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J. F. LANGSTON

FLUSHING VALVE

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Fig. 1.

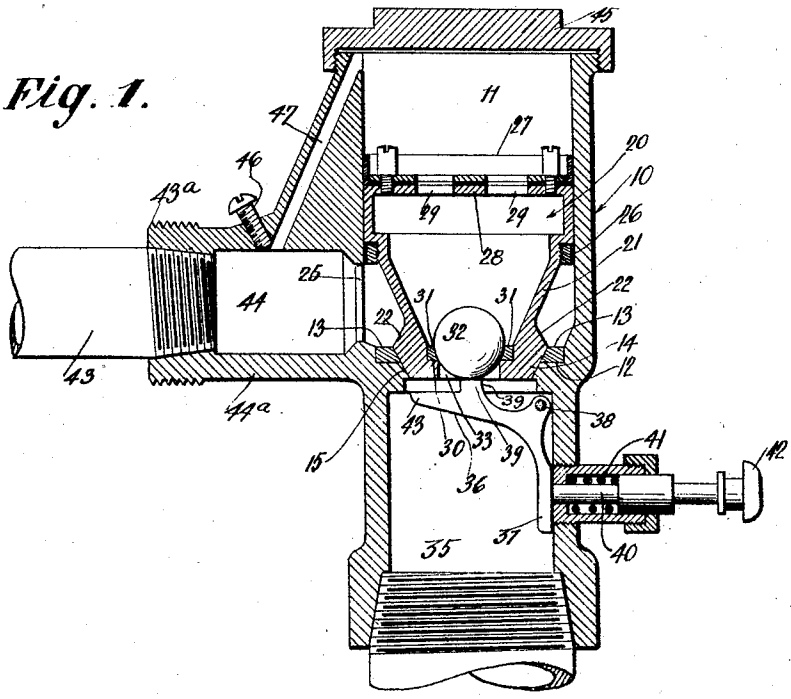
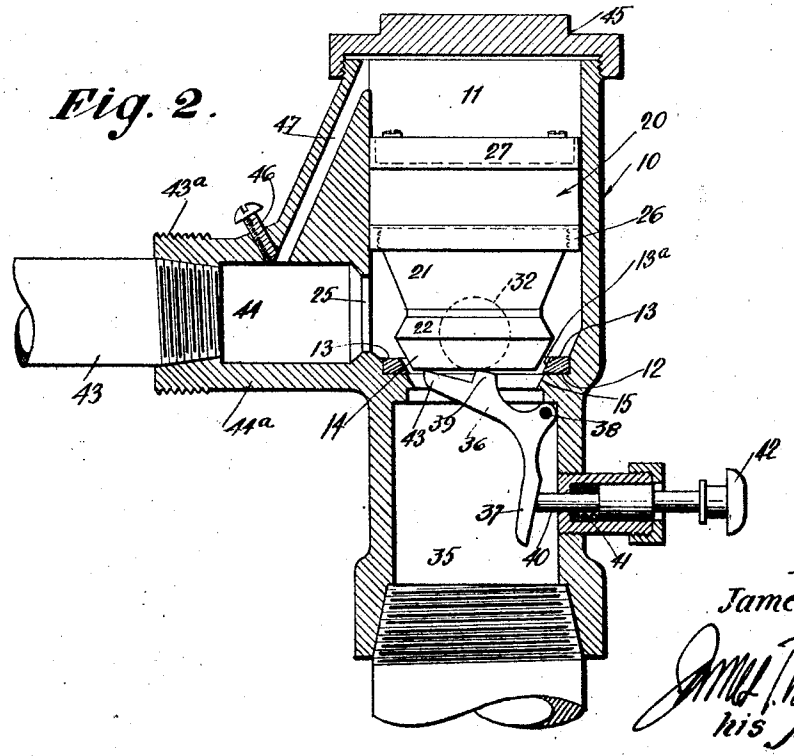


Fig. 2.



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FLUSHING VALVE.

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To all whom it may concern:

Be it known that I, JAMES F. LANGSTON, a citizen of the United States, residing in Los Angeles, county of Los Angeles, State of California, have invented new and useful Improvements in Flushing Valves, of which the following is a specification.

This invention relates to flushing valves—valves adapted to deliver a measured quantity of water or other fluid resultant upon a manual or other initial actuation; and it may be stated as a general object of the invention to provide a simple inexpensive form of valve that will be reliable in action, have long life, will not be liable to wear, deterioration, or disorder.

I am aware that automatic flushing valves have heretofore been used; but it has been a universal shortcoming of such valves that they are very liable to become disordered, especially after they have been in use for a little time, thus requiring more or less constant attention to keep them in working order. My flushing valve is designed particularly to overcome these difficulties by providing a structure that is little subject to wear, composed of a few simple parts without any delicate mechanism, and so proportioned and designed as to give accurate and reliable action.

The features of the invention reside largely in matters of general arrangement and design that will be best understood from a detailed description of a specific and preferred form of device embodying the invention; and for that purpose I refer to the accompanying drawings in which—

Fig. 1 is a vertical central section of my improved flushing valve in its normal or closed position;

Fig. 2 is a similar view showing the parts in the position they take when actuated by the initial manual operation.

In the drawings the numeral 10 designates a body for the flushing valve, which body may be conveniently made of cast brass or any other suitable material, preferably non-corrosive. This body contains a cylinder 11 of about the size illustrated in the drawings (the drawings being in full size scale for a valve of ordinary size and capacity). At the lower end of cylinder 11 there is an annular recess 12 carrying a valve seat ring 13 of some suitable material, say rubber. The conical valve 14 is adapted to seat on and in the valve seat ring 13, valve 14 being tapered at approximately such an angle as is illustrated in the drawings, and the seating surface of ring 13 being correspondingly tapered. Below the valve seat ring the body casting may have a tapered conical surface 15 that forms substantially a continuation of the tapered conical inner valve seating face of ring 13, when the valve seating ring 13 is expanded outwardly by the downward seating action of valve 14. For instance, when valve 14 is off ring 13, the inner conical surface 13^a of ring 13 may stand somewhat inwardly of conical surface 15 of the body; but when valve 14 comes down on ring 13 the conical inner surface 13^a of ring 13 will be expanded outwardly as the valve takes a tight seat thereon, until the conical surface of the valve also comes into seating contact with surface 15. The surface 15 may also form an effective seat for the valve; but because of the superior sealing action of rubber or the like I prefer to depend upon the seat at 13^a for the sealing action the seat at 15 being more in the nature of a stop or limiting means to limit the ultimate downward movement of the valve and limit the amount that the ring 13 is expanded, thus preventing permanent deformation of ring 13 and adding very materially to its life.

Conical valve 14 is carried on the lower end of a piston 20 movable vertically in cylinder 11. The piston 20 has a downwardly tapering conical extension 21, and then immediately above valve 14 it has a downwardly expanding conical part 22. The maximum diameter of the valve and of part 22 is less than that of pistion 20; and consequently, the whole movable member (piston and valve) has a greater surface against which water pressure exerts a pressure upwardly than it has surface against which the water pressure exerts a pressure downwardly. Consequently, with water pressure introduced into the lower part of the cylinder through port 25, there is always a tendency of the pressure to raise the piston and valve, the tendency being measured by the differ-

ential between the areas on the piston that take upward and downward pressures respectively.

At its lower edge piston 20 carries a small downwardly facing cup leather 26 that prevents water under pressure leaking upwardly past the piston; and at its upper end the piston has an upwardly facing cup leather 27 that makes the piston tight as regards water pressure above it. The piston is hollow, preferably a hollow casting. Its head 28 has openings 29 to allow free passage of water from above the piston to its interior; and in the lower inner part of the piston, preferably immediately within valve 14, the piston carries a recess 30 in which there is a valve seat ring 31 also preferably of rubber or some other similar material. On this valve seat ring a ball valve 32 normally seats and thus seals the valve opening 33. The rubber valve seat ring 31, with its valve seating surface, may bear the same relation to the outer edge of recess 30 as valve seat surface 13ª of ring 13 bears to surface 15, as hereinbefore explained. The openings 39 and the valve opening 33 are sufficiently large to allow free and quick passage of water downwardly from the cylinder above the piston, through the openings into the discharge passage 35 when valve 32 is lifted off its seat.

A small bell-crank lever with horizontal and vertical arms 36 and 37 is pivoted at 38 in discharge passage 35. Normally the horizontal arm lies in the position shown in Fig. 1 with a small projection 39 immediately below valve 32, while the vertical arm 37 lies opposite a push pin 40 which is normally held out by a spring 41 and may be pushed inwardly by pressing on button 42. Inward pressure on button 42 throws the bell-crank lever to the position shown in Fig. 2. In going to this position the projection 39 first lifts valve 32 off its seat. Then the lever extension shown at 43 moves up into contact with the lower face of valve 14 and assists in raising the valve and the piston. It will be understood that the water pressure which stands in the annular space around the parts 21 and 22 always has a tendency to lift the valve and piston, and will lift it immediately pressure is relieved from cylinder 11 above the piston; but I find it advantageous to have the initial manual operation capable of at least assisting the valve to start upwardly off its seat. Dependent upon the exact construction and proportion of the parts, when the parts are in the position shown in Fig. 2 valve 32 may still be kept off its seat or it may have been allowed to return to its seat by the fact that its seat, along with the valve and piston, has been raised high enough to come up to the valve which is still supported by projection 39. This will depend somewhat upon how far button 42 is pressed inwardly. But, in any case, the proportions are so made that, in the length of time ordinarily required to move the mechanism from the position of Fig. 1 to the position of Fig. 2, all or at least a considerable quantity of water in cylinder 11 and within hollow piston 20, will have escaped through valve opening 33 into discharge passage 35. The water pressure above the piston being thus relieved, the differential water pressure from below then tends to raise the piston further, and does raise it until upward movement of the piston is stopped. This stoppage may either be caused by the piston coming into contact with cylinder cap 45, or by the accumulation of equalizing pressure in the cylinder due to the water that is then entering the cylinder through passage 47 controlled by screw 46. By properly setting control screw 46 the amount of water admitted in a given time through passage 47 may be nicely regulated. If this passage is open wide, the water may pass into cylinder 11 fast enough to not only fill up the hollow interior of the piston but also to bring the water level above the piston head; and in such case the piston will stop its upward movement when this water has been moved up to cap 45. On the other hand, control screw 42 may be set down to close off passage 47 so that water enters cylinder 11 very slowly and so that the interior of the piston is not filled by the time the piston reaches cap 45.

Water under pressure comes from mains through pipe 43 into the feed passage 44 with which passage 47 connects. The port at 25 is sufficiently restricted that a pressure is always kept on port 47 sufficient to make the total downward pressure on the piston substantially greater than the upward water pressure on the piston; so that when cylinder 11 is filled with water from passage 47, the pressure is sufficient to move the piston downwardly. The speed of such downward movement will depend on the setting of control screw 46, and the piston moves down until valve 14 is again seated on ring 13, when the flushing flow of water through the device is shut off. As soon as this flow of water is shut off the pressure at passage 47 materially increases, thereby increasing the effective force by which the piston is moved downwardly and thus seating valve 14 finally, securely, and tightly, on its seat. In this connection I wish to point out that I have made valve 14 with a conical seating surface of about the angle shown in the drawings. I have found that by making this valve with a rather slight taper (rather than a great or abrupt taper) I am able to make the valve seat positively and tightly even though control screw 46 may be set to admit water into cylinder 11 very slowly. If the taper is made greater, so that the

valve seat surface approaches more nearly being flat, it is not possible to obtain reliable positive action with control screw 46 set for slow downward movement of the piston.

Another feature of my device that I wish to draw particular attention to is this:— that I gain additional capacity in cylinder 11 by making piston 20 hollow. For instance, in the design shown, the total capacity of the cylinder above the piston and of the hollow piston, is about twice that of the cylinder alone above the piston. The amount of time necessary to seat the valve 14 will be readily seen to be dependent upon the capacity (the space to be filled above the piston) and upon the rate of water flow through passage 41. With the amount of space thus doubled, for any given quantity of water desired to be delivered by the flushing valve, it is not necessary to adjust control screw 46 nearly so finely as would otherwise be the case. Even when adjusted for a comparatively large quantity of water to be discharged, the control screw still allows a large enough flow past it that the control is not delicate and is thus not liable to disorder.

If a larger water connection is needed, for a larger water supply, a larger pipe may be connected to the exterior threads at 43ª. And the casting 44ª around inlet 44 is made heavy enough that the inlet may be bored out, and the respective port at 25 may also be enlarged if desired, to increase the water supply to the valve. Thus, for instance, the pipe at 43 may be three-quarter inch while threads 43ª are to take a one inch connection.

Having described a preferred form of my invention, I claim:

1. A flushing valve comprising a body containing a cylinder with an outlet valve passage and seat at one end, an inlet leading with a restriction into the cylinder near that end, and a restricted passage connecting the inlet, at a point outside its restriction, to the other end of the cylinder; a hollow piston in the cylinder with a hollow downward reduced extension, a valve on the lower end of the extension adapted to seat on said valve seat, said extension having at its lower end a relief passage communicating with the piston and extension interiors and opening to the cylinder, a valve seat formed in said passage, a valve ball loose within the interior of the extension and adapted to seat on the relief valve seat; and a manually operable lifting arm under the piston extension and having a part adapted to enter the relief passage to directly engage and lift the relief valve off its seat and having another part adapted to engage and lift the extension and piston after lifting the relief valve.

2. A flushing valve comprising a body containing a cylinder with an outlet valve passage and seat at one end, an inlet leading with a restriction into the cylinder near that end, and a restricted passage connecting the inlet, at a point outside its restriction, to the other end of the cylinder; a hollow piston in the cylinder with a hollow downward reduced extension, a valve on the lower end of the extension adapted to seat on said valve seat, said extension having at its lower end a relief passage communicating with the piston and extension interiors and opening to the cylinder, a valve seat formed in said passage, a valve ball loose within the interior of the extension and adapted to seat on the relief valve seat, a removable and apertured cap on top the piston for preventing displacement of the ball from within the piston; and a manually operable lifting arm under the piston extension and having a part adapted to enter the relief passage to directly engage and lift the relief valve off its seat and having another part adapted to engage and lift the extension and piston after lifting the relief valve.

3. A flushing valve comprising a body containing a cylinder with an outlet valve passage and seat at one end, an inlet leading with a restriction into the cylinder near that end, and a restricted passage connecting the inlet, at a point outside its restriction, to the other end of the cylinder; a hollow piston in the cylinder with a hollow downward reduced extension, a valve on the lower end of the extension adapted to seat on said valve seat, said extension having at its lower end a relief passage communicating with the piston and extension interiors and opening to the cylinder, a valve seat formed in said passage, a valve ball loose within the interior of the extension and adapted to seat on the relief valve seat, the interior walls of the extension converging towards and leading directly to said relief valve seat for guiding the ball thereto; and a manually operable lifting arm under the piston extension and having a part adapted to enter the relief passage to directly engage and lift the relief valve off its seat and having another part adapted to engage and lift the extension and piston after lifting the relief valve.

4. A flushing valve comprising a body containing a cylinder with an outlet valve passage and seat at one end, an inlet leading with a restriction into the cylinder near that end, and a restricted passage connecting the inlet, at a point outside its restriction, to the other end of the cylinder; a hollow piston in the cylinder with a hollow downward reduced extension, a valve on the lower end of the extension adapted to seat on said valve seat, said extension having at its lower end a relief passage

communicating with the piston and extension interiors and opening to the cylinder, a valve seat formed in said passage, a valve ball loose within the interior of the extension and adapted to seat on the relief valve seat, the interior walls of the extension converging towards and leading directly to said relief valve seat and providing the sole means for guiding the ball to seat; and a manually operable lifting arm under the piston extension and having a part adapted to enter the relief passage to directly engage and lift the relief valve off its seat and having another part adapted to engage and lift the extension and piston after lifting the relief valve.

In witness that I claim the foregoing I have hereunto subscribed my name this 22nd day of January 1923.

JAMES F. LANGSTON.