Sept. 16, 1930. A. B. HAUSER 1,775,856

FOUR-WAY VALVE

Filed May 24, 1929

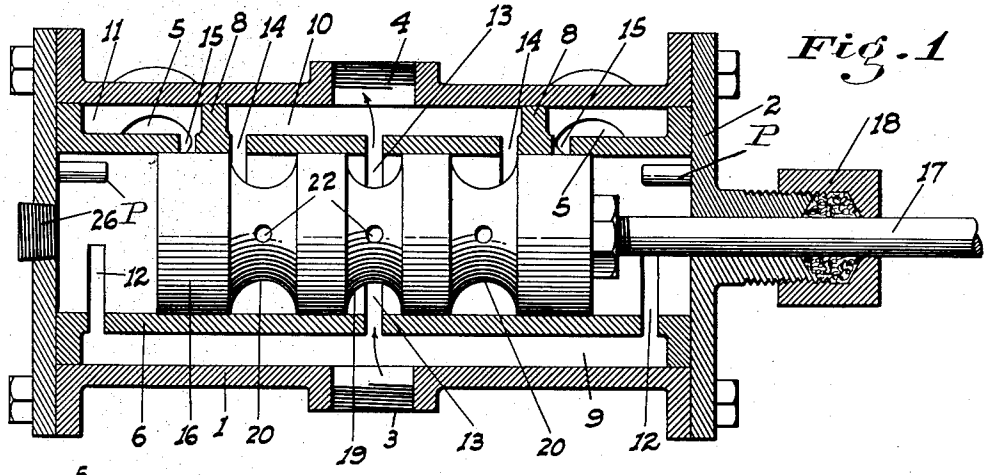



Fig. 1

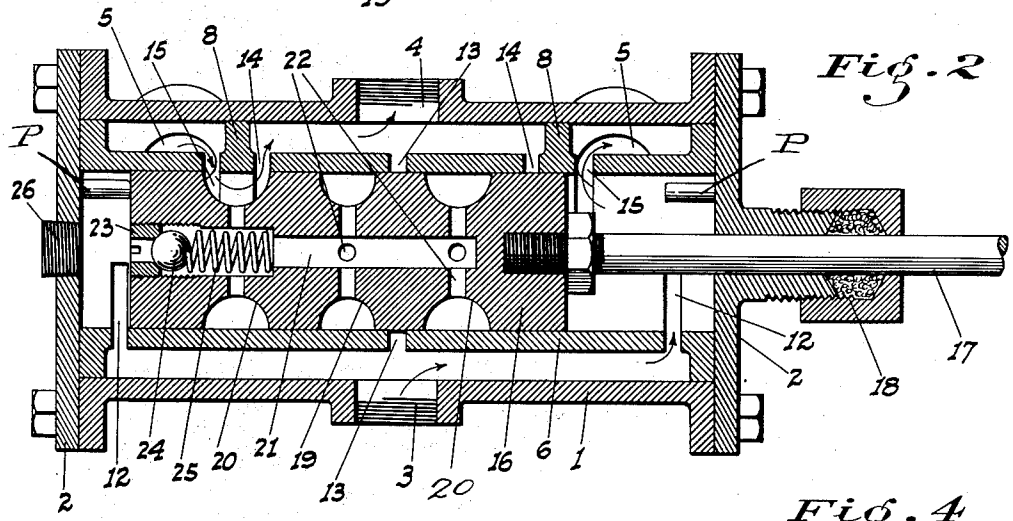



Fig. 2

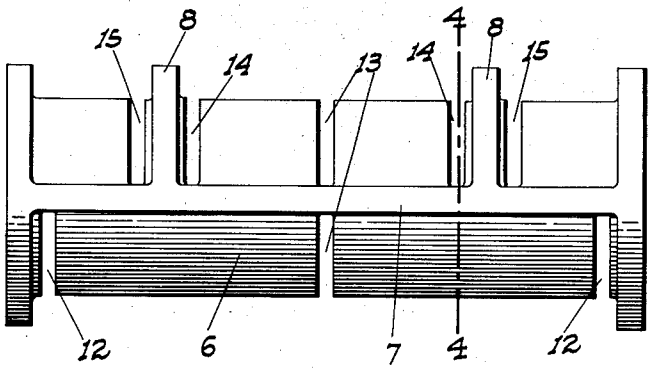
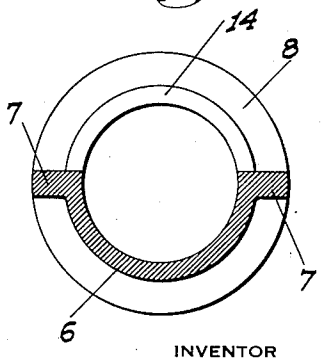



Fig. 3

Fig. 4




INVENTOR

A. B. Hauser

BY

ATTORNEY

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# UNITED STATES PATENT OFFICE

ALBERT B. HAUSER, OF STOCKTON, CALIFORNIA

## FOUR-WAY VALVE

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This invention relates to valves for controlling the flow of oil or similar fluid under pressure from a pump or other source of pressure to a mechanism to be operated by the fluid.

The principal obect of my invention is to provide a valve of this general character so arranged that with a single movable valve member the fluid may be passed from the source of pressure to either one or the other of a pair of outlet pipes selectively while the pressure is being released from the other pipe; and held in either pipe if desired while the flow from the source returns to the same without necessitating the stopping of the pressure pump.

A further obect is to arrange a pressure relieving means in connection with the valve of such a nature that regardless of the position of the movable valve member any excessive pressure in the intake side of the line will be relieved and returned to the source.

The structure has only one normally movable part and is arranged to give long service without wear or possible leakage and the number of parts in the device as a whole is exceptionally small so that the valve is not apt to give trouble.

A further obect of the invention is to produce a simple and inexpensive device and yet one which will be exceedingly effective for the purpose for which it is designed.

These objects I accomplish by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

In the drawings similar characters of reference indicate corresponding parts in the several views:

Fig. 1 is a sectional elevation of the structure, the valve member being shown in full and in its neutral position.

Fig. 2 is a similar view, the valve member being shown in section and as moved to one end of its stroke to admit fluid to one of the outlet pipes and release the same from the other pipe.

Fig. 3 is a side elevation of the fluid distributing sleeve of the device detached.

Fig. 4 is a cross section on the sleeve taken on the line 4—4 of Fig. 3.

Referring now more particularly to the characters of reference on the drawings, the numeral 1 denotes a cylindrical casing which is closed at both ends by heads 2. The casing centrally of its length has diametrically opposed intake and discharge openings 3 and 4 respectively adapted for connection to the separated ends of a pressure pipe leading from a pressure pump or the like back to the same. Toward its ends the casing has other outlet openings 5, both located on the same side of the horizontal central plane of the casing as the discharge opening 4. These openings 5 may be in radial alinement with the outlet 4, or angularly disposed relative thereto as may be desired, as long as they both retain their positions relative to the horizontal central plane of the casing as above set forth.

Disposed in the casing concentric therewith and extending the full distance between the heads is a sleeve 6 of sufficiently smaller external diameter than the bore of the casing to leave ample fluid-passage space therebetween. This sleeve has outwardly projecting opposed flanges 7 along both sides extending to have a close fit with the wall of the casing and disposed in the horizontal central plane of the casing and sleeve between the openings 3 and 4. The sleeve also has a pair of longitudinally spaced circumferential flanges 8 which extend about the sleeve between the flanges 7 only on that side of the same which faces the outlets 5; and disposed adacent but beyond said outlets relative to the corresponding ends of the casing. These flanges also have a tight fit with the wall of the casing so as to be leak-proof. These flanges therefore are in effect partitions dividing the space between the casing and sleeve into a full length chamber 9 with which the intake 3 communicates, a chamber 10 with which the outlet 4 communicates and chambers 11 with which the outlets 5 separately communicate. The chambers 10 and 11 are all on what constitutes the outlet side of the structure, while the chamber 9 extends the full length of the intake side, the flanges

7 preventing any direct communication between the intake and outlet chambers, as will be evident.

The sleeve however which is of course hollow has circumferential ports 12 therethrough adjacent its ends and communicating with the chamber 9; similar centrally located ports 13 on both sides of the flanges 7 and communicating with the chambers 9 and 10; similar ports 14 adjacent the near sides of the flanges 8 and also communicating with the chamber 10; and other ports 15 disposed adjacent the opposite sides of the flanges 8 and communicating with the chambers 11. The sleeve is made independent of the outer casing for convenience and simplicity of manufacture, but when assembled with said casing it forms in effect a part of the casing, as will be evident.

It is the object of this structure to be able to selectively control the flow of a fluid entering the chamber 9 from the intake 3 through the ports 12 and 15 to either one of the chamber 11 and the corresponding outlet 5 selectively; from said chamber 9 to the chamber 10 through the ports 13; or from the chambers 11 to the chamber 10 through the ports 15 and 14. This is done by a piston valve 16 snugly slidable in the sleeve and having an operating rod 17 extending from one end thereof through a packing gland 18 on one of the heads 2 so that the valve may be slid back and forth.

This valve has a centrifugal groove 19 centrally of its length, which when the valve is disposed so as to be in a neutral position or centrally between the ends of its stroke registers with the ports 13 and permits an unobstructed flow of fluid from the chamber 9 to the chamber 10 or from the intake 3 to the outlet 4. This positioning of the piston is shown in Fig. 1. The valve also has a pair of other centrifugal grooves 20 disposed equal distances from both sides of the centrifugal grooves 19.

These grooves, when the valve is in the above neutral position, are disposed so as to register with the ports 14 but not with the ports 15, the latter being shut off by the solid portion of the piston beyond said grooves. The ports 12 are open to the interior of the sleeve at all times. Any fluid which may be in the outlets 5 is therefore held against return to the source while the fluid from the pump passes unobstructedly through the line back to the pump.

The stroke of the valve from its neutral position in either direction is limited by stop pins "P" projecting inwardly from the heads. When the piston is moved to either limit of movement, as shown in Fig. 2, one of the grooves 20 registers with both, adjacent grooves 14 and 15; the ports 13 are shut off by the solid portion of the piston between the groove 19 and the other groove 20; the other port 14 is also shut off by the end portion of the piston; while the corresponding port 15 is open to freely communicate with the adjacent port 12. The fluid therefore passes from the intake 3 and chamber 9 to one of the chambers 11 and the adjacent outlet 5 and at the same time discharges from the other outlet 5 to the chamber 10 and thence to the outlet 4. When the piston is shifted to its opposite limit of movement the reverse conditions as to the outlets 5 obtain.

It will therefore be seen that if said outlets are connected by pipes to the ends of a control cylinder of a hydraulic mechanism of any character the flow to either end of the cylinder may be controlled merely by moving the piston in one direction or the other, or the pressure may be held in the cylinder, as may be desired.

In connection with the above apparatus I have arranged a pressure relieving means so that if the pressure is excessive in the intake pipe or in the pressure side of the casing at any time such pressure will be automatically relieved. This means is arranged as follows: Drilled in the piston from the end of the same opposite the rod 17 is a passage 21 which communicates with all the grooves 19 and 20 by means of radially extending ports 22. Adjustable in the outer end of the passage is a tubular nut 23 forming a seat for a check ball 24 which is held against its seat by a spring 25 set to resist any desired pressure by the adjustment of the nut. To enable the nut to be adjusted the adjacent head 2 is provided with an opening alined with said nut so that a tool may be inserted to turn the nut, said opening being normally closed by a removable plug 26. This ball is arranged to open only away from the outer end of the passage 21 and since the chamber 9 is always in communication with said end of the piston and passage, the fluid pressure from the intake 3 always acts against the ball to force the same away from its seat, which it will not do unless the pressure is greater than that which the spring has been set to resist. Since the passage 21 communicates with all the piston grooves and since one of these grooves at least is always positioned to communicate with the chamber 10, which is connected with the return outlet to the pump, any excessive pressure passing by the ball will of course be always relieved.

The parts of the structure are preferably all symmetrical so that it makes no difference from which end the sleeve is inserted in the casing, or which way the piston is inserted in the sleeve.

From the foregoing description it will be readily seen that I have produced such a device as substantially fulfills the objects of the invention as set forth herein.

While this specification sets forth in detail the present and preferred construction

of the device, still in practice such deviations from such detail may be resorted to as do not form a deparature from the spirit of the invention, as defined by the appended claims.

Having thus described my invention what I claim as new and useful and desire to secure by Letters Patent is:

1. A four way valve comprising a closed casing having an intake opening on one side, and three longitudinally spaced outlets on the opposite side, and valve means within the casing for controlling the flow from the intake to any one at a time of the outlets selectively, while maintaining the intermediate outlet always in communication either with the intake or with one or the other of the endmost outlets.

2. A four way valve comprising a closed casing having an intake opening on one side, and three longitudinally spaced outlets on the opposite side, and valve means within the casing for controlling the flow from the intake to either one at a time of the endmost outlets selectively while at the same time establishing communication between the other endmost outlet and the intermediate outlet.

3. A four way valve comprising a closed casing having an intake opening on one side, and three longitudinally spaced outlets on the opposite side, and valve means within the casing for controlling the flow from the intake to either one at a time of the endmost outlets selectively while at the same time establishing communication between the other endmost outlet and the intermediate outlet, and for alternately shutting off both endmost outlets from the intake while placing the intake in communication with the intermediate outlet.

4. A four way valve comprising a tubular casing closed at its ends and having an intake opening on one side, and three longitudinally spaced outlets on the opposite side, means formed with the casing to provide a chamber communicating with the intake opening, and other chambers separate from each other and from the first chamber communicating with the respective outlets, three longitudinally spaced ports affording communication between the intake chamber and the interior of the casing, a port leading to the interior of the casing from each of the endmost outlet chambers, and three longitudinally spaced ports leading to the interior of the casing from the intermediate outlet chamber, a longitudinally slidable piston in the casing, and passage means provided in the piston arranged with the shifting of the piston from one position to another, to cooperate with the ports and chambers in a manner to establish communication between the intermediate outlet and the intake while shutting off communication between the intake and the other outlets; and for alternately establishing communication between the intake and either at a time of the endmost outlets selectively while placing the other endmost outlet in communication with the intermediate outlet and then closing communication between the intake and intermediate outlet.

5. A four way valve comprising a closed casing having an intake opening on one side, and three longitudinally spaced outlets on the opposite side, a sleeve mounted in the casing in clearance relation with the side walls thereof, flanges extending from the sleeve to the casing to form a chamber communicating with the intake opening, and other chambers separate from each other and from the first chamber communicating with the respective outlets, three longitudinally spaced ports cut in the sleeve communicating with the intake chamber, a port in the sleeve for each of the endmost outlet chambers, and three longitudinally spaced ports in the sleeve for the intermediate outlet chamber, a longitudinally slidable piston in the sleeve, and three longitudinally spaced circumferential grooves in the outer surface of the piston; said grooves being so disposed relative to the sleeve ports that when the piston is centrally of its limits of movement in the sleeve the central groove registers with one of the intake chamber ports and with the intermediate outlet-chamber port while the ports of the other outlets are covered; and when the piston is shifted to either limit of movement, one of the endmost outlet-chamber ports is open to communication with the adjacent endmost intake-chamber port while the other endmost outlet-chamber ports and the adjacent intermediate outlet-chamber port both register with an endmost piston-groove, while the intermediate ports are covered.

6. In a valve structure, a casing having an intake to one side and longitudinally spaced outlets from the other side, valve means within the casing including a piston operable to place the intake in communication with the outlets alternately and selectively, a passage in the piston open at all times to the intake, a pressure resisting check valve in the passage opening only away from the intake, and passage means from said passage inwardly of the check valve to the periphery of the piston arranged to communicate at all times with a certain one only of the outlets irrespective of the position of the piston.

7. A structure as in claim 6, with means operable from the exterior of the casing through an opening in the end thereof for altering the resistance of the check valve.

8. A four way valve including a sleeve, means provided in connection with the sleeve forming three longitudinally separated chambers outwardly of the same along one side and a single similarly disposed chamber along the opposite side, separate outlets

from the three first named chambers, an intake to the last named chamber, a piston slidable in the sleeve, ports from each of the chambers to the interior of the sleeve, and passage-grooves in the piston to cooperate with the ports; said ports and passage means being arranged, by the shifting of the piston from one position to another, to establish communication between the intermediate outlet-chamber and the intake chamber while shutting off communication between said intake chamber and the other outlet chamber, and to alternately establish communication between the intake chamber and either at a time of the endmost outlet chambers selectively, while placing the other endmost outlet chamber in communication with the intermediate outlet chamber and closing communication between the intake and intermediate outlet chambers.

In testimony whereof I affix my signature.

ALBERT B. HAUSER.