38 in a direction to seat or close the latter.

If desired, the rod 49 may be in two sec-

tions connected by means of an adjustable coupling 68.

With this improved construction it will be manifest that the normal tendency of the spring 67 is to close the valve 38 and thereby shut off a supply of liquid from the container 32 to the cylinder 15. When pressure is exerted upon the liquid in the cylinder 15 such pressure will be prevented from acting upon the valve 38 to unseat the latter by reason of the valve 37 closing under such pressure. The only exit under these conditions for the liquid from the cylinder 15 is through the opening 28, but as this opening is closed by the valve 39 under a predetermined resistance pressure, it will be manifest that the only escape for the liquid from the cylinder 15 when the valves 37 and 38 are closed, will be through the opening 28.

It is thought that the operation of this device will be clearly understood from the foregoing and without any further explanation.

The valve 38, however, will be unseated by the engagement of the shoulder or collar 53 with the arm 50 at a predetermined time in the cycle of operation of the press, that is after the ram has started to ascend, the collar 53 being adjusted to engage and rock the arm 50 at such point. This will raise the arm 50 and also the arm 55 causing the link 56 to raise the arm 57 to shift the arm 60 to cause the link 61 to rock the shaft 63 in a direction to unseat the valve 38 against the stress of the spring 67.

When the ram 12 starts to descend, the shoulder or collar 53 will have a tendency to move away from the arm 50, but the spring 67 will cause the arm 50 to follow the collar 53 and will close the valve 38. The valve 38 will be closed before the ram reaches the limit of its downward movement and for this reason the rod 49 slides loosely through the arm 50.

While the preferred form of the invention has 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 relation to the other, a liquid column for supplying liquid to the cushion, an outlet through which liquid is discharged from the cushion, variable resistance pressure creating means for controlling said outlet, and automatically controlled means for supplying liquid from said column to said cylinder around the said resistance pressure creating means.

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 relation to the other, a liquid column for supplying liquid to the cushion, an outlet through which liquid is discharged from the cushion, variable resistance pressure creating means for controlling said outlet, and means for supplying liquid from said column to said cylinder around the said resistance pressure creating means.

3. 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 relation to the other, a liquid column for supplying liquid to the cushion, an outlet through which liquid is discharged from the cushion, variable resistance pressure creating means for controlling said outlet, means for supplying liquid from said column to said cylinder around the said resistance pressure creating means, and means controlled by a movable part of the press for controlling the second recited means.

4. 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 relation to the other, a liquid column for supplying liquid to the cushion, an outlet through which liquid is discharged from the cushion, fluid pressure controlled variable resistance pressure creating means for controlling said outlet, and automatically controlled means for supplying liquid from said column to said cylinder around the said resistance pressure creating means.

5. 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 relation to the other, a liquid supply for supplying liquid to the cushion, an outlet through which the liquid is discharged from the cushion, fluid pressure controlled variable resistance pressure creating means for controlling said outlet, and automatically controlled means whereby liquid may be supplied from said liquid supply to said cushion around the said resistance pressure creating means.

6. In a press a pressure pad, an hydraulic cushion for resisting the movement of the pad in one direction, a liquid supply for supplying liquid to the cushion, a discharge passage from the cylinder communicating with said supply, fluid pressure controlled variable pressure creating means for controlling said discharge passage, a passage forming communication between the said supply and said cushion for delivering liquid to the cushion around said resistance pressure creating

means, means for controlling the last said passage, and means for varying at will the said fluid pressure.

7. In a press a pressure pad, an hydraulic cushion for resisting the movement of the pad in one direction, a liquid supply for supplying liquid to the cushion, a discharge passage from the cylinder communicating with said supply, fluid pressure controlled variable pressure creating means for controlling said discharge passage, a passage forming communication between the said supply and said cushion for delivering liquid to the cushion around said resistance pressure creating means, means for controlling the last said passage from a movable part of the press, and means for varying at will the said fluid pressure.

8. In a press a pressure pad, an hydraulic cushion for resisting the movement of the pad in one direction, a liquid conduit, two passages forming communication between said cushion and said conduit, fluid pressure controlled variable resistance pressure creating means for controlling one of said passages, mechanical means for controlling the other of said passages, and means for varying at will the said fluid passage, all of said passages leading around the other passage.

9. In a press a pressure pad, an hydraulic cushion for resisting the movement of the pad in one direction, a liquid conduit, two passages forming communication between said cushion and said conduit, fluid pressure controlled variable resistance pressure creating means for controlling one of said passages, mechanical means for controlling the other of said passages, and means for varying at will the said fluid pressure.

10. In a press a pressure pad, an hydraulic cushion for resisting the movement of the pad in one direction, a liquid conduit, two passages forming communication between said conduit and the respective passages, a fluid pressure controlled variable resistance pressure creating means for controlling one of said passages to the flow of the liquid in one direction with respect to the cushion, the other of said passages leading around said pressure creating means, two valves for controlling the last said passage, each opening to the flow of the liquid in one direction, one of the last said valves operating automatically under the pressure of the liquid, and means for actuating the other of the valves which control the last said passage.

11. In a press a pressure pad, an hydraulic cushion for resisting the movement of the pad in one direction, a liquid conduit, two passages forming communication between said conduit and the respective passages, a fluid pressure controlled variable resistance pressure creating means for controlling one of said passages to the flow of the liquid in one direction with respect to the cushion, the other of said passages leading around said pressure creating means, two valves for controlling the last said passage, each opening to the flow of the liquid in one direction, one of the last said valves operating automatically under the pressure of the liquid, and means operable from a movable part of the press for actuating the other of the valves which control the last said passage.

12. In a press a pressure pad, an hydraulic cushion for resisting the movement of the pad in one direction, a liquid conduit, two passages forming communication between said conduit and the respective passages, a fluid pressure controlled variable resistance pressure creating means for controlling one of said passages to the flow of the liquid in one direction with respect to the cushion, the other of said passages leading around said pressure creating means, two valves for controlling the last said passage, each opening to the flow of the liquid in one direction, one of the last said valves operating automatically under the pressure of the liquid, means for actuating the other of the valves which control the last said passage, and means for varying at will the fluid pressure against which the said resistance pressure creating means is operable.

13. In a press a pressure pad, an hydraulic cushion for resisting the movement of the pad in one direction, a liquid conduit, two passages forming communication between said conduit and the respective passages, a fluid pressure controlled variable resistance pressure creating means for controlling one of said passages to the flow of the liquid in one direction with respect to the cushion, the other of said passages leading around said pressure creating means, two valves for controlling the last said passage, each opening to the flow of the liquid in one direction, one of the last said valves operating automatically under the pressure of the liquid, means tending normally to close the other of the valves which control the last said passage, and means for opening the last said valve at a predetermined time in the cycle of operation of the press.

14. In a press a pressure pad, an hydraulic cushion for resisting the movement of the pad in one direction, a liquid conduit, two passages forming communication between said conduit and the respective passages, a fluid pressure controlled variable resistance pressure creating means for controlling one of said passages to the flow of the liquid in one direction with respect to the cushion, the other of said passages leading around said pressure creating means, two valves for controlling the last said passage, each opening to the flow of the liquid in one direction, one of the last said valves operating automatically under the pressure of the liquid, means tending normally to close the other of the

valves which control the last said passage, and means for opening the last said valve from a movable part of the press.

In testimony whereof I have signed my name to this specification, on this 21st day of January A. D., 1929.

FREDRICH J. RODE.