June 18, 1929. H. M. LOFTON 1,717,392

FIRE HYDRANT

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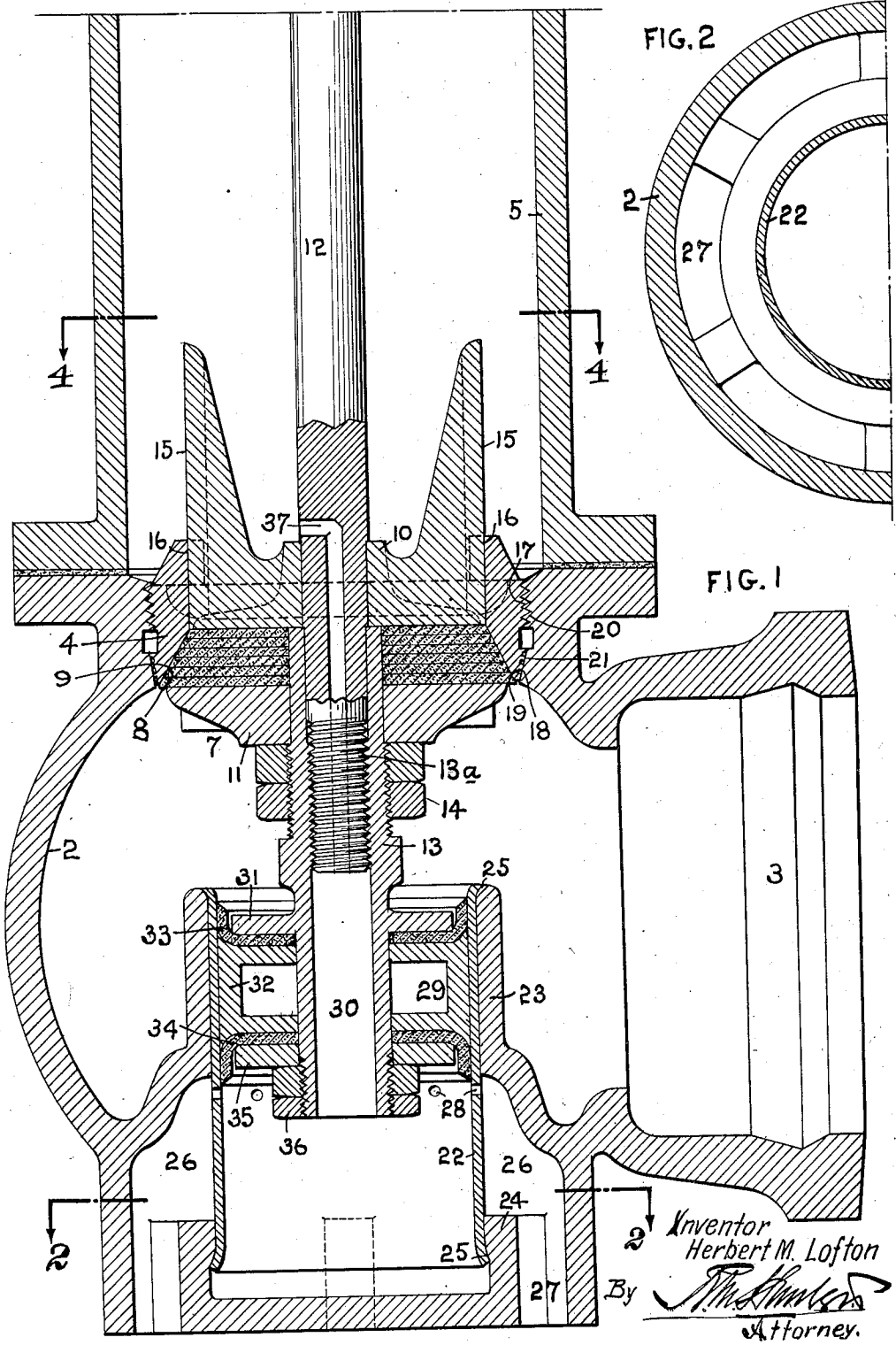

FIG. 2

FIG. 1

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FIG. 3

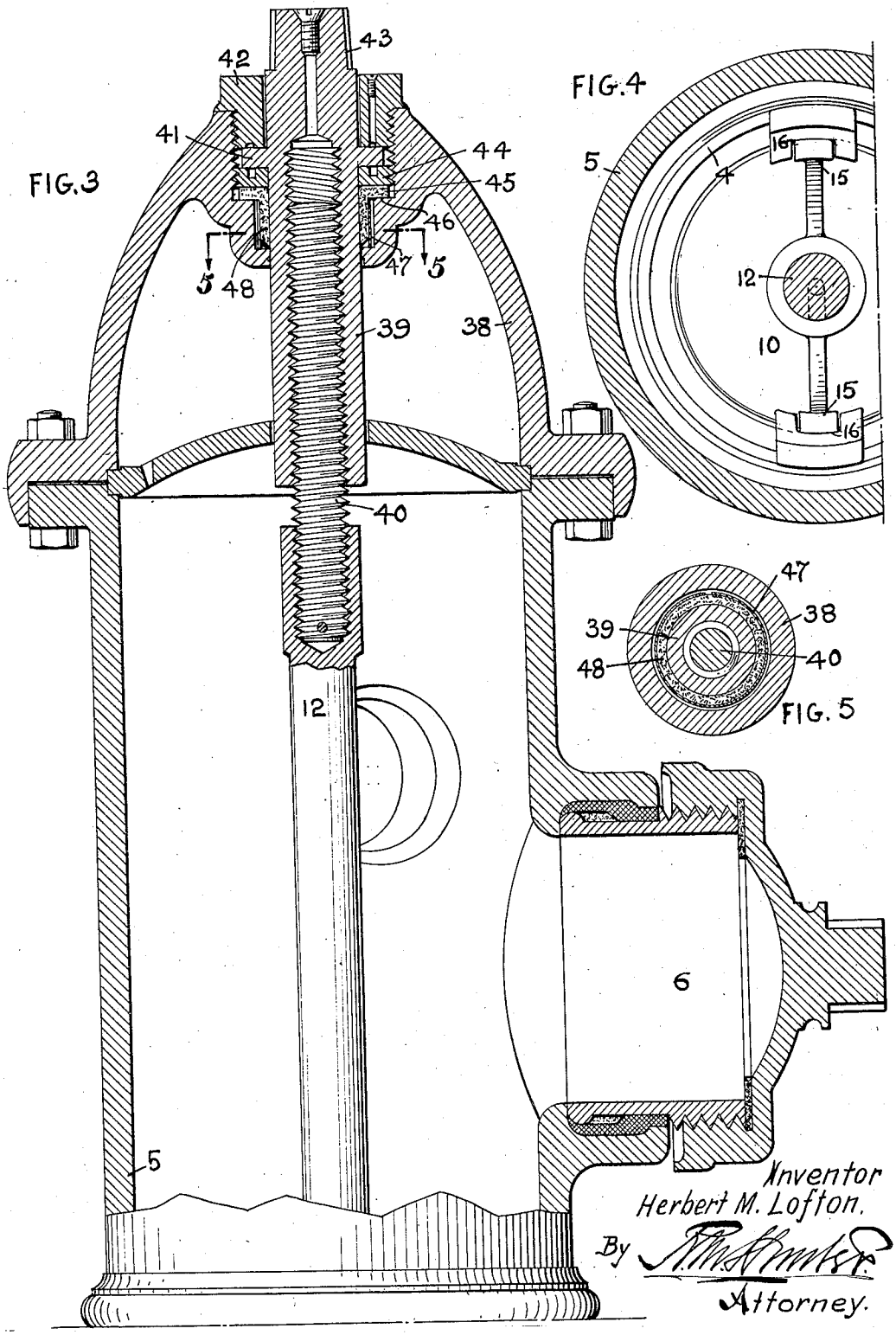

FIG. 4

FIG. 5

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UNITED STATES PATENT OFFICE.

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FIRE HYDRANT.

Application filed June 18, 1926. Serial No. 116,851.

The main object of my invention is to so construct a fire hydrant that the main valve is to a large extent counter-balanced in its opening and preferably in its closing movements in respect to the pressure of the water from the street main. Where no means is provided for counter-balancing the water pressure, a great deal of force is required to depress or open the valve, and this is particularly so where very high pressures are employed in the street mains, which have been necessary on account of the greatly increasing height of buildings in commercial districts.

A further object of my invention is to provide a satisfactory drainage method for draining the hydrant barrel above the main valve when the latter has been closed, and especially useful in connection with the balancing features for facilitating the easy opening and closing of the valve.

My object is further to provide an improved stuffing box at the top of the hydrant whereby the usual fibrous packing may be omitted and a special cupped leather packing employed.

With the above and other objects in view, the nature of which will be more fully understood from the description hereinafter, the invention consists in the novel construction of fire hydrant, as hereinafter more fully described and defined in the claims.

Referring to the drawings: Fig. 1 is a vertical section through the lower part of the hydrant, and more particularly illustrating the main valve together with the counter-balancing and drainage features; Fig. 2 is a cross-section taken on line 2—2 of Fig. 1; Fig. 3 is a vertical section of the upper part of the hydrant and showing, more particularly, the means for operating the valve; Fig. 4 is a cross section taken on line 4—4 of Fig. 1; and Fig. 5 is a cross section taken on line 5—5 of Fig. 3.

2 represents the shoe or elbow shaped base of the hydrant having the inlet 3 for connecting with the water main and carrying at its upper part a valve seat 4. Bolted to the upper portion of the shoe is the barrel or stock 5 which extends upwardly above the street level and is provided with the nozzle opening 6. 7 is the main valve formed with the conical seating portion 8 which seats upon the conical seat 9 of the annular bushing 4 constituting the valve seat ring. The conical seating portion 8 is clamped between the upper collar 10 and the lower collar 11 of the valve piece, said parts being clamped together through the medium of the valve stem 12 and tubular stem 13 which are united by the screw threaded portion 13ª and the nuts 14. The upper head 10 is provided with the upwardly extending guide wings 15 which fit into grooves 16 in the upper portion of the valve seat ring 4, whereby the valve 7 and the valve stem 12 are held against rotation while, at the same time, free to reciprocate vertically.

Ordinarily, seat rings for fire hydrants are provided with metal gaskets for insuring a tight joint between the ring and the shoe, but in my improvement herein, gaskets are dispensed with. In the present construction, the perimeter of the seat ring has its upper portion cylindrical and screw threaded, as at 17, whereas its lower portion is made conical as at 18, and preferably with a plurality of annular grooves 19 to increase the tightness of the joint. The upper part of the opening in the shoe is formed with an internal cylindrical screw thread 20 into which the screw thread 17 of the seat ring is screwed, and the lower part of its opening is made conical as at 21 so as to receive and act as a seat for the conical portion 18 of the seat ring, all of which is clearly shown in Fig. 1. It will be understood that when the seat ring is screwed down its conical portion 18 tightly seats upon the conical portion 21 of the shoe, and in that manner makes a very strong and tight joint, and by making the conical angle relatively small, the seat ring will be held firmly to the shoe and resistant to rotation when the stem is being acted upon by the operating bushing at the top of the hydrant.

Referring now to the balancing feature whereby the large main valve 7 may be opened downwardly against the great pressure of the water in the street mains, the following construction is employed. 22 is a tubular barrel which is fitted into an upper cylindrical flange 23 and a lower cylindrical flange 24 of the shoe in which it is secured by expanding the upper and lower edges, as at 25. Surrounding the cylinder 22 and between the upper flange 23 and lower flange 24 is an annular space 26 which has outlets 27 downwardly through the bottom of the shoe. 28 are drainage apertures through the tubular cylinder 22 about midway of its length and opening into the drainage passage 26. 29

is a balancing piston and comprises a downwardly extending tubular portion 30 flanged at 31 and forming a continuation of the tubuluar stem 13 of the main valve. Sleeved upon the tubular stem 30 is the central piston portion 32, the two cupped leather packings 33 and 34 and a clamping collar 35, all held between the flange 31 and the nuts 36 screwed upon the lower portion of the tubular stem 30. The balancing piston 29 may be made in any other suitable manner, but since it is to operate in connection with water, the construction shown has been found well suited to the purpose. It will be seen that this piston is subjected to the pressure of the water upon its upper side while its lower side is subjected only to the atmospheric pressure which exerts its influence through the drainage passages 26, 27 and 28, into the interior lower part of the cylinder 22. As the area of the balancing piston 29 approximates, though preferably is somewhat less than the area of the opening of the main valve seat, it is manifest that the hydraulic pressure of the water will be somewhat greater upon the main valve than upon the balancing piston, and this is desirable to insure some seating pressure; but the difference in area may be made as small as possible, so that the extent of the balancing of the main valve may be carried out to as great an extent as possible consistent with good operation of the device.

For the purpose of draining the hydrant barrel or stock 5 when the main valve is closed, I provide a drainage port 37 through the valve operating stem 12 whereby it provides at the top a communication with the interior of the barrel or stock 5 above the main valve, and at its bottom a communication with the interior of the tubular stem 30 which opens downward into the cylinder 22 below the balancing valve 29. As shown in Fig. 1, the water which might be in the barrel 5 when the valve is just closed would drain through the passage 37, thence through the tubular stem 30 into the cylinder 22, and thence through the apertures 28, 26 and 27 to the ground outside of the hydrant. It will also be seen that when the piston is descending together with the main valve in the act of opening the latter, the lower cupped leather portion 34 of the piston will close the drainage ports 28 so that the pressure of the water exerted above the main valve will not be able to force the water through the drainage ports 26, 27 and 28, but instead will exert a pressure commensurate with the pressure of the street main upon the underside of the balancing piston 29 as well as upon its upper side, and with the result that after the initial opening of the valve assisted by the water pressure upon the upper side of the balancing piston 29, the balancing requirement will no longer be necessary and, therefore, the balancing piston is in effect but out of action and merely moves with the main valve as a controlling means for the drainage. On account of the large movement of the main valve, the counter-balancing piston must have a vertical height which will maintain the drainage ports 28 closed throughout the main opening and closing movements of the main valve, being operative for controlling the drainage port with the first initial movement given to the valve stem and valve piece in opening the valve, and the final movement of said parts when closing the valve. While the cylinder 22 is shown as made of a piece of tubing expanded in tight position within the flanges 24 and 33 of the shoe, the said cylindrical portion may be integral with the shoe structure itself. However, it is advantageous to employ the construction as shown, because the tubing constituting the cylinder may be of brass, bronze or other non-rusting metal.

Referring to the means for imparting reciprocation to the valve stem 12 and as shown in Figs. 3 and 5, 39 is the operating stem nut internally screw threaded and cooperating with the threaded portion 40 of the valve stem 12. The stem nut 39 is provided with an annular flange 41 and an externally arranged usual polygonal shapel head 43 for the application of a wrench to rotate the nut. 42 is a hold-down nut which is screwed into the top of the bonnet 38 and provides an annular bearing for the flange of the stem nut. Below the flange 41, there is arranged a cupped leather packing, the radial portion 45 of which is clamped down upon the annular shoulder 46 of the bonnet by the screw bushing 44 and upon which the flange 41 of the stem nut rests, while the cylindrical portion 48 of the cupped leather snugly fits the outer circumference of the stem nut and is normally spring pressed against the same by the circular spring formed of spring sheet metal at 47. In this manner, the vertical thrust, whether upward or downward, due to the rotation of the stem sleeve is taken up by the metal portions 42 and 44, whereas the packing is securely clamped in position and is yieldingly pressed against the circumference of the sleeve, the latter being turned to a true cylinder. The clamping spring 47 holds the cupped leather at all times snugly against the stem nut, even when there is no pressure within the hydrant stock or barrel, and prevents the cupped leather from warping or distorting when not in use under water pressure.

One of the special advantages of my improved construction resides in the fact that by providing balancing means to permit easy opening of the main valve, I am enabled to provide a quick acting threaded connection between the valve stem and stem nut, so that the valve may be opened and closed quickly with a relatively small power. In an ordinary hydrant, where a relatively small water pres-

sure was controlled or where the main valve was relatively small, a threaded connection with the operating stem nut was usually made with six threads to the inch, whereas by my improvement, I am enabled to use a greater pitch amounting to three threads to the inch, thus doubling the speed of opening and closing the hydrant and operating a greater pressure and moving a larger valve piece without the application of any greater power.

While I have provided draining means whereby the stock or barrel of the hydrant may be drained through the valve stem and thence through the balancing cylinder 22, I do not restrict myself in this respect, as the draining of the barrel or stock may be accomplished in any other suitable manner such as heretofore practiced, though I prefer the construction shown.

In the operation of my improved hydrant, assuming the parts to be in the positions shown, the rotation of the stem nut 39 in a left hand direction will apply a downward pressure upon the main valve 7 and the balancing piston 29, and in view of the fact that the top area of the piston 29 is almost equal to the smallest area of the valve piece 7, the amount of resistance to opening of the valve would be proportional to the difference in areas, and consequently as this difference in area is relatively small compared to the full area of the main valve, a relatively smaller power exerted on the stem nut 39 is alone necessary to insure the opening of the main valve. As soon as this opening of the main valve takes place, the drainage ports 28 are closed and water under pressure passes through the drainage port 37 and into the lower part of the cylinder 22, so that it exerts an upward pressure on the underside of the balancing piston 29 equal to or approximately equal to the downward pressure upon the upper side of the piston, and thereafter, the main valve is moved up or down freely since the pressure is equalized upon its upper and lower portion, just as the pressure is equalized upon the upper and lower portions of the balancing piston 29. Reversely, in closing the main valve, the stem nut is rotated in a right hand direction and this lifts the valve stem and valve piece as well as the balancing piston without material resistance and just before the main valve seats the drainage ports 28 open to relieve the pressure under the balancing piston and thereupon the differential action of the balancing piston and main valve once more becomes effective so that the main valve closes gently and without jar, no matter how greatly the water pressure in the main may be. Thereafter, the stock or barrel drains automatically through the ports 37, cylinder 22, ports 28, 26 and 27 to the ground outside of the hydrant, and, at the same time, maintaining the cylinder 22 below the piston almost full of water and in condition to be quickly responsive upon again opening the valve.

It will now be apparent that I have devised a novel and useful construction which embodies the features of advantage enumerated as desirable, and while I have in the present instance shown and described the preferred embodiment thereof which has been found in practice to give satisfactory and reliable results, it is to be understood that I do not restrict myself to the details, as the same are susceptible of modification in various particulars without departing from the spirit or scope of the invention.

Having now described my invention, what I claim and desire to secure by Letters Patent is:

1. In a valve device of the character stated, a valve piece and an operating stem for reciprocating it toward and from a seat for controlling a fluid under pressure, combined with an inlet chamber in which the valve piece is moved in opening the valve, and means for largely counter-balancing the pressure of the fluid upon the valve piece against opening which comprises a cylinder in alinement with the valve piece and stem and opening into the chamber and of an internal diameter approaching the diameter of the valve seat opening, a piston movable in the cylinder so as to be affected by the fluid pressure of the fluid both within the cylinder and chamber when the valve is opened, said piston connected to and movable with the valve piece and the interior of said cylinder below the piston having communication with the space above the valve piece when the valve piece is open and with the atmosphere prior to and during the initial opening movement only of the valve piece in opening.

2. In a valve device of the character stated, a valve piece and an operating stem for reciprocating it toward and from a seat for controlling a fluid under pressure, combined with an inlet chamber in which the valve piece is moved in opening the valve, and means for largely counter-balancing the pressure of the fluid upon the valve piece to reduce its resistance to opening, comprising a cylinder in alinement with the valve piece and stem and opening into the inlet chamber, and a piston movable in the cylinder so as to be affected by the pressure of the fluid within the inlet chamber, said piston connected to and movable with the valve piece, and wherein further, a communicating drainage passage is provided from the delivery side of the valve piece to the interior of the cylinder below the piston, whereby fluid on the delivery side of the valve piece may drain through the cylinder prior to the initial opening movement of the valve piece the cylinder being provided with a drainage outlet through its side wall immediately beneath

the piston therein when raised to its highest position, whereby said drainage aperture is sealed by the piston when lowered within the cylinder.

3. The invention according to claim 1, wherein further, the piston operates as a drainage valve for controlling the escape of water from the valve device through the means of communication from the interior of the cylinder to the atmosphere, said piston having a depth or thickness in sliding contact with the interior of the cylinder which is greater than the total travel of the valve piece in fully opening or closing the valve device.

4. The invention according to claim 1, wherein further, the communication between the interior of the cylinder and the atmosphere comprises a port through the wall of the cylinder close to the piston when the valve piece is fully closed upon its seat, said port communicating with the drainage passage outside of the cylinder and extending down to the bottom of the valve device.

5. In fire hydrant, a reciprocating valve and stem, combined with means for reciprocating the stem comprising a stem nut forming a screw connection with the stem and having an annular flange and an extended upper part for operation by a wrench, a bonnet for the hydrant having a recess in its upper portion provided with an annular radial seat, a leather cup surrounding the stem nut and having a radial flange resting upon the annular radial seat, a clamping bushing screwed into the recess in the bonnet and tightly clamping the radial flanged portion of the leather cup, said bushing acting also as a bearing for the annular flange of the stem, and a retaining nut screwed into the upper portion of the bonnet and providing an annular under bearing surface for the upper side of the annular flange of the stem nut.

6. The invention according to claim 5, in which further, the cylindrical portion of the leather cup is arranged in a recess of considerable greater diameter, and a split clamping ring surrounds the leather and clamps it to the cylindrical outer surface of the stem nut.

7. In a device of the character stated, a reciprocating valve piece and stem, a rotating stem nut for operating said parts, means for supporting the stem nut against longitudinal movement while permitting rotary movement, and a water tight packing about the stem nut comprising a cupped leather packing having a cylindrical portion fitting tightly about the stem nut and an annular radial portion firmly clamped to the means for holding the stem nut against longitudinal movement, and a split clamping ring substantially surrounding the cylindrical portion of the cupped leather for yieldingly clamping it to the cylindrical surface of the stem nut.

8. In a valve device of the character stated, a valve piece and an operating stem for reciprocating it toward and from a seat for controlling a fluid under pressure, combined with an inlet chamber in which the valve piece is moved in opening the valve and means for largely counterbalancing the pressure of the fluid upon the valve piece to reduce its resistance to opening, comprising a cylinder in alinement with the valve piece and stem and opening into the inlet chamber, a piston movable in the cylinder so as to be affected by the pressure of the fluid within the inlet chamber, said piston connected to and movable with the valve piece, means for providing at all times a communication between the space on the delivery side of the valve piece and the cylinder space below the counter-balancing piston, and means for draining the valve device when the valve piece is closed upon its seat.

9. The invention according to claim 1, wherein further, the valve device is provided with a shoe formed with a cylindrical opening concentric with the axis of the valve piece and the stem and comprising upper and lower annular portions separated by a drainage space, and wherein the cylinder is formed of a piece of tubular metal snugly fitting the annular portions of the cylindrical opening so as to bridge over the drainage space and held in place by being outwardly flanged or upset in relation to one of the annular portions and providing a curved rim to insure easy entrance of the piston and at the same time hold the tubular cylinder against longitudinal movement when the valve is being opened or closed, said cylinder provided with drainage openings extending through the wall thereof into the drainage space.

In testimony of which invention, I hereunto set my hand.

HERBERT M. LOFTON.