

May 6, 1930.

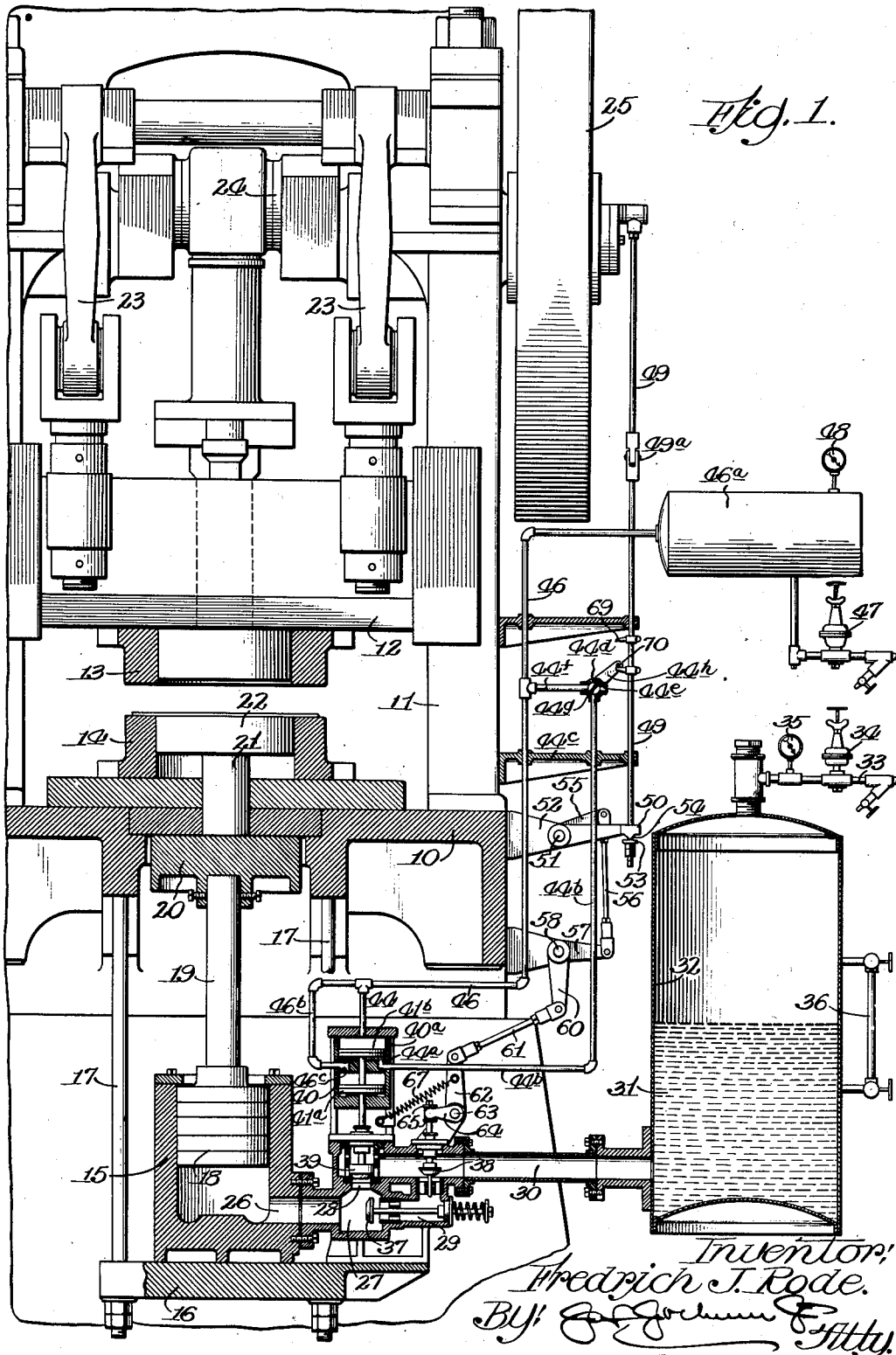
F. J. RODE

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CUSHION FOR SHEET METAL PRESSES

Filed Feb. 9, 1929

3 Sheets-Sheet 1



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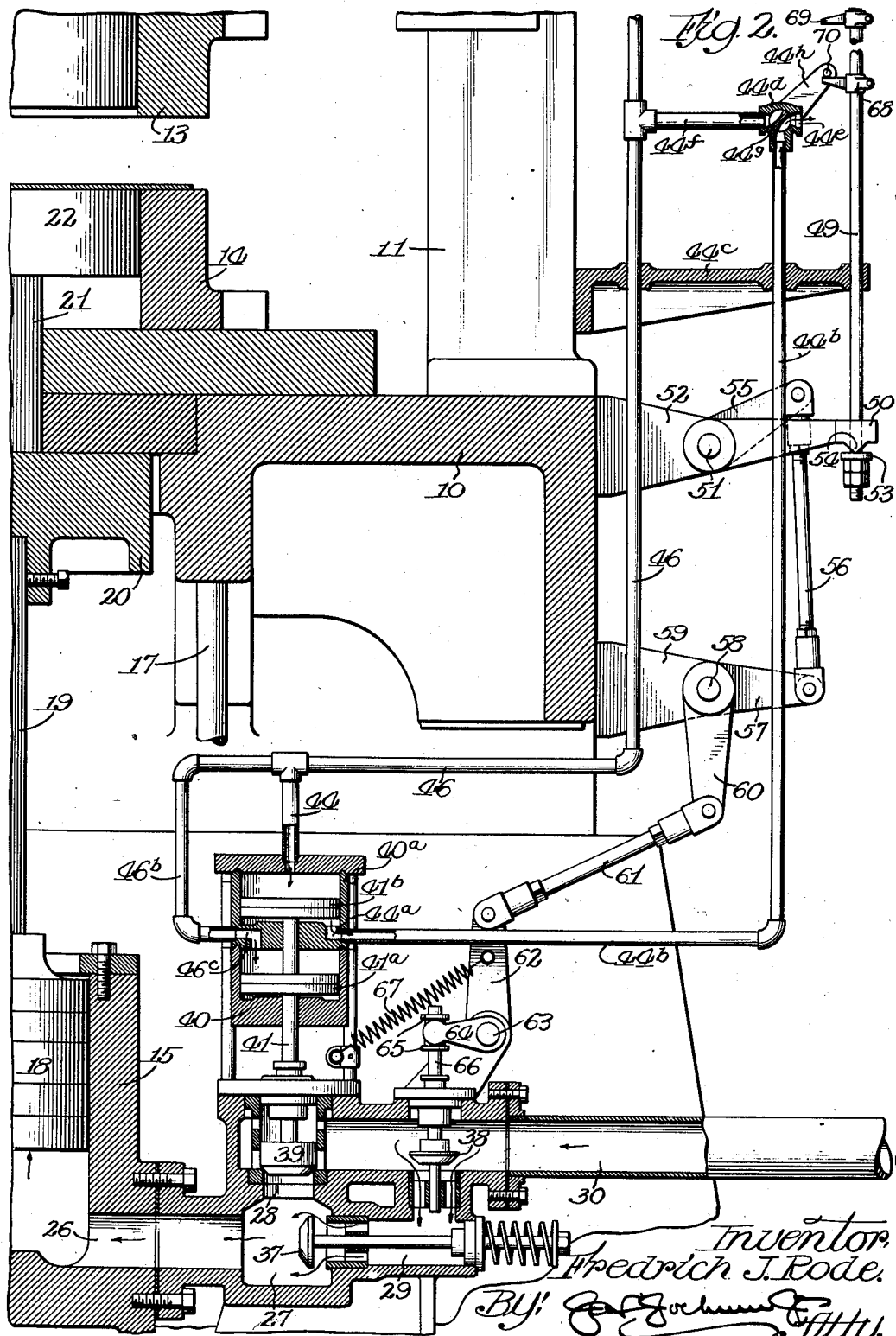
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CUSHION FOR SHEET METAL PRESSES

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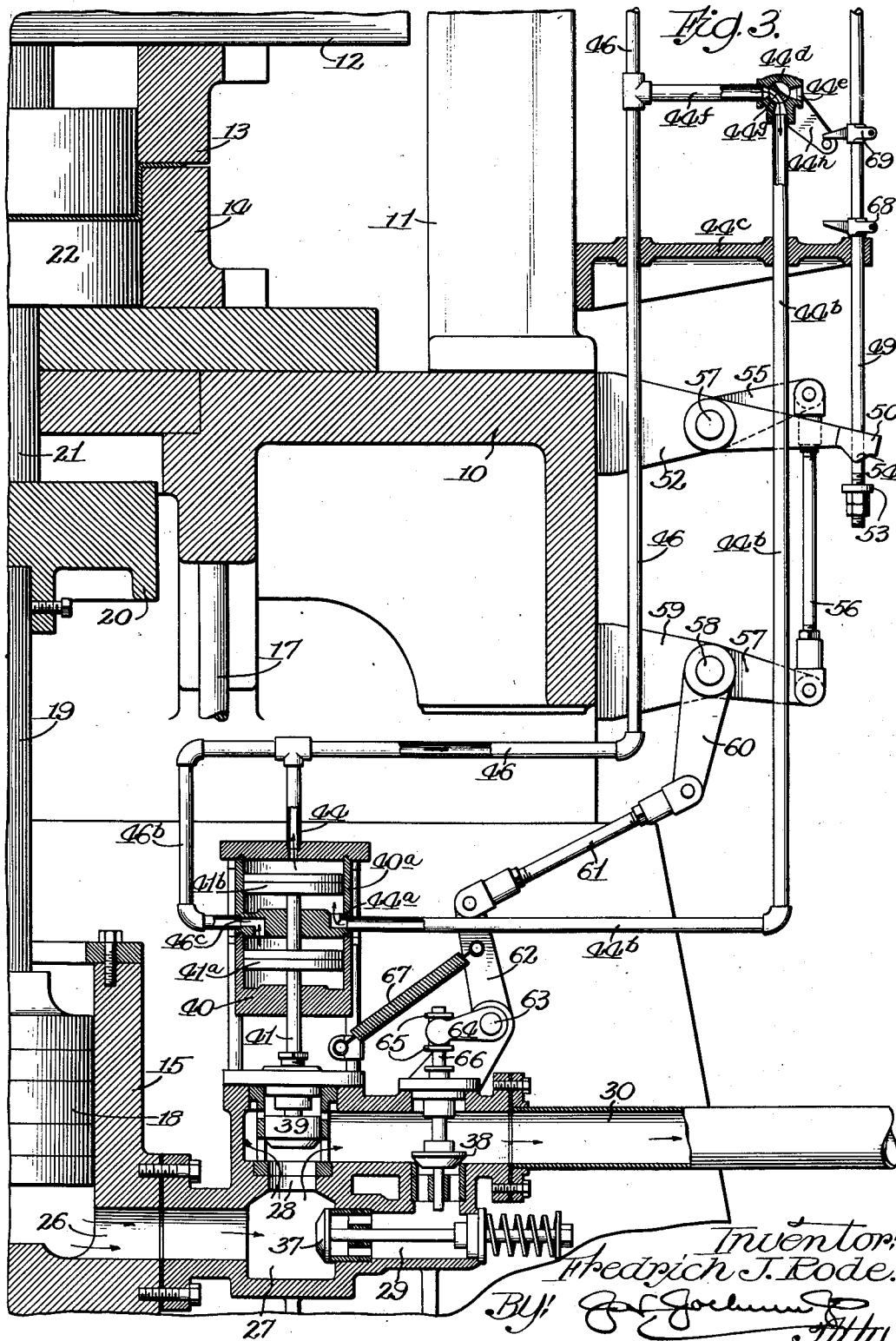
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CUSHION FOR SHEET METAL PRESSES

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UNITED STATES PATENT OFFICE

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CUSHION FOR SHEET-METAL PRESSES

Application filed February 9, 1929. Serial No. 338,817.

This invention relates to improvements in cushioning devices for presses of the character in which the metal is shaped by means of cooperating 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 pad, the latter being resisted by the said cushion, and one of the objects of the invention is to provide improved means for varying the resistance pressure against which the pad is movable.

A further object is to provide a fluid pressure cushion and fluid pressure controlled variable resistance pressure creating means against which the pressure pad operates, the variable resistance pressure creating means comprising a double cushion embodying two separate fluid controlled cushion elements, and improved means whereby the pressure in one of said elements may be varied without interfering with the fluid pressure in the other cushion element.

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 a reciprocable

ram, 13 a reciprocable die which co-operates with a die 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 a pressure pad 20 upon which pins or projections 21 rest, and which pins pass through the bed plate and are connected with the 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 26 preferably arranged adjacent the bottom thereof and communicating with this outlet 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 upon 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 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 pair of cylinders 40—40^a which are supported upon the casing of the valve chamber 27. Connected with the valve 39 is a stem or rod 41 which passes through one of the walls of each of the cylinders 40—40^a, and connected with this stem are pistons 41^a—41^b, reciprocable respectively in the cylinders 40—40^a. These cylinders 40 and 40^a are out of communication with each other.

A pipe 44 has communication with the cylinder 40^a on one side of the piston 41^b and to the pipe 44 is connected a pipe 46 through which fluid under any desired pressure is conveyed from any suitable source of supply such as from a tank or container 46^a. A fluid pressure regulating valve 47 may be provided for controlling the pressure of the fluid through the pipe 46, and the pressure indicating gauge 48 may also be provided.

Leading from the pipe 46 adjacent the cylinder 40^a is an extension 46^b which has communication with an opening 46^c extending through the head of the cylinder 40^a to form communication between said pipe extension 46^b and the cylinder 40 on one side of the

piston 41^a, so as to admit fluid into the cylinder 40 and also to permit the fluid to escape from the cylinder 40.

An opening 44^a is also provided in the head of the cylinder 40^a on the side of the piston 41^b opposite to the side on which the pipe 44 communicates with the cylinder 40^a. This opening 44^a serves as an inlet and also an outlet for fluid on one side of the piston 41^b in the cylinder 40^a. Communicating with the opening 44^a is a pipe 44^b which may be supported by means of a suitable bracket 44^c. Connected with the pipe 44^b is a two-way valve casing 44^d having an opening 44^e communicating with the atmosphere. A branch pipe 44^f forms communication between the pipe 46 and the valve casing 44^d. Within this valve casing is a three-way valve 44^g adapted to be adjusted by means of a handle 44^h so as to form communication between the pipe 46 through the branch 44^f (see Figure 3), through the valve casing 44^d, with the pipe 44^b so that when the valve 44^g is in the position shown in Figure 3, fluid from the pipe 44^b will flow into the cylinder 40^a beneath the piston 41^b and also through the pipe 44 on the top side of the piston 41^b to neutralize the pressure on both sides of the piston. At the same time pressure will flow into the cylinder 40 on the top side of the piston 41^a so that the valve 39 will then be held against its seat only by the pressure on the piston 41^a.

When, however, the valve 44^g assumes the position shown in Figure 2, communication will be established from the pipe 46, through the pipe 44, into the cylinder 40^a above the piston 41^b, and also through the extension 46^b, through the opening 46^c, into the cylinder 40 above the piston 41^a. At the same time communication will be established from the cylinder 40^a on the bottom side of the piston 41^b through the opening 44^a, pipe 44^b, through the valve casing 44^d to the atmosphere, through the opening 44^e, thereby allowing the fluid on the bottom side of the piston 41^b to escape. At this time the valve 39 will be held seated by the combined pressure on both of the pistons 41^a and 41^b.

It will therefore be manifest that by adjusting the valve 44^g the operation of the valve 39 may be controlled and the degree of resistance pressure with which the valve 39 is held closed will be controlled by the degree of fluid pressure in the cylinders 40 and 40^a on the top sides of the respective pistons 41^a and 41^b.

In order therefore to vary the resistance pressure exerted upon the valve 39 it is only necessary to vary or control the fluid pressure.

In order to vary the fluid pressure exerted upon the valve 39 to hold it seated, the valve 44^g serves as a means whereby the fluid pressure in the cylinder 40^a may be balanced without interfering with the fluid pressure in the

cylinder 40 so as to reduce the resistance pressure against which the valve 39 must be unseated. This is accomplished by positioning the valve 44^s as shown in Figure 3, so as to admit fluid pressure from the pipe 44^b into the cylinder 40^a on the bottom side of the piston 41^b.

When the pressure upon the fluid in the cylinder 15 overcomes the pressure in the cylinders 40 and 40^a the valve 39 will be unseated and the liquid will flow through the pipe 30 back into the container 32 assuming that the valve 38 is closed.

After the piston 18 has reached the limit of its lowermost movement and when the pressure in the cylinder 15 is overcome by the pressure in the cylinders 40—40^a, 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 open. Assuming the valve 38 to be open as shown in Figures 1 and 2, 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 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 recede. 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 preferably jointed as at 49^a and 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 is an adjustable collar 53 with which a portion 54 on 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 which 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 the latter.

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.

The valve 44 is adapted to be automatically operated at predetermined times in the cycle of operation of the press and any suitable means may be provided for accomplishing this result. A simple and efficient means embodies a pair of arms or fingers 68—69 which are secured to the rod 49. The arm 44^t of the valve 44^s is provided with a lateral extension 70 which is arranged within the path of reciprocatory movement of the arms 68—69. When the rod 49 is raised the arm 68 will engage the projection 70 and move the valve 44^s in one direction, at a predetermined time in the cycle of operation of the press. When the rod 49 is lowered the arm 69 will engage the projection 70 on the arm 44^t and move the valve 44^s in the opposite direction at another predetermined time in the cycle of operation of the press, with the result that the valve 44^s will be automatically shifted during the reciprocatory movement of the rod 49.

It is thought that the operation of this device will be clearly understood from the foregoing without 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 a rock 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.

5 What is claimed as new is:—

1. In a sheet metal press a pressure pad, a cushion for resisting the movement of the pad in one direction, means for creating a variable resistance pressure in said cushion, said means embodying two fluid pressure controlled elements, and means for varying the fluid pressure in one of said elements independently of the other of said elements.

15 2. In a sheet metal press a pressure pad, a cushion for resisting the movement of the pad in one direction, means for creating a variable resistance pressure in said cushion, said means embodying two fluid pressure controlled elements, and means responsive in its operation to the operation of a movable part of the press for varying the fluid pressure in one of said elements independently of the other of said elements.

25 3. In a sheet metal press a pressure pad, a cushion for resisting the movement of the pad in one direction, means for creating a variable resistance pressure in said cushion, said means embodying two fluid pressure controlled elements, and means for neutralizing the fluid pressure of one of said elements while the fluid pressure of the other of said elements remains active.

35 4. In a sheet metal press a pressure pad, a cushion for resisting the movement of the pad in one direction, means for creating a variable resistance pressure in said cushion, said means embodying two fluid pressure controlled elements, and means for neutralizing the fluid pressure of one of said elements independently of the other element, the said means being also operable to establish a uniform fluid pressure in both of said elements.

45 5. In a sheet metal press a pressure pad, a cushion for resisting the movement of the pad in one direction, means for creating a variable resistance pressure in said cushion, said means embodying two fluid controlled elements out of communication with each other, means for supplying fluid under pressure to said elements to create a predetermined pressure in the elements independent of each other, and means for varying the fluid pressure of one of said elements while the other of said elements maintains its predetermined pressure.

60 6. In a sheet metal press a pressure pad, a cushion for resisting the movement of the pad in one direction, means for creating a variable resistance pressure in said cushion, said means embodying two fluid controlled elements out of communication with each other, means for supplying fluid under pressure to said elements to create a predetermined pressure in the elements independent of each

other, and means responsive in its operation to a movable part of the press for varying the fluid pressure of one of said elements while the other of said elements maintains its predetermined pressure.

7. In a sheet metal press a pressure pad, a cushion for resisting the movement of the pad in one direction, means for creating a variable resistance pressure in said cushion, said means embodying two fluid controlled elements out of communication with each other, means for supplying fluid under pressure to said elements to create a predetermined pressure in the elements independent of each other, means rendered effective at a predetermined time in the cycle of operation of the press for varying the fluid pressure of one of said elements while maintaining the said predetermined fluid pressure of the other of said elements, and means whereby the time of operation of the last said means in the cycle of operation of the press may be varied.

8. In a sheet metal press a pressure pad, means for resisting the movement of the pad in one direction, means for creating a variable resistance pressure to the movement of said pad, the last said means embodying a pair of cylinder and piston elements, means for supplying fluid under pressure to said cylinders independently of each other to establish predetermined fluid pressures in said cylinders, and means for reducing the pressure in one of said cylinders while the said predetermined pressure is maintained in the other of said cylinders.

9. In a sheet metal press a pressure pad, means for resisting the movement of the pad in one direction, means for creating a variable resistance pressure to the movement of said pad, the last said means embodying a pair of cylinder and piston elements, means for supplying fluid under pressure to said cylinders independently of each other to establish predetermined fluid pressures in said cylinders, and means controlled in its action by a movable part of the press for reducing the pressure in one of said cylinders while the said predetermined pressure is maintained in the other said cylinders.

10. In a sheet metal press a pressure pad, means resisting the movement of the pad in one direction, means for causing said resistance to be variable, the last said means embodying a pair of cylinders and pistons in individual thereto, means common to said cylinders for supplying fluid thereto under a predetermined pressure, and means for reducing the pressure in one of said cylinders while the fluid is maintained at said predetermined pressure in the other of the cylinders.

11. In a sheet metal press a pressure pad, means for resisting the movement of the pad in one direction, means for causing said resistance to be variable, the last said means em-

bodying a pair of cylinders and pistons individual thereto, means for supplying fluid pressure to each of the cylinders on one side of the respective pistons, means for supplying said fluid pressure on the opposite side of one of said pistons to neutralize the fluid pressure on the opposite side of the last said piston, and means for controlling the last said means.

12. In a sheet metal press a pressure pad, means for resisting the movement of the pad in one direction, means for causing said resistance to be variable, the last said means embodying a pair of cylinders and pistons individual thereto, means for supplying fluid pressure to each of the cylinders on one side of the respective pistons, means for supplying said fluid pressure on the opposite side of one of said pistons to neutralize the fluid pressure on the opposite side of the last said piston, and means operable at a predetermined time in the cycle of operation of the press to control the last said means.

13. In a sheet metal press a pressure pad, means for resisting the movement of the pad in one direction, means for causing said resistance to be variable, the last said means embodying a pair of cylinders and pistons individual thereto, means for supplying fluid pressure to each of the cylinders on one side of the respective pistons, means for supplying said fluid pressure on the opposite side of one of said pistons to neutralize the fluid pressure on the opposite side of the last said piston, and means operable by a movable part of the press for controlling the last said means.

14. In a sheet metal press a pressure pad, means for resisting the movement of the pad in one direction, means for causing said resistance to be variable, the last said means embodying a pair of cylinders and pistons individual thereto, means for supplying fluid pressure to each of the cylinders on one side of the respective pistons, means for supplying said fluid pressure on the opposite side of one of said pistons to neutralize the fluid pressure on the opposite side of the last said piston, and means embodying a two-way valve device for controlling the last recited means.

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

FREDRICH J. RODE.