

Sept. 1, 1936.

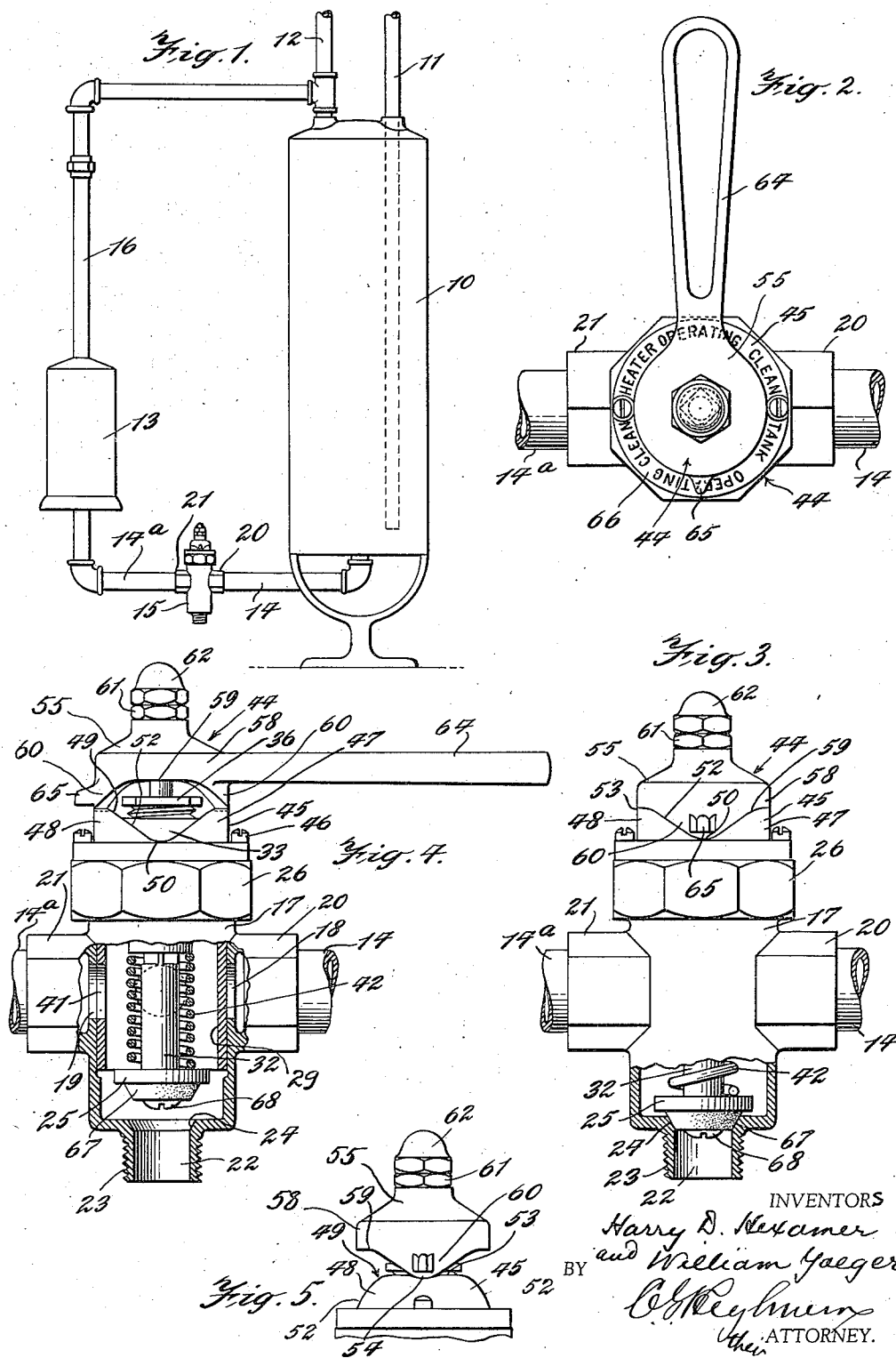
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2,052,827

VALVE

Filed May 4, 1935

2 Sheets-Sheet 1



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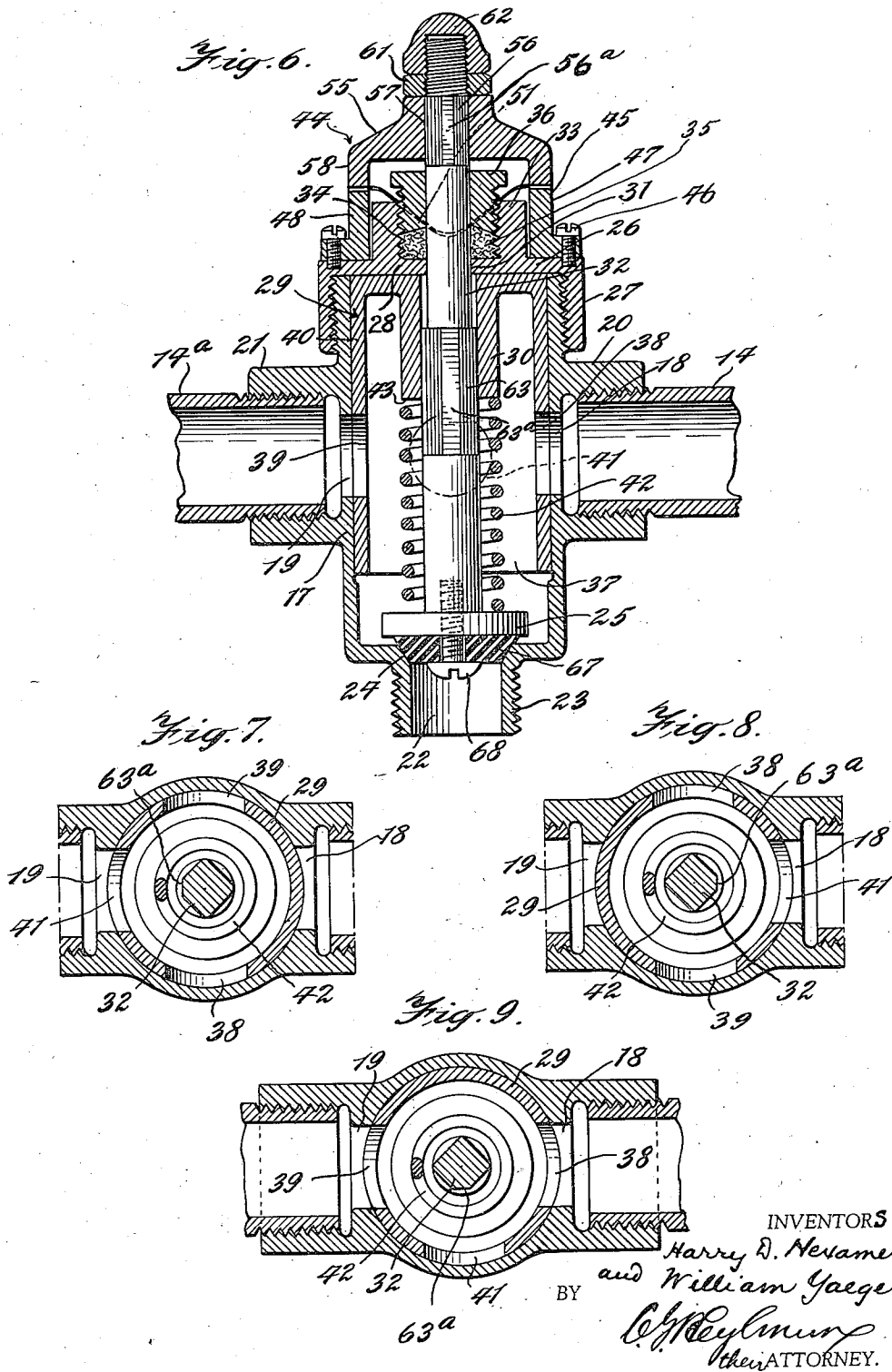
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UNITED STATES PATENT OFFICE

2,052,827

VALVE

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Application May 4, 1935, Serial No. 19,755

20 Claims. (Cl. 277—25)

Our invention relates to improvements in valves, and more particularly contemplates an improved valve for drawing off sediment, rust, or other accumulation of solid matter from domestic hot water or other supply systems, through the flow of water or other liquid therein under pressure.

The invention has for its object to provide a simple, efficient, and reliable device which may be operated to take different positions for causing the washing out or flushing of one side of a system and then the other, and the discharge or by-passing of the liquid from the system, and which must be returned to a normal operating position before the discharge of liquid from the system can be discontinued and normal circulation resumed.

Another object of the invention is to provide a device of the character specified which is compact and symmetrical in structure, and which may be applied universally to various types of liquid heating systems, irrespective of the relative positions of the tank and heater thereof, and so that the handle or other means for actuating the valve may be operated with facility without interference from contiguous walls or other obstructions.

Other objects will in part be obvious and in part be pointed out hereinafter.

It will be understood that while we have shown and hereinafter described our invention as employed for flushing a hot water system to remove sediment therefrom, that the invention is not limited to such use, but may be employed in any situation where its construction may be desirable or advantageous.

The invention consists in the improved and novel construction of said valve, and the arrangement and aggroupment of the elements thereof in operative combination, to be more fully described hereinafter and the novelty of which will be particularly pointed out and distinctly claimed.

In the accompanying drawings, to be taken as a part of these specifications, Figure 1 is an elevation of one type of hot water supply system and showing one form of valve constructed according to and embodying our said invention incorporated therein;

Fig. 2 is an enlarged plan view of the valve;

Fig. 3 is an elevation of the valve with parts broken away and partly in section, showing the parts in operating position to permit normal flow in the hot water supply system;

Fig. 4 is a similar elevation, with parts broken away and partly in section, showing the parts

in position for cleaning out one side of the system;

Fig. 5 is a detail view of one position of the operating or setting means for the valve;

Fig. 6 is an enlarged vertical sectional elevation of the valve, with the parts in position to permit normal circulation in the system;

Fig. 7 is a cross-section showing the parts in position for cleaning out one side of a system;

Fig. 8 is a similar cross-section showing the parts in position for cleaning out the other side of a system, and

Fig. 9 is another cross-section showing the parts in position for normal operation of the water heating system.

Referring to Fig. 1 of the drawings, we have shown, as one example of a hot water supply system, the storage tank 10 into which cold water is supplied under main pressure through a feed pipe 11. The hot water is delivered to the house service system (not shown) through pipe 12. The heat exchange element 13, for example, a gas-fired heater of well known form, is supplied with cold water from the lower end of tank 10 through communicatively connected supply pipes 14 and 14^a between which the draw-off valve 15 embodying our invention is connected. The water after being heated by the heater 13 passes through the outlet pipe 16 which is connected to the pipe 12, and through the latter to the upper end of the tank 10.

The valve 15 comprises a substantially cylindrical casing or body 17 having alined ports or passages 18 and 19 adapted to be connected respectively to the storage tank 10 and the heater 13, by means of the alining nipples 20 and 21 integral with the body 17, and receiving respectively the contiguous ends of the pipes 14 and 14^a.

A "drain" or by-passing port or passage 22 is provided through a nipple 23 at the lower end of the casing or body 17, and is located substantially in the vertical plane of the nipples 20 and 21. The inner end of the nipple 23 is formed as an annular valve seat 24 adapted to cooperate with the axially movable drain valve 25, as hereinafter described. The nipple 23 is adapted for the connection thereto of a hose or pipe for carrying away the water drained from the tank and heater.

The upper open end of the casing 17 is closed by a bonnet 26 which has a depending annular flange portion 27 having a threaded engagement with the exterior of the casing 17. The bonnet 26 includes a transverse wall portion 28 closing

the upper end of the casing 17 and serving as an abutment for receiving the thrust of a cylindrical hollow barrel valve member 29 disposed within the casing 17. The barrel valve 29 is provided with a depending axial sleeve 30 in alinement with an opening 31 in the transverse wall 28 through which the stem 32 of the valve 25 passes. The bonnet 26 above the portion 28 has a reduced annular portion 33 disposed about the projecting portion of the stem 32, providing means including a recess 34 for receiving gland packing 35 between the bonnet and valve stem. A threaded packing nut 36 serves to compress and retain the packing 35 in place.

The hollow valve member 29 is open at the lower end 37 thereof to place the interior thereof in communication with the drain outlet 22. Diametrically opposite ports 38 and 39 are formed in the lateral wall 40 of the barrel member 29, which ports when the valve 25 is in one operating position, are adapted to register with the ports 18 and 19 in the casing 17, as shown in Figs. 6 and 9, to allow normal circulation of the hot water through the system. A drain port 41 is also formed in the wall 40 at a point intermediate the ports 38 and 39 and in position to register with either the port 18 or the port 19, as shown in Figs. 4, 7 and 8. When the drain port 41 is alined with either ports 18 or 19 in the casing 17, the imperforate wall portion 40 between ports 38, 39 and opposite to port 41, serves to close the opposite ports 18 or 19, as the case may be.

A coil spring 42 under compression is disposed about the valve stem 32 between the enlarged valve portion 25 thereon and the lower end 43 of the sleeve 30, and exerts its force expansively to normally maintain the valve 25 seated, and to retain the upper end of the barrel valve 29 in engagement with the transverse wall portion 28.

The valves 25 and 29 are actuated by rotatable and axially movable means, indicated generally at 44, located at the top of the valve body 15. The means 44 cooperates with a cam ring 45 secured by screws 46 to the bonnet 26 and about the packing gland means 33. The cam ring 45 includes opposite cam or riser portions 47, 48 having the cam edges 49, and the cam portions 47 and 48 are separated or spaced apart at each of the contiguous pair of ends thereof to provide the intervening substantially V-shaped recesses 50 and 51 therebetween. Each of the cam edges 49 inclines upwardly at both ends 52, merging in a relatively flatter intermediate dwell portion 53 having a central notch or recess 54 (Fig. 5) therein for a purpose described hereinafter. The valve actuating means 44 includes an annular actuating member 55 keyed to the upper portion 56 of the valve stem 32, the valve stem portion 56 and the central hole 57 in the member 55 preferably being of polygonal cross-section, so that rotation of member 55 will rotate the valve stem 32. The member 55 has a depending cam ring portion 58 of a shape corresponding to and complementing that of the fixed cam ring 45, and includes the relatively wide opposite recesses 59 adapted to receive and substantially fit the cam portions 47 and 48 of the fixed cam ring 45, and the downwardly projecting opposite tapering cam portions 60 adapted to be received into and substantially fit the recesses 50 and 51 of the ring 45 when the member 55 is in position for normal operation, as shown in Fig. 3. The member 55 is retained on the stem 32 to cause axial movement of the stem therewith against the ten-

sion of the spring 42, by means of a lock-nut 61 threaded upon the stem 32 above the member 55 and retained in place by a cap nut 62, also threaded onto the stem. In order to effect rotation of the valve 29 by rotation of the member 55 and stem 32, the portion 63 of the stem 32 sliding in sleeve 30 of the valve member 29 is keyed thereto, such as by making the interior of the sleeve 30 and the portion 63 polygonal in cross-section (see Fig. 6).

The member 55 is preferably actuated by a handle 64 integral with said member and affording leverage. A pointer 65 is provided at the opposite side of the member 55 from the handle and in position to cooperate with suitable indicia, words or means 66 for indicating, as shown at Fig. 2, the various operative positions of the valve.

In operation, when the handle 64 is rotated clockwise from the position shown at Fig. 2, the cam portions 60 ride upon the complementary cam portions 47 and 48 to cause the valve 25 to open against the force of the spring 42, the rotation being continued until the points of the cam portions 60 enter the notches 54 and interengage the same to be retained in place upon the dwell portions 53. When the valve is in this position, the pointer 65 is at the "clean heater" position, in which the port 41 registers with the port 19 and the port 18 is closed, as shown in Figs. 4 and 7. The flow of water under pressure now reverses direction and scavenges the heater, the liquid being discharged through the drain port 22. When this operation is completed, the handle 64 may be rotated in either direction to bring the pointer 65 to the "clean tank" position, as shown in Fig. 8, wherein port 18 will be open and port 19 closed, to thereby cause the tank 10 to be cleaned and the dirt carrying liquid to be discharged at drain port 22. When the handle 64 is rotated to position the pointer 65 at either "operating" position the valve 25 is closed by expansion of spring 42 and the ports 38 and 39 register with the ports 18 and 19 to resume normal circulation, as shown in Figs. 6 and 9.

The valve 25 preferably includes a rubber or composition washer 67 engaging the valve seat 24, the washer being secured in position on the valve 25 by the screw 68 so as to be readily replaceable. By adjustment or backing off of the lock-nuts 61 and 62, the stem 32 is allowed to descend to compensate for wear on the washer 67, so that the valve 25 can be always maintained firmly on the seat 24 during normal operation of the system. The member 55, when the valve 25 is seated, is always retained in spaced relation to the cam ring 45 to insure full closing of the valve 25 and prevent leakage. We are thus able to prolong the use of the washer.

It will be noted that the spring 42 not only serves the purposes heretofore stated, but also maintains continuous and proper engagement between the complementary cams, and assures that the valves will be held in the positions to which they may be operated.

We provide the cam portions 47 and 48 at opposite sides of the member 45, so that upon actuation of the member 55 the stresses upon the valve stem 32 are evenly distributed and the handle may be turned to either of two opposite "operating" positions, because of the intervening recesses 50 and 59. This renders the valve of universal application. For example, if the positions of the tank 10 and heater 13, as shown in Fig. 1, were reversed, a room wall or other obstruction might

interfere with the actuation of the handle 64 in one of the "operating" positions. The opposite "operating" position will then be available to insure convenient operation. The handle 64 is adapted to swing through either arc of 180° for effecting full control of the valve 15.

The parts may be readily disassembled to enable renewal of parts. In order to repack the stem, it is only necessary to remove the handle 64 and member 44 by releasing the lock-nut 61 and cap 62. The portions 56 and 63 of the stem 32 are preferably provided with the flats 55^a and 63^a respectively, and the openings in the handle 64 and valve member 29 are correspondingly shaped to fit the same. Proper or correct assembly of the parts of the valve is thus insured. The handle 64 cannot be assembled upon the part 56 in "operating position" when in fact one or the other of the ports 18 or 19 is closed by the valve member 29. The handle when assembled must always indicate the true position of the valve, and trouble in the circulating line is thus avoided. To renew the seat washer 67, the bonnet may be unscrewed which will allow the entire valve assembly to be removed.

The valve embodying our said invention is positive in action and may be easily operated like a faucet. The operation of the valve is simple. Turn the handle a quarter turn to the right and then to the left of "operating" position and all the loose sediment and rust in the heater, tank and piping will be washed out through the drain connection 23 at the lower end of the valve 15. When the valve handle is pointed to the word "operating" on the dial, the valve allows full flow through the circulating conduits, and closes the drain.

What we claim and desire to secure by Letters Patent of the United States is:—

1. A valve comprising a casing having lateral ports in the wall thereof and a drain outlet port at an end thereof intermediate said lateral ports and including a valve seat, control means within said casing movable to a position for placing said lateral ports in communication with each other, and to other positions for placing one or the other of said lateral ports in communication with said drain outlet port and to close off the other of said lateral ports, a valve member within the casing to be operated with said control means and cooperating with said valve seat and seated thereon when said lateral ports are in communication with each other, and means operative upon actuation of said control means for lifting said valve member from said valve seat when the control means is moved to either of said other positions.

2. A valve comprising a casing having ports in the lateral wall thereof and a port at an end thereof, a barrel valve member rotatably disposed within said casing and having ports therein adapted to simultaneously register with said lateral ports, said valve member also having a port adapted to register with either of said first-named ports, said barrel valve member then closing off the other of said first-named ports, an axially movable valve member within said casing cooperating with the said end port and including a stem keyed to said barrel valve member, an actuating member connected to said stem, and means for imparting an axial movement to said stem upon rotation thereof by said actuating member.

3. A valve comprising a casing having opposing ports in the lateral wall thereof, and a port including a valve seat at an end thereof, a hollow

barrel valve member open at an end thereof rotatably disposed within said casing and having opposing ports in the wall thereof adapted to register with said first-named ports in a certain position of said barrel valve member, and a port in the barrel valve member intermediate said other ports therein and adapted to register with one of said first-named ports in one position of said barrel valve member and with the other of said first-named ports in another position of said barrel valve member, an axially movable valve member cooperating with said seat to close the contiguous port, and actuating means for raising said last-named valve member and simultaneously moving said barrel valve member to place said intermediate port in registry with either of said first-named ports in the casing.

4. A valve comprising a cylindrical casing having a pair of main ports therein and a by-passing port at the lower end thereof, a hollow cylindrical valve member open at the lower end thereof rotatably disposed within said casing, said member having a pair of ports therein adapted to register with said main ports in certain of the positions thereof, and said valve member having a port adapted to register with one or the other of said main ports in other positions of said member, said member then closing the remaining main port, an axially movable and rotatable valve member cooperating with the by-passing port and having a keyed connection with said cylindrical member, a spring interposed between said valve members, and actuating means for rotating said cylindrical valve member and axially moving said valve member, said actuating means being operable to open said lower valve member only when either of said main ports is closed.

5. A valve comprising a casing open at an end thereof, said casing having main lateral ports and a by-passing port at the other end thereof, a valve member rotatably disposed within said casing for controlling said main ports, an axially movable and rotatable valve member within said casing for controlling the by-passing port, said last-named means including a stem keyed to said first-named valve member and projecting outside the casing, a spring interposed between said valve members and urging said second-named valve member to close the by-passing port, a bonnet upon said casing and closing the open end thereof, a gland packing disposed upon said bonnet about the projecting portion of said stem, a cam member upon said bonnet, and a cooperating cam member upon said stem and rotatable relative to the first-named cam to move said second-named valve to open position.

6. A valve comprising a casing having lateral main ports and a by-passing port at an end thereof including a valve seat, a rotatable member within the casing for controlling said main ports, an axially movable and rotatable valve cooperating with said seat and having a stem keyed to said rotatable member and projecting outside the casing, a fixed cam portion, an actuating member slidably keyed to said stem and including a cam portion cooperating with and engaging said fixed cam portion to operate said valve, and means for removably retaining said actuating member on the stem, said means being adjustable to allow said valve to be fully seated.

7. A valve comprising a casing having main lateral ports and a by-passing port at an end thereof including a valve seat, a rotatable valve member within the casing for controlling said

main ports, an axially movable and rotatable valve member cooperating with said seat and having a stem slidably keyed to said rotatable member and projecting beyond the casing; a spring interposed between said valve members and urging said second-named valve member toward said seat, a fixed cam member at the upper end of the valve casing, a cooperating cam member keyed upon said stem, and means upon said stem for retaining said cam member thereon, said last-named means being adjustable to allow said valve to be fully seated by said spring.

8. A valve comprising a casing open at one end and having ports in the side thereof and a by-passing port at the opposite end thereof, a bonnet closing the open end of said casing, means on said bonnet for receiving packing material, a packing nut for closing said packing means, a rotatable member within the casing for controlling said side ports, an axially movable valve for controlling said by-passing port and including a stem extending through said rotatable member, said bonnet, said packing material, and said plug, said stem having a keyed connection with said rotatable member, a cam portion on said bonnet about said packing means, and an actuating member secured to said stem and including a depending cam portion cooperating with said first-named cam portion and covering said packing means.

9. A valve comprising a casing having lateral ports, and a by-passing port at an end thereof, a rotatable member within the casing for opening both lateral ports in certain of the positions thereof, and for closing one or the other of the lateral ports in other positions thereof and opening the remaining lateral port, an axially movable and rotatable valve member cooperating with said by-passing port and keyed to said rotatable member, a stationary cam member upon the valve casing, and a complementary cam member upon said stem, said cam members including portions coacting upon relative rotation thereof to open said axially movable valve in the two positions of said rotatable member at which one or the other lateral port is closed.

10. A valve comprising a casing having lateral ports and a by-passing port at one end thereof, a rotatable member within the casing for controlling said lateral ports, an axially movable and rotatable valve member for controlling the by-passing port and including a stem keyed to said rotatable member, and cam members upon the valve body and stem respectively and cooperating with each other to move said stem axially and rotate said rotatable member upon relative rotation of said cam members, said cam members each including oppositely disposed riser portions and intervening recesses, said by-passing valve member being opened in either of two positions of said cam members at which said riser portions engage and being closed in either of two positions of said cam members at which the recesses receive the riser portions.

11. A valve comprising a casing having lateral ports and a by-passing port at one end thereof, a rotatable member within the casing for controlling said lateral ports, an axially movable and rotatable valve member for controlling the by-passing port and including a stem keyed to said rotatable member, cam members upon the valve body and stem respectively and cooperating with each other to move said stem axially and rotate said rotatable member upon relative rotation of said cam members, said cam members each in-

cluding oppositely disposed riser portions and intervening recesses, said by-passing valve member being opened in either of two positions of said cam members at which said riser portions engage and being closed in either of two positions of said cam members at which the recesses receive the riser portions, and a spring to urge said by-passing valve member to close said by-passing port.

12. A valve comprising a casing having oppositely disposed ports therein and a by-passing port, a rotatable member within the casing having aligned ports therein adapted to register with said oppositely disposed casing ports in either of two positions of said member rotatively 180° apart, said member having an intermediate port adapted to register with either one or the other of the oppositely disposed casing ports at positions intermediate said 180° apart positions, the remaining casing port then being closed, an axially movable valve cooperating with said by-passing port and operatively associated with said rotatable member, and means for actuating said rotatable member and said axially movable valve, said means including cam portions coacting to close said axially movable valve in both of the 180° apart positions of said rotatable member and to open said valve at both of the intermediate positions of said rotatable member.

13. A valve comprising a casing having normally open ports therein and a by-passing port, a rotatable member for controlling said normally open ports, and adapted to open both or either one of said normally open ports, both of said normally open ports being opened at either of two positions of said rotatable member rotatively 180° apart, an axially movable valve including a stem for controlling the by-passing port, said stem being keyed to said rotatable member, and means for actuating said rotatable member and said valve, said means including a stationary cam member having separated riser portions and intervening recesses and a cam member secured to said stem and having separated riser portions and intervening recesses, said riser portions coacting to open the axially movable valve in positions of said rotatable member at which one of the normally open ports is closed and the other open and to close said valve in the 180° apart positions of said rotatable member.

14. A valve comprising a casing having lateral ports and drain port, a rotatable member within the casing for controlling the lateral ports, an axially movable valve member controlling the drain port and including a stem keyed to the rotatable member, a stationary cam member having opposite separated riser portions forming intervening recesses 180° apart, and a complementary cam member including a handle secured to said stem, the riser portions of said cam members engaging upon rotation of the complementary cam member in either direction from either of two positions 180° apart to move said stem to open the axially movable valve, and said axially movable valve being closed in either of the original positions of said complementary cam member.

15. A valve comprising a casing having lateral ports and an end port, a rotatable member within the casing for controlling the lateral ports, an axially movable valve member therein for controlling the end port and including a stem keyed to said rotatable member to rotate said member, and means for actuating said port controlling members including a stationary cam ring and a cooperating cam ring secured to said stem, said

cam rings each including separated riser portions and intervening recesses, the riser portions of one of said rings having notches therein adapted to engage the riser portions of the complementary ring for retaining the axially movable valve in open position.

16. A valve comprising a casing having opposing lateral ports and a by-passing port at an end thereof intermediate said lateral ports, means within the casing for controlling all of said ports to establish communication between both lateral ports and close said by-passing port in a normal position of said controlling means and to close either one of the lateral ports and open said by-passing port in other positions of said controlling means, said controlling means including a rotatable actuator for said several port controlling means, and means for imparting an axial movement to said actuator upon rotation thereof to cause a corresponding opening movement of the by-passing port controlling means upon movement of the actuator to either of the by-passing positions.

17. A valve comprising a casing having opposing lateral ports and a by-passing port at an end thereof intermediate said lateral ports, and means within the casing for controlling all of said ports to establish communication between both lateral ports and close the by-passing port in a normal position of said controlling means and to close either one of the lateral ports and open said by-passing port in other positions of said controlling means, said controlling means including a hollow barrel valve member within the casing having openings therein disposed to establish at various positions communication between said lateral ports and between each lateral port and said by-passing port, valvular means for said by-passing port, rotatable actuating means for said several port controlling means, and means for imparting an axial movement to said actuating means upon rotation thereof to cause a corresponding opening movement of said by-passing valve upon movement of the actuator to either by-passing position.

18. A valve comprising a casing having oppos-

ing lateral ports and a by-passing port at one end thereof intermediate said lateral ports, a rotatable port controlling member within the casing establishing in normal position communication between said lateral ports, and movable in opposite directions to close one lateral port or the other, an axially movable valve member within the casing for controlling the by-passing port, and means for imparting an axial opening movement to said valve member upon rotation of said controlling member in either direction from normal position.

19. A valve comprising a casing having opposing lateral ports and a by-passing port at the end thereof intermediate said lateral ports, means for controlling said lateral ports to normally establish communication between the lateral ports, said means being rotatable in opposite directions from normal position to close one lateral port or the other, an axially movable spring controlled valve member for controlling said by-passing port, and cam means for imparting an opening movement to said last-named valve member upon rotation of said controlling means in either direction from normal, said cam means including parts cooperating to interlock in the normal position of the port controlling means.

20. A valve comprising a casing having lateral ports and a by-passing port at the end thereof, a rotatable member within the casing for establishing normal communication between the lateral ports in either of two positions 180° apart, and movable in both directions from either normal position to close one lateral port or the other in the intermediate positions, an axially movable spring controlled valve member for said by-passing port, and cam means for imparting an opening movement to said last-named valve member upon rotation of the port controlling means in either direction from either normal position, said cam means having parts interlocking in both normal positions to indicate said positions and retain the controlling means therein.

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