Aug. 7, 1923. 1,464,286

E. O. LUNDBLAD

HYDRAULIC VALVE

Filed July 27, 1922

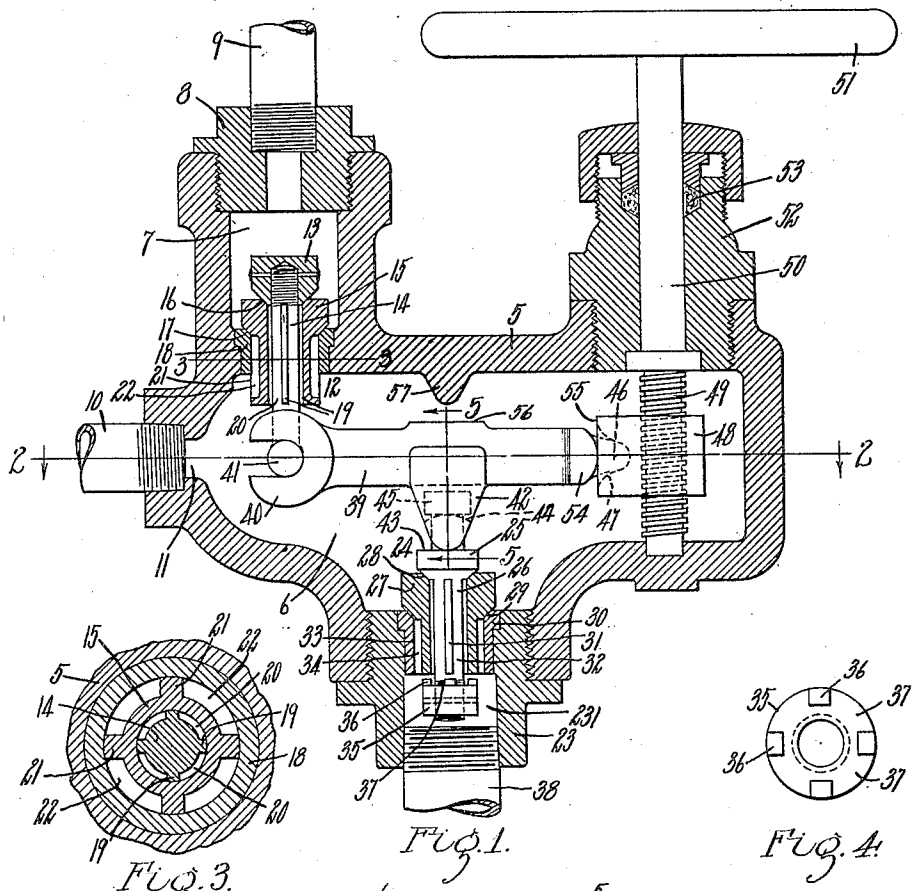


FIG. 1.

FIG. 3.

FIG. 4.

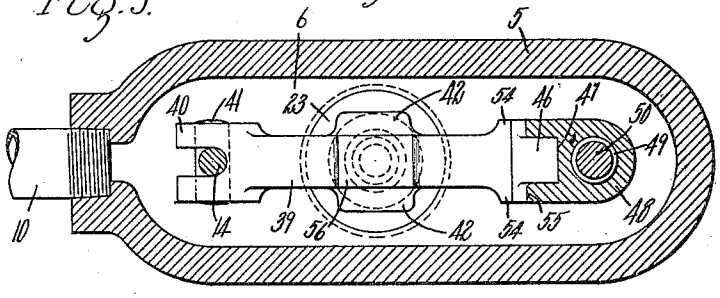


FIG. 2.

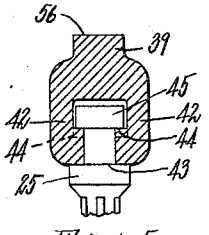


FIG. 5.

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UNITED STATES PATENT OFFICE.

EMIL O. LUNDBLAD, OF WAKEFIELD, MASSACHUSETTS.

HYDRAULIC VALVE.

Application filed July 27, 1922. Serial No. 577,885.

To all whom it may concern:

Be it known that I, EMIL O. LUNDBLAD, a subject of Sweden, residing at Wakefield, in the county of Middlesex and State of Massachusetts, have invented new and useful Improvements in Hydraulic Valves, of which the following is a specification.

This invention relates to a hydraulic valve and has for its object to provide a double valve of the character mentioned, particularly adapted to control, by a single operating member, both the admission and discharge of pressure fluid to and from hydraulic presses.

Another object of the invention is to prevent the waste of pressure fluid by providing a device having inlet and exhaust valves, both of which may be located in their closed positions simultaneously but only one of which may be open at a time, it being impossible to open the inlet valve if the exhaust valve is also open, or to open the exhaust valve if the inlet valve is open.

Another object of the invention is to provide an improved construction for the inlet and exhaust valves which control the passage of pressure fluid to and from the device, each of said valves embodying therein primary and secondary members, the former being mounted upon the latter, which is also free to rotate relatively to its seat and to the primary valve member, thereby rendering it possible for each valve member to seat in any position and rendering it impossible for either of said valve members to become worn in any particular location greater than any other.

The invention consists in the combination and arrangement of parts set forth in the following specification and particularly pointed out in the claims thereof.

Referring to the drawings:

Figure 1 represents a central vertical section through a valve embodying my invention.

Fig. 2 is a horizontal section taken on the line 2—2 of Fig. 1.

Fig. 3 is an enlarged detail horizontal section through the inlet valve as taken on the line 3—3 of Fig. 1.

Fig. 4 is an enlarged detail plan view of a portion of the exhaust valve.

Fig. 5 is a detail transverse section taken on the line 5—5 of Fig. 1.

Like numerals refer to like parts throughout the several views of the drawings.

In the drawings, 5 represents a casing in the interior of which is a pressure chamber 6 with which an inlet passage 7 connects. A plug 8 has screw-threaded engagement with the casing 5 at the entrance to the inlet passage 7 and an inlet pipe 9 is attached to said plug 8 and connects with the source of supply of a suitable pressure fluid, as, for example, water, steam or compressed air. Another pipe 10 constituting an outlet pipe has screw-threaded engagement with the casing 5 and communicates with the pressure chamber 6 by means of a passage 11.

Pressure fluid from the source of supply conducted to the passage 7 by the pipe 9 is admitted to the pressure chamber 6 through the medium of an inlet valve 12 which embodies therein a primary valve member 13 fast to a valve stem 14 and movable in unison therewith and a secondary valve member 15 loosely mounted upon and surrounding said valve stem. A primary valve member 13 is normally seated at 16 upon the secondary valve member 15, while the latter is normally seated at 17 upon a bushing 18 located between the passage 7 and pressure chamber 6. The valve stem 14 is provided with a plurality of radially disposed ribs 19, the outer edges of which engage the interior bore of the secondary valve member 15, and said ribs co-operate with said secondary valve member to form ports 20 which extend longitudinally of the inlet valve 12 between the valve stem 14 and the secondary valve member 15. The secondary valve member 15 is also provided with a plurality of radially disposed ribs 21, the outer edges of which engage the interior bore of the bushing 18, and said ribs co-operate with said bushing to form ports 22 which extend longitudinally of the inlet valve 12 between the secondary valve member 15 and the bushing 18. The pressure of the fluid within the passage 7 acting against the upper extremi-

ties of the primary and secondary valve members 15 and 13 respectively, normally holds both seated, and, therefore, closed, and prevents the entrance of the pressure fluid into the pressure chamber 6.

In order to exhaust fluid from the pressure chamber 6, a plug 23 has screw-threaded engagement with the casing 5, and mounted within an exhaust passage 231 extending through said plug 23 is an exhaust valve 24 which embodies therein a primary valve member 25 having a valve stem 26 formed integral therewith, and a secondary valve member 27 loosely mounted upon and surrounding said valve stem. The primary valve member 25 is normally seated at 28 upon the secondary valve member 27, while the latter is normally seated at 29 upon a bushing 30 provided in the plug 23. The valve stem 26 is provided with a plurality of radially disposed ribs 31, the outer edges of which engage the interior bore of the secondary valve member 27 and said ribs co-operate with said secondary valve member to form ports 32 which extend longitudinally of the exhaust valve 24 between the valve stem 26 and the secondary valve member 27. The secondary valve member 27 is also provided with radially disposed ribs 33, the outer edges of which engage the interior bore of the bushing 30, and said ribs co-operate with said bushing to form ports 34 which extend longitudinally of the exhaust valve 24 between the secondary valve member 27 and the bushing 30.

Fast to the lower end portion of the valve stem 26 is a nut 35, illustrated in detail in Fig. 4, upon the upper surface of which are a plurality of projections 36, which are adapted to engage the lower extremity of the secondary valve member 27 when the primary valve member 25 is lifted, as will be hereinafter more fully described, and between said projections 36 are located a plurality of ports 37. An exhaust pipe 38 connects with the plug 23 and extends to any suitable point where it is desired to discharge the exhaust pressure fluid.

The inlet valve 12 is opened to admit pressure fluid into the pressure chamber 6 and although normally closed by the pressure fluid, it is also at times positively closed to prevent leakage therethrough into said pressure chamber and the exhaust valve 24 is opened to discharge said pressure fluid from said pressure chamber by mechanism as follows: Located within the pressure chamber 6 is a lever 39, one end of which is forked at 40 and loosely connected to a transversely extending end portion 41 of the valve stem 14. The forked portion 40 of the lever 39 is constructed and arranged to engage the lower extremity of the secondary valve member 15 in order that the latter may be lifted from its seat 17 and the portion 41 of the valve stem 14 at times during the operation of the device constitutes a pivot for the lever 39. The lever 39 has a pair of downwardly projecting arms 42, the lower extremities of which rest upon a shouldered portion 43 of the primary valve member 25, thereby forming a fulcrum for said lever, and the arms 42 have oppositely disposed shoulders 44 which engage the under surface of a head 45 formed at the upper extremity of the primary valve member 25 and provide a means for lifting the latter.

The end portion of the lever 39 opposite the fork 40 has a rounded extremity 46 which projects into a similarly shaped recess 47 formed in a nut 48, the latter being mounted upon a screw-threaded portion 49 of a shaft 50, at the upper end of which is a hand wheel 51. The shaft 50 is mounted to rotate in a bearing member 52 through which leakage of the pressure fluid is prevented by a stuffing box 53. Projections 54 formed upon the opposite sides of the lever 39 engage a surface 55 of the nut 48 and act to hold both lever and nut in correct relation to each other. A flat surface 56 is provided upon the lever 39 and at times said surface is brought into contact with a projection 57 projecting downwardly from the interior of the casing 5 and said projection forms a fulcrum for said lever as will be hereinafter more fully explained.

The general operation of the device is as follows: Assuming that the inlet valve 12 and exhaust valve 24 are closed as illustrated in Fig. 1 said inlet valve being held closed by the pressure of fluid thereabove and the exhaust valve 24 held closed by the lever 39 and nut 48, when it is desired to admit the pressure fluid to the pressure chamber 6 from which it may pass through the pipe 10 to a hydraulic press or other device actuated by fluid pressure, the operating wheel 51 is turned to rotate the shaft 50 in the proper direction to feed the nut 48 downwardly upon the screw-threaded portion 49 of said shaft. This movement of the nut 48 rocks the lever 39, the arms 42 of said lever constituting a fulcrum therefor, thereby lifting the primary valve member 13 of the inlet valve 12 and admitting pressure fluid through the ports 20 extending longitudinally of the valve stem 14 into the pressure chamber 6. If the nut 48 is only lowered a short distance, the primary valve member 13 alone is opened but if, however, the hand wheel 51 is still further rotated, the nut 48 is lowered sufficiently to rock the lever 39 so that the upper surface of the forked end 40 thereof will engage the under extremity of the secondary valve member 15 of the inlet valve 12, thereby lifting said secondary valve member off of its seat 17, and thereafter also admitting

pressure fluid to the pressure chamber 6 through the ports 22 of said secondary valve member. As soon as the pressure fluid enters the pressure chamber 6, said pressure fluid acts upon the exhaust valve 24 to hold the members thereof tightly closed and said exhaust valve will thereafter be held closed as long as the pressure is maintained within said pressure chamber.

When it is desired to exhaust the pressure fluid from the pressure chamber 6 and its connections to the hydraulic press, the hand wheel 51 is rotated in a reverse direction and the nut 48 is lifted, thereby rocking the lever 39 and utilizing the arms 42 thereof as a fulcrum and again seating the primary and secondary valve members of the inlet valve 12 upon their respective seats. As soon as the inlet valve 12 is closed, a continued movement of the nut 48 upwardly will first lift the primary valve member of the exhaust valve 24, allowing the pressure fluid within the pressure chamber to pass outwardly through the ports 32 extending longitudinally of the valve stem 26, and a still further movement of said hand wheel and nut 48 will cause the nut 35 at the lower end of the valve stem 26 to engage the under extremity of the secondary valve member 27 and lift the latter from its seat 29, thereby allowing the pressure fluid to also flow outwardly through the ports 34 and said fluid will pass off through the exhaust pipe 38. As soon as the pressure is released from the pressure chamber, the action of the pressure fluid above the inlet valve will hold the latter tightly closed.

It is evident that at the end of the day's work the pressure of the fluid above the inlet valve 12 may be reduced to such an extent that said fluid will not hold said inlet valve tightly closed, in which case the fluid may leak therethrough. At such times said inlet valve may be positively held closed by turning the hand wheel 51 in the proper direction to lift the nut 48 to rock the lever 39 into contact with the projection 57, and the latter acting as a fulcrum for the lever 39, will cause the latter to force the primary and secondary members of the inlet valve tightly against their respective seats. At this time the primary and secondary members of the exhaust valve 24 will both be open.

It will be noted that during the operation of the device while it is possible for the inlet and exhaust valves both to be located in their closed positions simultaneously, that it is impossible for both to be opened simultaneously as whenever the inlet valve is open, the exhaust valve is closed, and in like manner whenever the exhaust valve is open, the inlet valve is closed, the result being a great saving of the pressure fluid which usually goes to waste in devices of this character. The fact that the secondary valve members of each valve are rotatable upon the primary valve members, prevents excessive wear in any one spot and thereby prolongs the life of the various valve members.

I claim:

1. A device of the character described having, in combination, a casing provided with a pressure chamber having an inlet passage, an outlet passage and an exhaust passage communicating therewith, a valve for said inlet passage, a valve for said exhaust passage, a lever located within said pressure chamber and operatively connected to both of said valves, and means to rock said lever and open separately either of said valves, each of said valves being adapted to be closed by the pressure of fluid thereon.

2. A device of the character described having, in combination, a casing provided with a pressure chamber having an inlet passage, an outlet passage and an exhaust passage communicating therewith, a valve for said inlet passage, a valve for said exhaust passage, a lever located within said pressure chamber and operatively connected to both of said valves and means to rock said lever and open separately and positively close separately either of said valves, each of said valves also being adapted to be closed by the pressure of fluid thereon.

3. A device of the character described having, in combination, a casing provided with a pressure chamber having an inlet passage, an outlet passage and an exhaust passage communicating therewith, a valve for said inlet passage, a valve for said exhaust passage, a lever located within said pressure chamber and operatively connected to both of said valves and means to operate said lever to open separately either of said valves.

4. A device of the character described having, in combination, a casing provided with a pressure chamber having an inlet passage, an outlet passage and an exhaust passage communicating therewith, a valve for said inlet passage, a valve for said exhaust passage, a lever located within said pressure chamber and operatively connected to both of said valves and means to operate said lever to open separatively either of said valves and also positively close separately either of said valves.

5. A device of the character described having, in combination, a casing provided with a pressure chamber having an inlet passage, an outlet passage and an exhaust passage communicating therewith, a valve for said inlet passage, a valve for said exhaust passage, a lever located within said pressure chamber and operatively connect-

ed to both of said valves, a nut engaging said lever and means to move said nut to operate said lever to either open or close separately either of said valves.

6. A device of the character described having, in combination, a casing provided with a pressure chamber having an inlet passage, an outlet passage and an exhaust passage communicating therewith, a valve for said inlet passage, a valve for said exhaust passage, a lever located within said pressure chamber and operatively connected to both of said valves, a nut engaging said lever, a shaft provided with a screw-threaded portion having engagement with said nut and means to rotate said shaft in either direction and thereby open or close separately either of said valves.

7. A device of the character described having, in combination, a casing provided with a pressure chamber having an inlet passage, an outlet passage and an exhaust passage communicating therewith, an inlet valve embodying therein primary and secondary valve members, an exhaust valve, a lever located within said pressure chamber and operatively connected to both of said valves and means to rock said lever and open separately the members of said inlet valve and said exhaust valve.

8. A device of the character described having, in combination, a casing provided with a pressure chamber having an inlet passage, an outlet passage and an exhaust passage communicating therewith, an inlet valve, an exhaust valve embodying therein primary and secondary valve members, a lever located within said pressure chamber and operatively connected to both of said valves and means to rock said lever and open separately said inlet valve and the members of said exhaust valve.

9. A device of the character described having, in combination, a casing provided with a pressure chamber having an inlet passage, an outlet passage and an exhaust passage communicating therewith, an inlet valve embodying therein primary and secondary valve members, an exhaust valve embodying therein primary and secondary valve members, a lever located within said pressure chamber and operatively connected to both of said valves and means to rock said lever and open separately the members of both of said valves.

10. A device of the character described having, in combination, a casing provided with a pressure chamber having an inlet passage, an outlet passage and an exhaust passage communicating therewith, an inlet valve embodying therein primary and secondary valve members mounted one upon the other, said secondary valve member being rotatable relatively to said primary valve member, an exhaust valve embodying therein primary and secondary valve members mounted one upon the other, said last-named secondary valve member being rotatable relatively to said last-named primary valve member, a lever located within said pressure chamber and operatively connected to both of said valves and means to rock said lever and open separately the members of both of said valves.

11. A device of the character described having, in combination, a casing provided with a pressure chamber having an inlet passage, an outlet passage and an exhaust passage communicating therewith, an inlet valve embodying therein primary and secondary valve members, an exhaust valve embodying therein primary and secondary valve members, a lever located within said pressure chamber and operatively connected to both of said primary valve members and means to rock said lever to operate separately either of said primary valve members.

12. A device of the character described having, in combination, a casing provided with a pressure chamber having an inlet passage, an outlet passage and an exhaust passage communicating therewith, an inlet valve embodying therein primary and secondary valve members, an exhaust valve embodying therein primary and secondary valve members, a lever located within said pressure chamber and operatively connected to both of said primary valve members, means to rock said lever to operate separately either of said primary valve members, said lever also being adapted to contact with the secondary valve member of said inlet valve and open said valve member.

13. A device of the character described having, in combination, a casing provided with a pressure chamber having an inlet passage, an outlet passage and an exhaust passage communicating therewith, an inlet valve embodying therein primary and secondary valve members, an exhaust valve embodying therein primary and secondary valve members, a lever located within said pressure chamber and operatively connected to both of said primary valve members, means to rock said lever to operate separately either of said primary valve members, said lever also being adapted to contact with the secondary valve member of said inlet valve and open said valve member and means fast to the primary valve member of said exhaust valve to open the secondary member thereof.

14. A device of the character described having, in combination, a casing provided with a pressure chamber therein, an inlet valve for said pressure chamber, an exhaust valve for said pressure chamber, a lever

pivotally mounted within said pressure chamber upon said exhaust valve and operatively connected with said inlet valve and means to rock said lever to open separately either of said valves.

15. A device of the character described having, in combination, a casing provided with a pressure chamber therein, an inlet valve for said pressure chamber, an exhaust valve for said pressure chamber, a lever pivotally mounted upon said exhaust valve and operatively connected with said inlet valve and means to rock said lever to open separately either of said valves, said casing also being provided with a projection located within said pressure chamber and also constituting a pivot for said lever.

16. A device of the character described having, in combination, a casing provided with a pressure chamber having an inlet passage, an outlet passage and an exhaust passage communicating therewith, an inlet valve for said inlet passage, an exhaust valve for said exhaust passage, a lever pivotally mounted within said pressure chamber upon said exhaust valve and operatively connected with said inlet valve, said connection also constituting a pivot for said lever and means to rock said lever upon either of said pivots and thereby open separately either of said valves.

17. A device of the character described having, in combination, a casing provided with a pressure chamber having an inlet passage, an outlet passage and an exhaust passage communicating therewith, an inlet valve for said inlet passage, an exhaust valve for said exhaust passage, a lever pivotally mounted upon said exhaust valve and operatively connected with said inlet valve, said connection also constituting a pivot for said lever, said casing also being provided with a projection located within said pressure chamber and also constituting a pivot for said lever and means to rock said lever upon either of said pivots and thereby operate either of said valves.

18. A device of the character described having, in combination, a casing provided with a pressure chamber having an inlet passage, an outlet passage and an exhaust passage communicating therewith, an inlet valve for said inlet passage, an exhaust valve for said exhaust passage, a lever pivotally mounted upon said exhaust valve and operatively connected with said inlet valve, said connection also constituting a pivot for said lever, said casing also being provided with a projection located within said pressure chamber and constituting a pivot for said lever, a nut engaging said lever and means to move said nut to rock said lever upon either of said pivots and thereby operate either of said valves.

19. A device of the character described having, in combination, a casing provided with a pressure chamber having an inlet passage, an outlet passage and an exhaust passage communicating therewith, an inlet valve for said inlet passage, an exhaust valve for said exhaust passage, a lever pivotally mounted upon said exhaust valve and operatively connected with said inlet valve, said connection also constituting a pivot for said lever, said casing also being provided with a projection located within said pressure chamber and constituting a pivot for said lever, a nut engaging said lever, a shaft provided with a screw-threaded portion having engagement with said nut and means to rotate said shaft in either direction and thereby open or close separately either of said valves.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

EMIL O. LUNDBLAD.

Witnesses:

FRANKLIN E. LOW,

KATHRYN M. JOYCE.