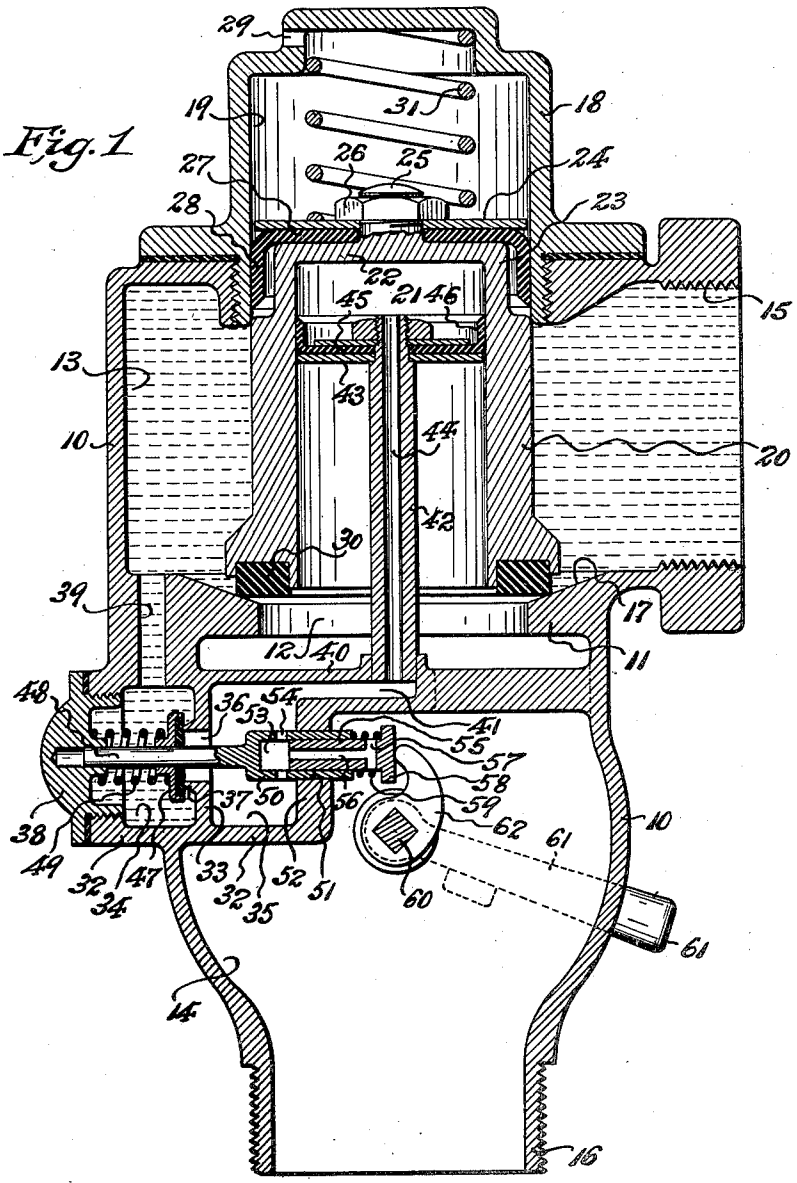
Oct. 24, 1944. W. MEYER 2,361,225

LINE PRESSURE OPENED SELF-CLOSING VALVE

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Fig. 1



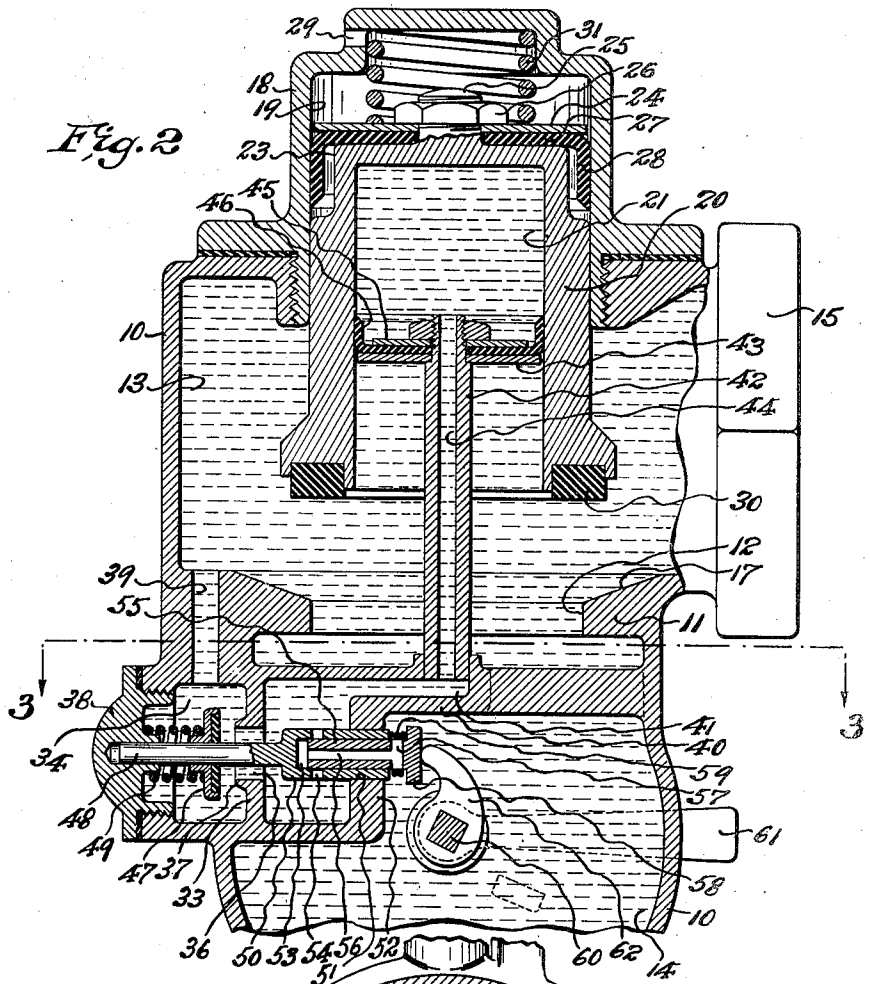
INVENTOR.
William Meyer,
BY George S. Richards
ATTORNEY.

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LINE PRESSURE OPENED SELF-CLOSING VALVE

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Fig. 2



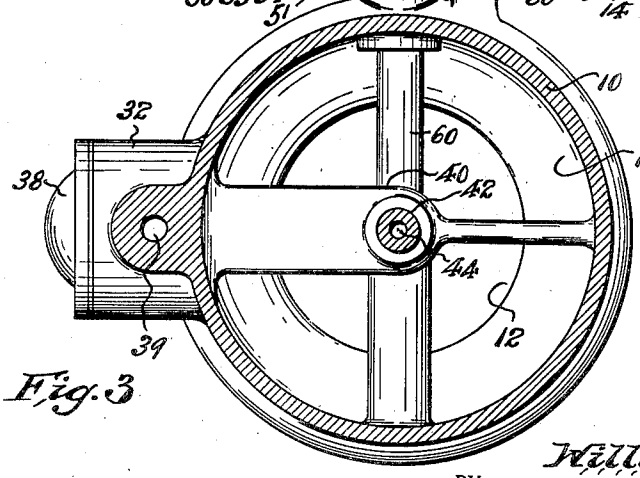


Fig. 3

INVENTOR.
William Meyer,
BY George D. Richards
ATTORNEY.

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LINE PRESSURE OPENED SELF-CLOSING VALVE

William Meyer, East Orange, N. J., assignor to Wheaton Brass Works, Newark, N. J., a corporation of New Jersey

Application May 12, 1943, Serial No. 486,647

3 Claims. (Cl. 137—139)

This invention relates to improvements in self-closing valves; and the invention has reference, more particularly, to a novel construction of self-closing valve provided with means to apply the fluid pressure of the supply line serving the same to its valve member, whereby to open the latter.

The invention has for an object to provide a novel construction of self-closing valve having manipulatable control means for applying the pressure of the fluid supply line, by which the valve is served, to the valve closure member, whereby to move the latter to valve port opening position.

The invention has for a further object to provide, in a self-closing valve, a hollow movable valve member having a cylinder chamber and a stationary piston or plunger entered in the latter, together with manipulatable fluid by-pass means for delivering fluid at supply line pressure into said cylinder chamber, between the same and said piston or plunger, whereby to apply such supply line pressure to the valve member for moving the same to open position.

Other objects of this invention, not at this time more particularly enumerated, will be understood from the following detailed description of the same.

An illustrative embodiment of this invention is shown in the accompanying drawings, in which:

Fig. 1 is a longitudinal sectional view of a valve according to this invention, showing its movable valve member in closed position; Fig. 2 is a fragmentary longitudinal sectional view of the same, showing its valve member in open position; and Fig. 3 is a horizontal sectional view, taken on line 3—3 in Fig. 2.

Similar characters of reference are employed in the above described views, to indicate corresponding parts.

Referring to said drawings, the valve structure as therein illustratively shown, comprises a valve casing or housing 10 of suitable shape, the interior of which is subdivided by a transverse partition 11 having formed therein a valve port 12, above which is the valve intake chamber 13, and below which is the valve outlet chamber 14. Leading laterally into the intake chamber 13 is a suitably formed intake connection 15 to which a fluid supply pipe (not shown) may be suitably coupled or joined; and leading from the outlet chamber 14 is a suitably formed discharge connection 16 to which a fluid discharge pipe (not shown) may be suitably coupled or joined. Formed on the upper side of the partition 11, and around the valve port 12 therein, is an annular chamfered valve seat 17.

Suitably connected with the top of the valve casing or housing 10, in axially aligned relation to and above the valve port 12, is a bonnet 18 of reduced diameter. The interior of said bonnet opens downwardly into the valve intake chamber 13, and said interior provides a guide cylinder 19.

Cooperative with said valve port 12 and its valve seat 17 is the hollow body 20 of movable valve member, the same being formed to provide an interior cylinder chamber 21 having a downwardly open end, but closed at its upper end by an end wall 22. Said valve member body 20 and the interior of said guide cylinder 19 are conformable in cross sectional shape (which is preferably circular), so that the upper end portion of the former is slidably received in the latter so as to guide the movements of said valve member in a path axially aligned relative to the valve port 12. The upper extremity 23 of said valve member body 20 is of reduced diameter. Affixed to the upper extremity of said valve member body 20, by suitable means such e. g. as the keeper plate 24, stud 25 and nut 26, is a sealing washer 27 of suitable flexible material, the same having a dependent peripheral skirt 28 to slidingly hug the walls of said guide cylinder 19, to thereby seal the interior of the latter against communication with the intake chamber 13, and against admission of fluid from said intake chamber 13 into said guide cylinder interior. Said bonnet 18 is provided with a suitable air vent 29 which is open to the atmosphere. Suitably affixed to the lower end of said valve member body 20 is an annular valve washer 30, the same being preferably made of a material or composition sufficiently soft to compress conformingly and sealingly to the valve seat 17, when the valve member is engaged therewith in valve port closing position. Arranged between the end of said bonnet 18 and the upper end of said valve member body 20 is a compression spring 31, which is adapted to yieldably exert a downward thrust upon said valve member, whereby to move the valve body 20 and its valve washer 30 down upon the valve seat 17 and in closed relation to the valve port 12.

Formed in connection with the valve casing or housing 10 below the partition 11 as a fluid by-pass valve housing 32 which is subdivided by a vertical partition 33, outwardly of which is a by-pass intake chamber 34 and inwardly of which is a by-pass outlet chamber 35. Formed in said partition 22 is a by-pass valve port 36, provided at its by-pass intake chamber facing

side with a raised annular valve seat 37, which surrounds the margin of said port 36. The outer end of said by-pass intake chamber 34 opens exteriorly of the valve housing or casing 10, but is closed by a removable closure cap 38, which is suitably affixed to the exterior end of the by-pass valve housing 32. Extending downwardly through the partition 11 of the valve housing or casing 10 is a fluid delivery passage 39 leading from the main valve intake chamber 13 into the by-pass valve intake chamber 34. Connected with the interior part of the by-pass valve housing 32 is an extension 40 disposed beneath the main valve port 12 so as to intersect the axis thereof, and formed in this extension 40 is a discharge passage 41 leading from the by-pass outlet chamber 35. Affixed to said extension 40, to project upwardly therefrom, and to pass axially through the main valve port 12 into the cylinder chamber 21 of the main valve body 20, is the tubular stem 42 of a stationary piston or plunger 43. Said stationary piston or plunger 43 is entered in said cylinder chamber 21 of the main valve body 20. Said tubular stem 42 provides a passage 44 in communication between the discharge passage 41 of the by-pass outlet chamber 35 and the interior of the cylinder chamber 21 of the main valve body 20 above the piston or plunger 43. Said piston or plunger 43 includes a piston washer 45 of comparatively flexible material, having an upstanding peripheral skirt 46 to slidingly hug the walls of said main valve cylinder chamber 21, whereby to serve as a leak-proof seal between the latter and said piston or plunger 43.

The by-pass valve port 36 is normally closed by a by-pass valve member 47, the outer end of the stem 48 of which is slidably supported and guided in a guide socket 49, with which the closure cap 38 of the housing 32 is provided. Mounted around the outer portion of said stem 48, between said closure cap 38 and the by-pass valve member 47, is a compression spring 49 which is adapted to yieldably exert an inward thrust upon said by-pass valve member, whereby to move the latter against the valve seat 37 and in normal closed relation to the by-pass valve port 36. The inner end portion of the valve stem 48 projects through the by-pass valve port 36, and extends into said by-pass outlet chamber 35, and the same is provided with a diametrically enlarged free end portion adapted to form a drain valve casing 50. Said drain valve casing 50 slidably extends through an opening 51 provided in the inner end wall 52 of the by-pass valve housing 32, whereby to project into the outlet chamber 14 of the main valve housing or casing 10. Said drain valve casing 50 is provided with an outwardly endwise open axial bore which forms a drain valve chamber 53. Formed in the wall of said drain valve casing 50 are one or more drain intake ports 54 which provide communication between the inward interior of said drain valve chamber 53 and the interior of said by-pass valve housing outlet chamber 35. Entered in the drain valve chamber 53, through its open end, is a movable drain valve 55 which is telescopically slidable therein with a close fit. This drain valve 55 is provided with an axial outlet passage 56, terminating adjacent to the outer end of the drain valve body in lateral discharge port means 57 which communicate with the interior of the main valve outlet chamber 14. At its outer extremity, said drain valve 55 is provided with a diametrically enlarged head 58, and mounted around the outwardly projecting portion of said drain valve body and said head 58 is a compression spring 59 which is adapted to yieldably exert an outwardly moving thrust upon the drain valve 55, whereby to normally uncover the drain intake ports 54, when the by-pass valve member 47 is disposed in by-pass valve port closing position.

Means are provided for closing the drain valve 55 and opening the by-pass valve member 47 by manual operation. This means comprises a spindle 60 journaled to extend transversely through the outlet chamber 14 of the main valve housing or casing 10. One end of said spindle projects exteriorly through a stuffing box (not shown) in a manner well known in the art, and the exterior portion of the spindle is optionally provided with a fixed or detachable hand lever means 61 for manually rotating the spindle. Fixed on the spindle, so as to turn therewith, is a thrust member or cam 62. Said thrust member or cam, when rotated in proper direction, is adapted to impart an outward axial thrust upon the drain and by-pass valve means to close the one and open the other.

To cause the main valve to open, the operator swings upward the hand lever 61, thus rotating the thrust member or cam 62 in direction to thrust against the drain and by-pass valve means. The first effect of such operative thrust is to initially slide inward the drain valve 55 to the limit of its inward movement, whereby its inner end passes and blocks off the drain intake ports 54. After the drain valve 55 reaches the limit of such inward movement, the thrust of the cam 62 thereupon is transmitted to the by-pass valve stem 48, whereby to impart movement thereto which carries the by-pass valve member 47 away from the seat 37, and thus opens the by-pass valve port 36. Upon opening of the by-pass valve port 36, the fluid in the main valve intake chamber 13, which is under the pressure of the fluid supply line by which said main valve is served, is caused, by such pressure, to flow through the delivery passage 39, the by-pass intake chamber 34 and open by-pass valve port 36 into the by-pass outlet chamber 35. Escape from the by-pass outlet chamber 35 being prevented by the closure of the drain valve means, the fluid flows from said by-pass outlet chamber 35 through the discharge passage 41, the piston or plunger stem passage 44 into the main valve cylinder chamber 21, between the closed upper end of the latter and the stationary piston or plunger 43. The pressure of fluid thus admitted to the main valve cylinder chamber 21 exerts an upwardly moving thrust upon the main valve body 20 against the tension of the main valve closing spring 31, thereby causing the main valve body 20 to rise, and thus open the main valve port 12 to the outward flow of fluid from the supply line through the main valve. The opening movement of the main valve body is not obstructed by compression of air within the bonnet 18, since the interior of the latter is vented by the vent 29 which is open to the atmosphere.

So long as the by-pass valve means is held open, by the operator's actuation of the control cam, the main valve will remain open to outward flow of fluid therethrough. To cause the main valve to close, the operator releases and swings back the hand lever 62, thus returning the thrust member or cam 62 to normal initial position, whereby the by-pass valve will close and the drain valve will open. The by-pass

valve member 47 first closes under the terminal pressure of its closing spring 49, thus cutting off flow of fluid under supply line pressure into the by-pass outlet chamber 35. After the by-pass valve member 47 thus closes, the drain valve 55 continues outward movement under the thrust of its spring 59, thereby opening the drain intake ports 54 for communication with the discharge passages 56—57 of said drain valve 55. The closing of the by-pass valve member 47 shuts off flow of fluid under supply line pressure into the by-pass outlet chamber 35, and thus drops the pressure of fluid in the main valve cylinder chamber 21, so that the main valve closing spring 31 immediately exerts its closing thrust on the main valve to carry the same down to main valve port closing position. As the main valve body 20 moves downward, the fluid in its cylinder chamber 21 will be expelled through the piston or plunger passage 44, the passage 41, and by-pass outlet chamber 35 to be drained therefrom, through the drain intake ports 54 and drain valve discharge passages 56—57, into the main valve outlet chamber 14. Such expulsion and draining of fluid from the main valve cylinder chamber may be utilized as a check upon the closing movement of the main valve, whereby to cause slow closing thereof and consequent prevention of sudden back pressure shock in the supply line, so that occurrence of "water-hammer" is avoided.

The valve of this invention has the advantage of being very easily operated, especially when used in lines carrying fluid at comparatively high pressure, since the fluid pressure itself is utilized to raise the main valve to open position, and the operator is required to use but little force in turning the control thrust member or cam 62. The valve of this invention is serviceable in connection with any fluid supply line wherein the fluid pressure exceeds atmospheric pressure plus the tensional pressure of the main valve closing spring 31 which is employed in any given case.

I am aware that changes could be made in the constructions above set forth, and many apparently widely different embodiments of this invention could be made without departing from the scope thereof as defined in the following claims. It is therefore intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. In a valve structure provided with a port intermediate its intake and outlet sides adapted to be opened and closed by a hollow valve body slidably related to a stationary piston, said piston having a fluid passage communicating with the interior of said valve body, means to control flow of fluid under pressure, which enters the valve structure from a supply thereof, into and out of said valve body interior for the purposes described comprising, a by-pass valve housing within the valve structure, said housing being subdivided by a wall to provide a by-pass intake chamber in communication with the intake side of the valve structure and an outlet chamber communicating with the hollow valve through the passage with which the latter's cooperative piston is provided, said wall having a by-pass port, a normally closed by-pass port shut-off valve, a normally open drain valve leading from said by-pass outlet chamber to the outlet side of said valve structure, means to cooperatively relate said drain valve and shut-off valve whereby closing movement of the former effects opening movement of the latter, a rotatable cam cooperative with said drain valve for actuating the same, a spindle for mounting said cam, said spindle having an end portion projecting externally from the valve structure, and manipulatable lever means on said external end portion of said spindle.

2. In a valve structure provided with a port intermediate its intake and outlet sides adapted to be opened and closed by a hollow valve body slidably related to a stationary piston, said piston having a fluid passage communicating with the interior of said valve body, means to control flow of fluid under pressure, which enters the valve structure from a supply thereof, into and out of said valve body interior for the purposes described comprising, a by-pass valve housing within the valve structure, said housing being subdivided by a wall to provide a by-pass intake chamber in communication with the intake side of the valve structure and an outlet chamber communicating with the hollow valve body through the passage with which the latter's cooperative piston is provided, said wall having a by-pass port, a by-pass valve movable to open and close said by-pass port, a slidably supported stem to carry said by-pass valve, the inner end portion of said stem being formed to provide a drain valve casing having a drain valve chamber provided with drain intake means leading thereinto from said by-pass outlet chamber, a drain valve axially movable in said drain valve chamber to open and close said drain intake means, the exterior end of said drain valve being disposed to project into the interior of the outlet side of said valve structure, said drain valve having fluid discharge passage means to communicate between said drain valve chamber and the outlet side of said valve structure, and manipulatable means to axially move said drain valve to first close said drain intake means and then transmit motion to said stem to open said by-pass valve.

3. In a valve structure provided with a port intermediate its intake and outlet sides adapted to be opened and closed by a hollow valve body slidably related to a stationary piston, said piston having a fluid passage communicating with the interior of said valve body, means to control flow of fluid under pressure, which enters the valve structure from a supply thereof, into and out of said valve body interior for the purposes described comprising, a by-pass valve housing within the valve structure, said housing being subdivided by a wall to provide a by-pass intake chamber in communication with the intake side of the valve structure and an outlet chamber communicating with the hollow valve body through the passage with which the latter's cooperative piston is provided, said wall having a by-pass port, a by-pass valve movable to open and close said by-pass port, a slidably supported stem to carry said by-pass valve, the inner end portion of said stem being formed to provide a drain valve casing having a drain valve chamber provided with drain intake means leading thereinto from said by-pass outlet chamber, a drain valve axially movable in said drain valve chamber to open and close said drain intake means, the exterior end of said drain valve being disposed to project into the interior of the outlet side of said valve structure, said drain valve hav-

ing fluid discharge passage means to communicate between said drain valve chamber and the outlet side of said valve structure, and manipulatable means to axially move said drain valve to first close said drain intake means and then transmit motion to said stem to open said bypass valve, said latter means comprising a rotatable cam within the valve structure interior, a spindle for mounting said cam, said spindle having an end portion projecting externally from the valve structure, and manipulatable lever means on said external end portion of said spindle.

WILLIAM MEYER.