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C. BATEHOLTS

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HYDRAULIC VALVE

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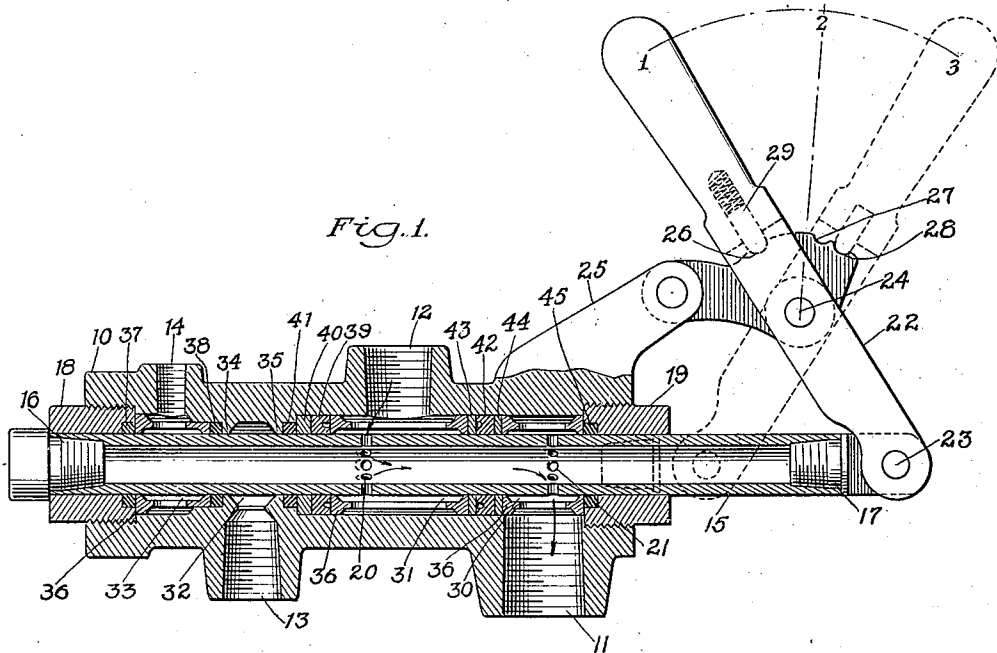


Fig. 3.

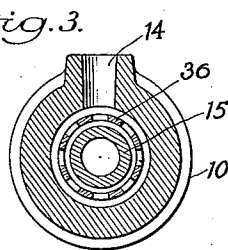
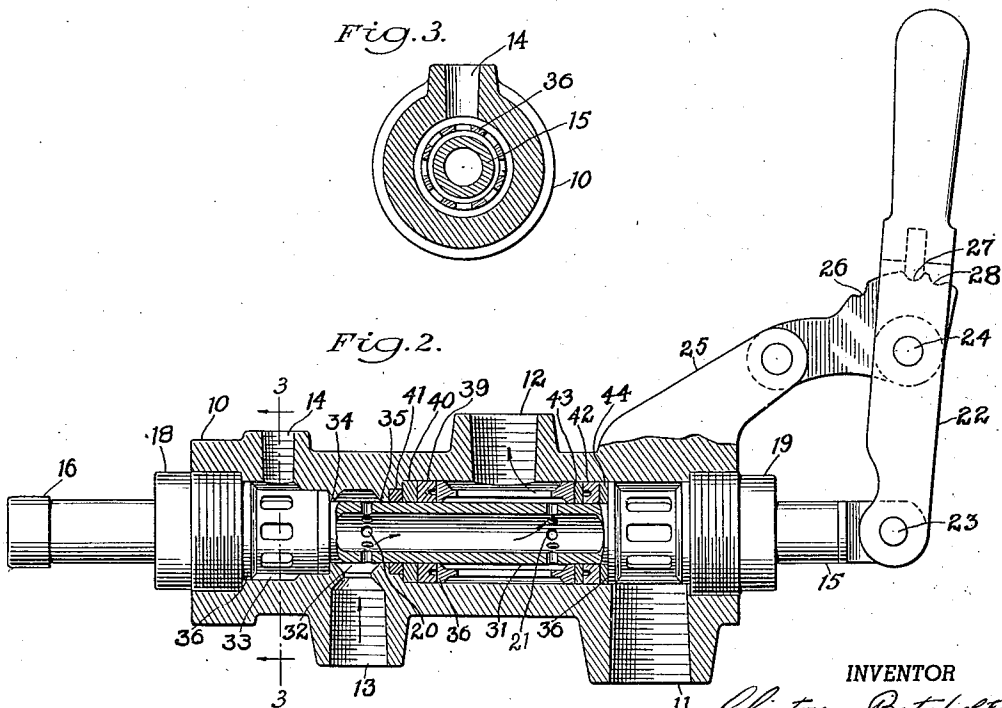


Fig. 2.



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HYDRAULIC VALVE

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1 Claim. (Cl. 251—78)

This invention relates to valves, especially those of the type used in connection with the operation of hydraulic mechanisms such as presses and the like.

It is now common practice to control the operation of such mechanisms by means of water or other liquid through the medium of a valve having a port adapted to be connected to the mechanism to be operated, a port adapted to be connected to a source of water under low-pressure, a port adapted to be connected to a source of water under high-pressure, a port adapted to be connected to a discharge drain, and a movable piston or plunger adapted when in one position to establish communication between the low-pressure port and the mechanism operating port, when in another position to establish communication between the high-pressure port and the mechanism operating port, and when in still another position to establish communication between the mechanism operating port and the discharge port. In addition, such valves are usually provided with means for preventing leakage along the outer surface of the plunger from the path of communication established between any two given ports. Aside from the fact that such valves, as heretofore constructed, were extremely costly they were unsatisfactory in that the means for preventing leakage quickly wore out and had to be replaced, and this, in turn, involved considerable expense due to the construction of the valve. In addition, such valves, as heretofore constructed, were unsatisfactory in that the operator frequently became confused in the operation thereof with the result that the desired sequence of operation in establishing communication between the port actuating mechanism and the low-pressure port, the high-pressure port and finally the discharge port was not attained.

In accordance with the present invention, the above noted, as well as other objections, are obviated in such valves by providing a casting having a central bore from which open in line, and in the order named, a discharge port, a mechanism actuating port, a low-pressure port and a high-pressure port. A tubular plunger, closed at both ends, is slidably mounted in glands threaded into the casting at each end of the bore, and it is adapted and arranged to be reciprocated through the bore by means of an operating handle from one fixed station to another. The plunger is provided with two sets of holes which are so positioned that when the plunger is located at one of its extreme positions in the bore they establish communication between the mecha-

nism actuating port and the discharge port, and the other two ports are so spaced along the bore that when the plunger is moved to an intermediate position the holes establish communication between the mechanism actuating port and the low-pressure port and when the plunger is moved to its other extreme position the holes establish communication between the mechanism actuating port and the high-pressure port. In consequence, it is only necessary to move the plunger from one extreme position to another and then back again to its starting position to actuate the mechanism first under low-pressure, then by high-pressure, and finally to relieve the pressure in the mechanism in the order named.

To prevent leakage from the path of communication established by the plunger between any two ports, a compressible member is positioned on opposite sides of each port, and means are provided for maintaining these members compressed about the plunger as it is reciprocated from one extreme position to the other through the bore. As an important feature of the invention, the valve is so constructed that the means for maintaining these members compressed about the plunger may be easily removed therefrom so that when the members become worn they may be inexpensively replaced. To this end, the bore is so formed that one of the central ports opens from an annular groove defined by walls which are formed as a part of the casting and which are of substantially the same diameter as the diameter of the plunger. The bore, on opposite sides of these walls, is enlarged, and the compressible members are held in place on opposite sides of each of the ports by perforated annular spacers positioned in the bore about the plunger, and they are compressed about the plunger by means of the glands through which the plunger slides and which are threaded into the casting at each end of the bore. Thus, to remove and replace the members it is only necessary to remove the glands, the spacers and the compressible members, and then to reassemble the structure using new compressible members where necessary.

For a more complete description of the invention reference may be made to the accompanying drawing. In this drawing, however, the invention has been shown merely by way of example and in preferred form, and obviously many variations and modifications may be made therein which will still be comprised within its spirit. It is to be understood, therefore, that the invention is not limited to any specific form or em-

bodiment, except insofar as such limitations are specified in the appended claim.

Referring to the drawing:

Figure 1 is a side elevational view, in section, of a valve embodying the features of the present invention and showing the plunger in one of its extreme positions;

Figure 2 is a side elevational view, partly in section, showing the plunger in its intermediate position; and

Figure 3 is a view along line 3—3 of Figure 2.

As shown in the drawing, the improved valve comprises a casting 10 having a longitudinal bore from which open in line, and in the order named, a discharge port 11, a mechanism actuating port 12, a low-pressure port 13 and a high-pressure port 14. A tubular plunger 15 closed at both ends, as by plugs 16, 17, threaded therein, is slidably mounted in glands 18, 19, threaded into the casting 10 at each end of the longitudinal bore. The plunger 15 is provided with two sets of holes 20, 21 and it is adapted and arranged to be reciprocated through the longitudinal bore from one extreme position to another by an operating handle 22 pivotally connected by a pin 23 at one of its ends to the plunger 15 and rotatably mounted intermediate its ends on a pin 24 journaled in the bifurcated end of a bracket 25 which may comprise a part of the casting 10. The bracket 25 is provided with three detents, 26, 27, 28, adapted to receive a spring pressed pin 29 on the handle 22 and so spaced that when the pin 29 is engaged by one or the other of the end detents 26, 28, the plunger 15 is located in one or the other of its two extreme positions in the bore and when the pin 29 is engaged by the middle detent 27, the plunger 15 is located in a desired intermediate position in the bore.

Those portions of the bore, 30, 31, 32 and 33 from which open the discharge port 11, the mechanism actuating port 12, the low-pressure port 13, and the high-pressure port 14, respectively, are effectively sealed from one another along the outer surface of the plunger 15 in the manner subsequently to be described, but they are so dimensioned with respect to the distance between the two sets of holes 20, 21 through the walls of the plunger 15 that when the plunger is in one of its extreme positions, as determined by the engagement of the pin 29 in an end detent 28, communication is established between the mechanism actuating port 12 and the discharge port 11, when the plunger 15 is in its intermediate position, as determined by the engagement of the pin 29 in the middle detent 27, communication is established between the mechanism actuating port 12 and the low pressure port 13, and finally when the plunger 15 is in its other extreme position, as determined by the engagement of the pin 29 in the other end detent 26, communication is established between the mechanism actuating port 12 and the high-pressure port 14. Under these conditions, therefore, it is only necessary for the operator to reciprocate the plunger 15 by means of the handle 22 from one extreme position to another and then back again to its starting position to establish communication between the actuating mechanism port 12 and the low-pressure port 13, the high-pressure port 14, again the low-pressure port 13, and finally the discharge port 11 and in the order named.

To effectively seal those portions of the bore from which the ports open, compressible members are positioned about the plunger 15 on opposite sides of each port, and replaceable means

are provided for maintaining these members compressed about the plunger 15 and against the walls of the bore. To this end, that portion 32 of the bore from which the low-pressure port 13 opens is defined by two fixed walls 34, 35, which may be formed as a part of the casting and which are of substantially the same diameter as the diameter of the plunger 15.

At the inner end of the other three ports an annular spacer member 36, perforated to permit the passage of liquid therethrough, is positioned about the plunger 15. A pair of compressible members such as leather washers 37, 38, are positioned about the plunger 15 at each end of the spacer member 36 at the inner end of the high-pressure port 14, one being located in a housing formed in the gland 18 and the other being located in a housing formed in the casting 10 adjacent the wall 34, and the arrangement of the parts is such that the washers 37, 38 may be compressed about the plunger 15 and against the walls of the bore to the degree of tightness necessary to prevent leakage along the outer surface of the plunger 15 from the high-pressure port 14 and from one side of the low-pressure port 13 as the plunger 15 is reciprocated from one of its extreme positions to the other. Adjacent that end of the spacer member 36, at the inner end of the mechanism actuating port 12, and next to the low-pressure port 13, a compressible washer 39 is positioned about the plunger 15. Next to the washer 39 a non-yielding spacing washer 40 is positioned about the plunger 15 and finally a compressible washer 41 is positioned about the plunger 15 next to the washer 40 in a housing formed by the casting at the adjacent side of the low-pressure port 13. Between the other end of the spacer member at the inner end of the mechanism actuating port 12 and the adjacent end of the spacer member at the inner end of the discharge port 11, a compressible washer 42 is positioned about the plunger 15 between two non-yielding washers 43, 44. And at the other end of the spacer member at the inner end of the discharge port 11, a compressible washer 45 is positioned about the plunger and in a housing formed in the end bearing gland 19, the arrangement of parts being such that the compressible washers 39, 41, 42 and 45 may be compressed about the plunger and against the walls of the bore to the degree of tightness necessary to prevent leakage along the outer surface of the plunger 15 from the discharge port 11, the mechanism actuating port 12, and the remaining side of the low-pressure port 13.

In view of the above described arrangement, it is obvious that the replacement of one or more worn out compressible washers is a simple matter since all the parts may be easily and quickly removed from the bore in the casting.

The compressible washers 41, 42, adjacent the ends of the spacer at the inner end of the mechanism actuating port 12, being relatively large, may be provided with notches 48 to make them more yielding in character.

Having thus described my invention, I claim:

A valve for hydraulic presses and the like comprising a casting having a longitudinal bore from which open in line and in the order named, a discharge port, a mechanism actuating port, a low-pressure port opening at its inner end into an annular groove defined by two fixed walls, and a high-pressure port, a removable gland positioned at each end of said bore, a tubular plunger having two sets of holes in the walls thereof mounted

in said bore and journaled in said glands, a spacer member positioned about said plunger at the inner end of said high-pressure port, a compressible member positioned about said plunger adjacent each end of said spacer member, a spacer positioned about said plunger at the inner end of said mechanism actuating port, a pair of compressible members and an intermediate non-yielding member positioned about said plunger between one end of said second mentioned spacer and the adjacent fixed wall, a spacer positioned about said plunger at the inner end of the discharge port, a pair of non-yielding members and an intermediate compressible member positioned about said plunger between one end of said third mentioned spacer and the adjacent end of the spacer at the inner end of the mechanism actu-

ating port, a compressible member positioned between the other end of the spacer at the inner end of the discharge port and the adjacent gland, and means for reciprocating said plunger through said glands from one fixed station to another and then back again, the distances between the two sets of holes in the plunger and the location and size of the annular grooves into which the ports open being such that as the plunger is reciprocated from one fixed station to the other and back again communication is established in the order named between the mechanism actuating port and the low-pressure port, the high-pressure port, the low-pressure port and finally the discharge port.

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