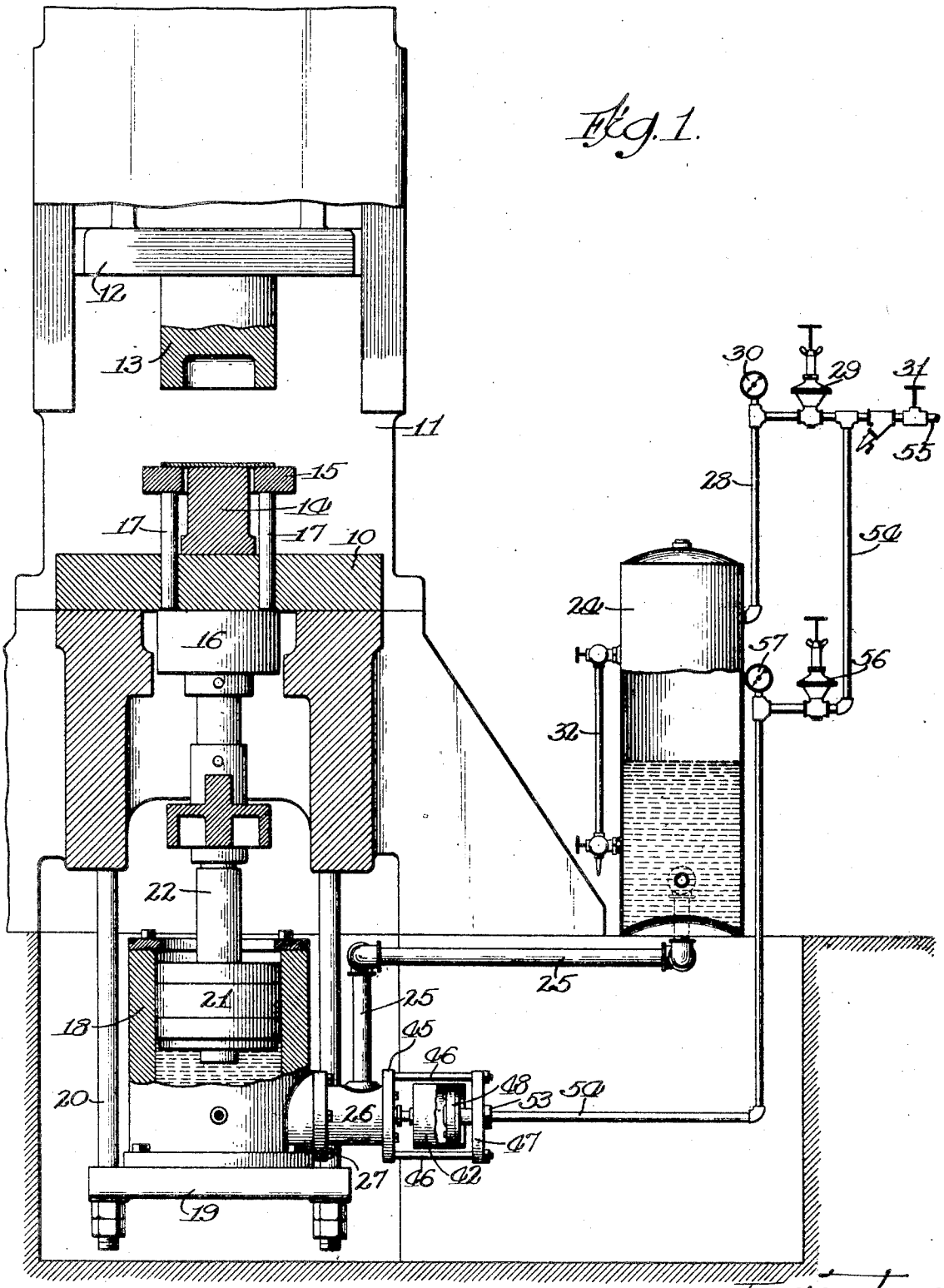
March 15, 1932. F. J. RODE 1,849,690

CUSHION FOR SHEET METAL PRESSES

Filed Jan. 18, 1929 2 Sheets-Sheet 1

Fig. 1.



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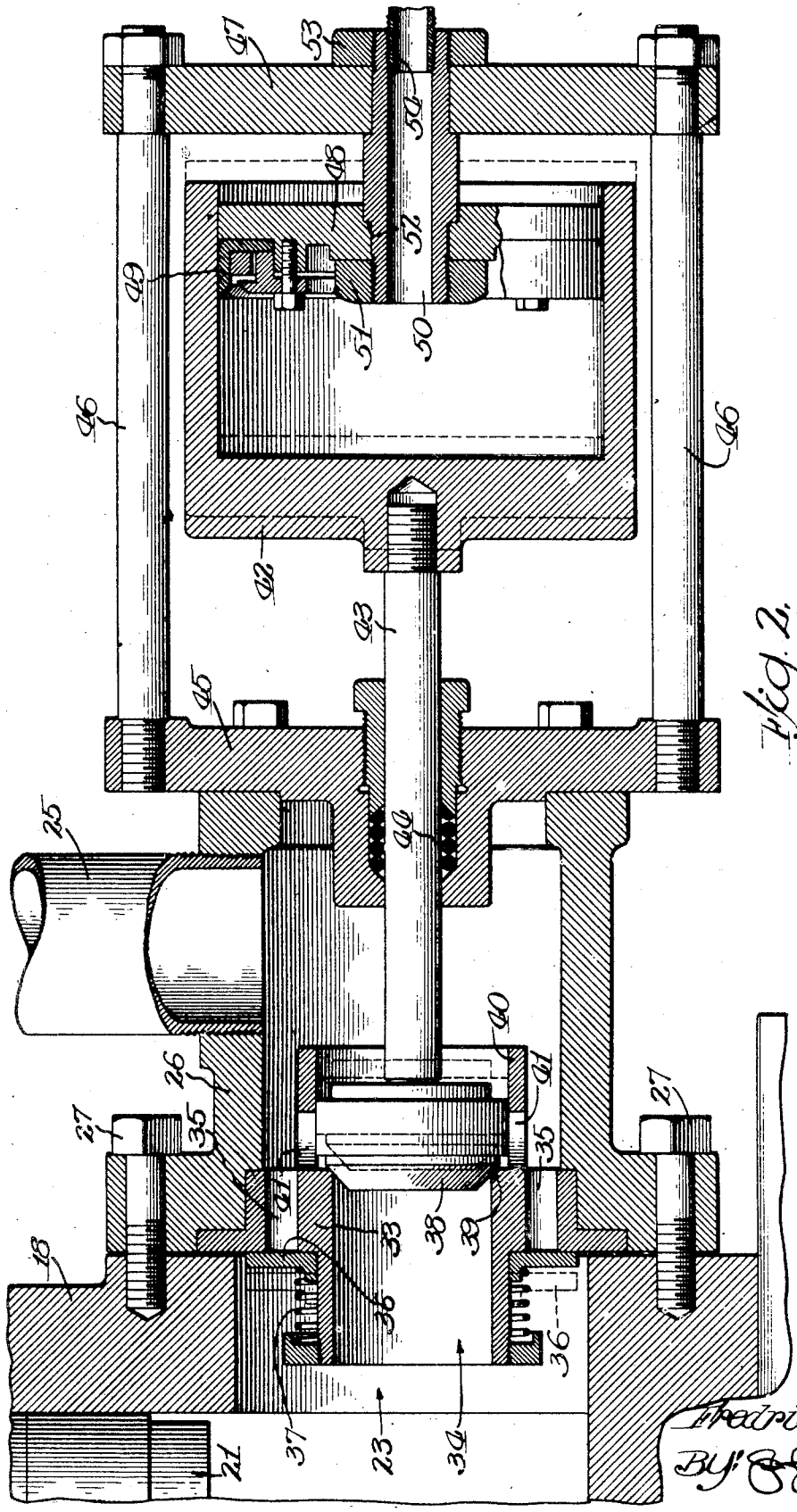


Fig. 2.

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UNITED STATES PATENT OFFICE

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CUSHION FOR SHEET METAL PRESSES

Application filed January 18, 1929. Serial No. 333,335.

This invention relates in general to cushioning devices for presses of the character in which the metal is shaped by means of cooperating dies, one of which dies 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 the said cushion, and one of the objects of the invention is to provide an improved fluid pressure cushion of this character embodying valve for providing a variable resistance pressure of the fluid to the action of the blank or work holder and which valve is itself controlled by the fluid pressure.

A further object is to provide with an improved valve of this character means whereby the fluid pressure may be controlled whereby a very wide range of variable resistance pressure against which the valve is opened or unseated may be obtained, within a very compact space.

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 press having a cushion in a valve controlling means constructed in accordance with the principles of this invention applied thereto.

Figure 2 is a sectional view on an enlarged scale of the valve mechanism.

Referring more particularly to the drawings the numeral 10 designates generally the bed of a press, 11 the uprights, 12 a reciprocable ram upon which a die member 13 is connected to reciprocate therewith. Mounted upon the bed of the press is a die 14 with which a blank or holder member 15 co-operates. Arranged beneath the bed of the press is a pressure pad 16 and the work or blank holder element 15 is supported by means of suitable pins 17 which pass through the bed of the press and rest upon the pressure pad.

The pressure pad is controlled in its action in one direction by a cushioning device embodying a cylinder 18 mounted upon a support 19, the latter in turn being supported from the press by means of rods or hangers 20.

Within the cylinder 18 is a reciprocable piston 21, and in the present form of the invention the piston 21 is provided with a piston rod 22 which supports the pad 16.

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

The cylinder 18 is provided near its bottom with an opening 23 which in the present form of the invention serves as an inlet and an outlet for the fluid and the fluid (preferably liquid) is supplied from a tank or container 24 through a pipe 25, and which pipe 25 has communication with the interior of a valve casing 26, the latter being secured to the cylinder in any suitable manner such as by means of the fastening bolts 27 and in a position that the valve casing will communicate with the opening 23.

The liquid is delivered into the cylinder 18 preferably by the fluid pressure which is supplied through a pipe 28 into the container 24 above the liquid therein, a pressure regulating valve 29 and a pressure gauge 30 being provided in the pipe. A cut off valve 31 may also be provided for cutting off the supply of pressure creating fluid. The container 24 may also be provided with an indicator gauge 32.

As is well known in this art, when the fluid pressure is exerted upon the top of the liquid in the container 24 it will force the liquid from the container and into the cylinder 18 to raise the piston 21 and thereby restore the work holding member and pressure pad 16 to their normal position and to supply the cylinder with the liquid which acts as a resistance pressure creating means to the movement of the piston 21 in one direction.

Within the valve casing 26 is provided a member 33 having a central opening 34 and additional openings 35 out of communication with the central opening, all of which open-

ings form communications between the pipe 25 and the interior of the cylinder 18.

A spring controlled valve 36 is provided for closing the openings 35 to the passage of the liquid in one direction, that is when the liquid is forced through the pipe 25 and into the valve casing 26 from the container 24, the pressure of the liquid flowing through the openings 35 will unseat the valve 36 and permit the liquid to flow into the cylinder 18. Pressure upon the liquid in the cylinder, when such pressure overcomes the pressure of the liquid in the tank 24, augmented by the spring 37 which controls the valve 36, will seat the valve 36 and thereby prevent the liquid from escaping from the cylinder through the openings 35.

Under these conditions, however, the liquid will have a tendency to escape from the cylinder to flow back to the container 24 through the pipe 25, through the outlet opening 34.

A valve 38 is provided which co-operates with a portion 39 of the tubular member 33 which is shaped to form a valve seat and against which the valve 38 rests so as to close the opening 34.

If desired this valve 38 may operate in a tubular extension 40 of the member 33, such extension having openings 41 and through which latter openings the liquid will escape to flow into the pipe 25 when the valve 38 is unseated.

The valve 38 is so arranged that it will close to prevent the liquid from flowing from the pipe 25 into the cylinder 18.

When the piston 21 descends in the cylinder pressure will be created upon the liquid therein and the valve 38 will be unseated by this pressure when the pressure of the liquid in the cylinder 18 is sufficient to overcome the pressure by means of which the valve 38 is held seated.

Therefore, in order to control, regulate or provide a means whereby the resistance pressure against which the valve 38 is to be unseated by the pressure of the liquid in the cylinder 18, fluid pressure means are provided for controlling the operation of the valve 38.

To that end there may be provided a cylinder 42 which is connected with a rod or valve stem 43 secured to and projecting from the valve 38. This valve stem or rod passes through a suitable stuffing or packing box 44 provided in the head 45 of the valve casing 26.

Connected to the head 45 by means of suitable rods 46 and spaced from such head, is a bar or member 47 and secured to this bar or member 47 is a piston 48 which operates in the cylinder 42. The piston is provided with suitable packing 49 and is secured to the member 47 by means of a tubular element 50 which preferably passes through the piston 48 and is fastened by means of a nut or collar threaded on the end of the tubular member 50 and which nut or collar preferably co-operates with shoulders 52.

The other end of the tubular member 50 is secured in any suitable manner to the bar or member 47 preferably by means of a fastening nut or collar 53, so that the tubular member will pass through the rod or member 47. To this tubular member is connected one end of a supply pipe 54 and which pipe 54 is in turn connected with a supply pipe 55 and which pipe 55 also has connection with the supply pipe 28.

Thus it will be seen that fluid pressure will be admitted from the pipe 55 through the piston 48, and into the cylinder 42 until the desired fluid pressure is obtained in the cylinder 42 to hold the valve 38 against its seat 39 and against which pressure in the cylinder 42 the valve 38 is adapted to be unseated, the other side of the cylinder head 42 being subjected to atmospheric pressure only.

A fluid pressure regulator 56 may be provided in the pipe 54 and a pressure gauge 57 may also be provided in the pipe 54.

Thus it will be manifest that by varying the pressure in the cylinder 42 the resistance pressure against which the valve 38 is to be unseated may be varied at will and at any time during the operation of the press.

When the valve 38 is unseated, which will occur when the piston 21 is descending and when it has created a pressure upon the liquid in the cylinder 18 to overcome the pressure of the fluid in the cylinder 42 the liquid will escape from the cylinder 18 and will flow through the pipe 25 back into the container 24.

When the pressure of the fluid in the cylinder 42 overcomes the pressure upon the liquid in the cylinder 18, the valve 38 will be seated and the pressure of the fluid in the container 24 upon the liquid in the container will force the liquid into the cylinder 18 by unseating the valve 36 against the stress of the spring 37 to raise or return the piston 21 and the pressure pad 16 to their normal positions.

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 sheet metal press a pressure pad, an hydraulic cushion resisting the movement of the pad in one direction and embodying a cylinder, a piston therefor, said piston and cylinder being movable one with relation to the other, a conduit leading to and from the cylinder for the passage of liquid, and a variable resistance fluid pressure controlled com-

bined check and relief valve for controlling said conduit.

2. In a sheet metal press a pressure pad, an hydraulic cushion resisting the movement of the pad in one direction and embodying a cylinder, a piston therefor, said piston and cylinder being movable one with relation to the other, a conduit leading to and from the cylinder for the passage of liquid, fluid pressure controlled variable resistance pressure creating combined check and relief valve for controlling said conduit, and means for varying at will the said fluid pressure.

3. In a sheet metal press a pressure pad, an hydraulic cushion resisting the movement of the pad in one direction and embodying a cylinder and piston movable one with relation to the other, a fluid passage communicating with the cylinder, a valve for controlling said passage, a cylinder and piston one of which is connected with the valve and movable therewith and the other of which is stationary, said valve being unseated by the pressure in said passage, and means for supplying a fluid between the last said piston and cylinder on one side of the one which is movable for providing a resistance pressure against which said valve is adapted to be unseated, the other side of the last recited piston and cylinder which is movable being subjected to atmospheric pressure only.

4. In a sheet metal press a pressure pad, an hydraulic cushion resisting the movement of the pad in one direction and embodying a cylinder and piston movable one with relation to the other, a fluid passage communicating with the cylinder, a valve for controlling said passage, a cylinder and piston one of which is connected with the valve and the other of which is stationary, said valve being unseated by the pressure in said passage, means for supplying a fluid between the last said piston and cylinder for providing a resistance pressure against which said valve is adapted to be unseated, and means for varying at will the resistance pressure against which the said valve is to be unseated.

5. In a press a pressure pad, an hydraulic cushion resisting the movement of the pad in one direction and embodying a cylinder and piston movable one with relation to the other, a passage for conducting liquid to and from the cylinder, a valve operating to permit the liquid to flow to the cylinder through said passage and to prevent its flowing away from the cylinder, a second valve operating to permit the liquid to flow away from the cylinder and also operating to prevent the liquid flowing to the cylinder, and fluid pressure controlled means operating upon one of the said valves and against which pressure the last said valve is adapted to be opened by the pressure upon the liquid in the cushion.

6. In a press a pressure pad, an hydraulic cushion resisting the movement of the pad in one direction and embodying a cylinder and piston movable one with relation to the other, a passage for conducting liquid to and from the cylinder, a valve operating to permit the liquid to flow to the cylinder through said passage and to prevent its flowing away from the cylinder, a second valve operating to permit the liquid to flow away from the cylinder and also operating to prevent the liquid flowing to the cylinder, fluid pressure controlled means operating upon one of the said valves and against which pressure the last said valve is adapted to be opened by the pressure upon the liquid in the cushion, and means for varying at will the resistance pressure against which the last recited valve is adapted to be opened.

7. In a press a pressure pad, an hydraulic cushion resisting the movement of said pad in one direction and embodying a cylinder and piston movable one with relation to the other, an outlet from the cylinder, a valve controlling said outlet, additional cylinder and piston elements, one of which latter is connected with said valve and movable therewith and the other of which is stationary, and means for supplying a fluid between the last said cylinder and piston on one side of the movable element for establishing a predetermined resistance pressure against which the said valve is adapted to be opened, the other side of said movable element being subjected to atmospheric pressure only.

8. In a press a pressure pad, an hydraulic cushion resisting the movement of said pad in one direction and embodying a cylinder and piston movable one with relation to the other, an outlet from the cylinder, a valve controlling said outlet, an additional cylinder and piston, one of which latter is connected with said valve and the other of which is stationary, means for supplying a fluid between the last said cylinder and piston for establishing a predetermined resistance pressure against which the said valve is adapted to be opened, and means for varying said resistance pressure at will.

9. In a press, a pressure pad, a fluid pressure cushion for resisting the movement of the pad in one direction and embodying a cylinder and piston movable one with relation to the other, an outlet from the cylinder, a valve for controlling said outlet, and fluid pressure controlled variable resistance creating means against which said valve is adapted to be opened, said resistance means embodying cylinder and piston elements one of which is connected with the valve and movable therewith and the other of which is stationary, one side of the movable element being subjected to atmospheric pressure.

10. In a press, a pressure pad, a fluid pressure cushion for resisting the movement of the pad in one direction and embodying a cylinder and piston movable one with rela-

tion to the other, an outlet from the cylinder, a valve for controlling said outlet, fluid pressure controlled variable resistance creating means against which said valve is adapted to be opened, said resistance means embodying a cylinder and piston one of which is connected with the valve and movable therewith and the other of which is stationary, means for supplying fluid to the last said cylinder, and means for varying at will the fluid pressure of the said resistance creating means.

11. In a press, a pressure pad, a fluid pressure cushion for resisting the movement of said pad in one direction and embodying a passage for the fluid, a valve for controlling said passage, cylinder and piston elements movable one with relation to the other one of which is connected to and movable with said valve, means anchoring the other of the said elements to the casing of said valve, and means for supplying a fluid to one side of the movable one of said elements for establishing a predetermined variable fluid resistance pressure against which the said valve is adapted to be unseated, the other side of the movable one of said elements being subjected to atmospheric pressure.

12. A variable resistance pressure creating means embodying a liquid passage, a valve for controlling said passage, fluid pressure resistance creating means against which the valve is adapted to be opened by pressure created in said passage, said resistance creating means embodying cylinder and piston elements one of which is stationary and the other of which is connected with and movable with the valve, and means for supplying fluid between said piston and cylinder and on one side only of the movable one of said elements, the other side of said movable element being subjected to atmospheric pressure.

13. A variable resistance pressure creating means embodying a liquid passage, a valve for controlling said passage, fluid pressure resistance creating means against which the valve is adapted to be opened by pressure created in said passage, said resistance creating means embodying a cylinder and piston one of which is stationary and the other of which is connected and movable with the valve, means for supplying fluid between said piston and cylinder, and means for varying at will the said resistance pressure against which said valve is adapted to be opened.

14. A variable resistance pressure creating means embodying a liquid passage, a valve for controlling said passage, fluid pressure resistance creating means against which the valve is adapted to be opened by pressure created in said passage, said resistance creating means embodying a cylinder and piston one of which is stationary and the other of which is connected and movable with the valve, and means for supplying fluid pressure between the cylinder and piston through and to the other side of the stationary one of the two.

15. In a press of the character described, a blank or work holding member, a cushion for resisting the movement of the said member in one direction, said cushion embodying a cylinder, a conduit communicating with the cylinder and forming an inlet and an outlet for fluid into and out of the cylinder, a valve structure for controlling said passage, a fluid pressure means for controlling said valve, said valve serving as a variable resistance pressure creating valve and as a check valve and a relief valve.

16. In a press of the character described, a blank or work holding member, a cushion for resisting the movement of the said member in one direction, said cushion embodying a cylinder, a conduit communicating with the cylinder and forming an inlet and an outlet for fluid into and out of the cylinder, a valve structure for controlling said passage, fluid pressure means for controlling said valve, said valve serving as a variable resistance pressure creating valve and as a check valve and a relief valve, and means whereby said fluid pressure will operate to open said valve.

17. A press of the character described embodying a pressure member, a cushion for resisting the movement of the member in one direction, a conduit communicating with the cushion and constituting an inlet and an outlet for fluid into and out of the cushion, a valve for controlling said conduit, said valve operating as a relief, a check and an operating valve, and fluid pressure means for controlling the valve.

18. A press of the character described embodying a pressure member, a cushion for resisting the movement of the member in one direction, a conduit communicating with the cushion and constituting an inlet and an outlet for fluid into and out of the cushion, a valve for controlling said conduit, said valve operating as a relief, a check and an operating valve, and fluid pressure means for controlling the valve, the said fluid pressure serving to cause the said valve to operate as a resistance pressure creating means for the fluid in the cushion.

In testimony whereof I have signed my name to this specification on this 15th day of January, A. D. 1929.

FREDRICH J. RODE.