

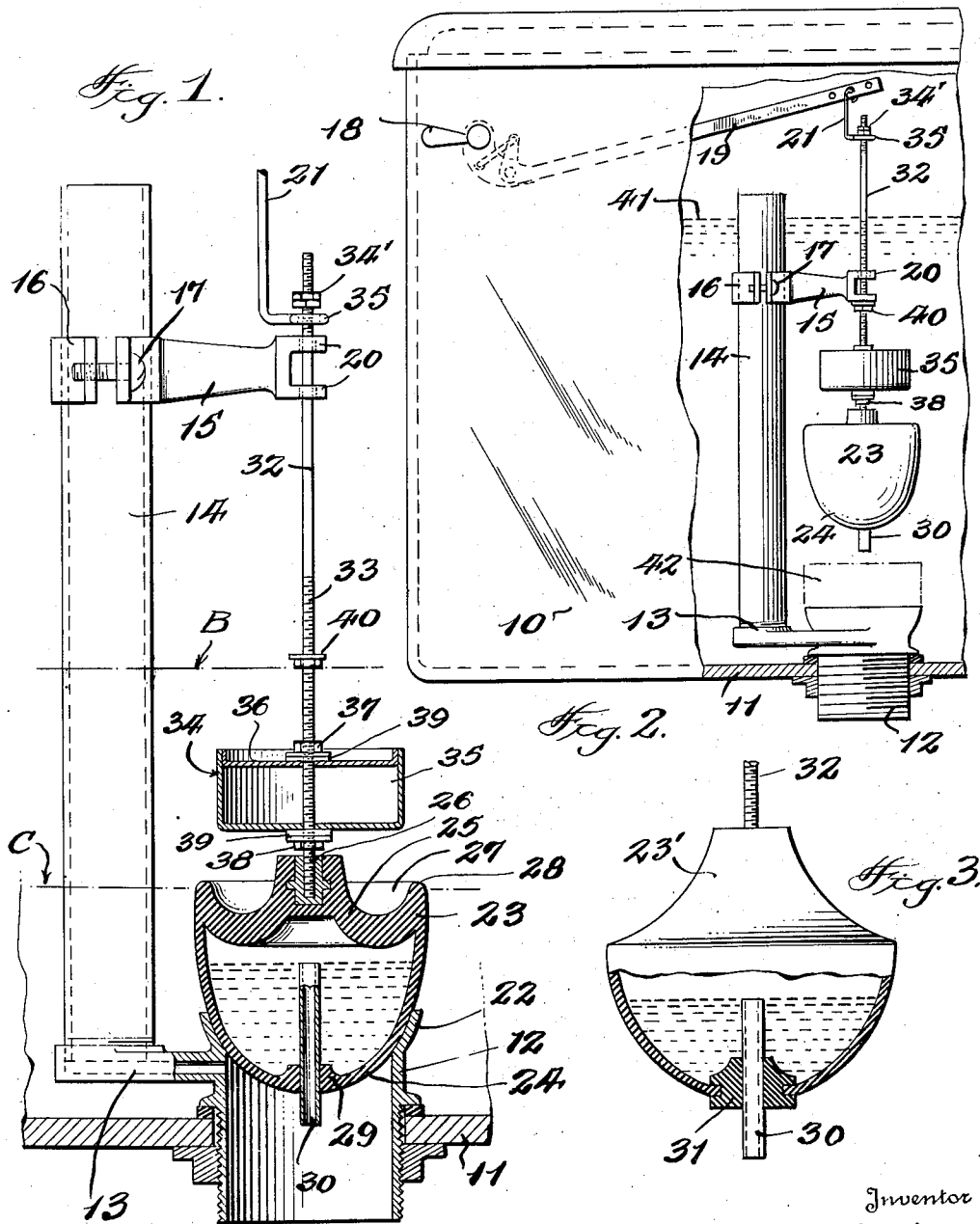
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FLUSH VALVE

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FLUSH VALVE

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The invention relates to flush valves such as used in water closets, and has for an object to provide a novel construction in such a valve and means for regulating its action, to the end that the quantity of water discharged at each operation may be controlled within satisfactory limits, without sacrificing the advantage of the full head obtained with a full tank, regardless of limiting the quantity of water discharged.

It is also an aim to present such construction which will permit usual tank and valve mountings to be employed, and in which the valve and adjusting means will be of an extremely simple nature, adapted to be produced at reasonable cost, and involving slight departure from ordinary valve constructions.

The need for adjusting means of this kind in order to economize the use of water, is well understood, and also the need to adapt the flushing action to special requirements or conditions where more or less water may be needed.

Another object of the invention is to provide means whereby the tendency of the hollow rubber ball with rounded bottom adapted to seat concentrically in the conventional outlet will be counteracted, this being a serious cause of water waste, due to the "slip-stream" which often results. It is a further object of the invention to provide a construction of valve which will minimize requirements for servicing, and especially subsequent to installation with the expensive calls of plumbers involved.

A still further aim is to present such an article which may be readily installed in the usual valve stem guide and mounting, which will embody in itself all necessary means for regulating the quantity of water discharged without necessity for disturbing the operating handle connections and guide device.

Additional objects, and features of invention as well as advantages in function and use, will be apparent from the following description and accompanying drawing, as will be appreciated by those experienced in the art.

Referring more particularly to the drawing:

Figure 1 is a sectional view of a tank and valve installation, embodying my invention.

Figure 2 is an elevational view of a portion of a tank, with the front wall broken away and showing my invention in elevation therein.

Figure 3 is a detail of a modified form of valve, partly in section, embodying my invention, and showing an adjustment different from that involved in Figure 1.

There is illustrated a familiar form of flush

tank 10, having a bottom 11, with an outlet opening suitably located, in which there is engaged a familiar form of outlet port and fitting 12, mounted on the tank in the familiar way, and including a lateral duct and stand pipe mounting 13, in which the usual standpipe 14 is erected. Upon the stand-pipe there is clamped a familiar form of bracket 15 having the clamping portion 16 and screw 17 by which it is secured in longitudinal adjustment on the pipe 14. Upon the front wall of the tank 10 there is also mounted the usual operating handle 18 by means of hooks, the valve raising lever 19 is operated, to connections of any suitable kind, these and the mounting of the lever being familiar in the art and therefore not illustrated. The outer end of the bracket arm 15 is provided with vertically apertured ears 20 in which a valve stem may slide, as is familiar in the art, and on the end of the lever 19, there is swingingly suspended a link 21 of conventional form engaged as usual with the lever 19.

The outlet fitting 12 is formed with a seat portion 22, having an inner face which may be in the form of a segment of a sphere adapted to fit against the spherical under side of a flush valve of rubber, generally corresponding in its lower surface to the surfaces of valves as heretofore used in this situation. There is provided a valve 23, formed of elastic rubber, the valve being generally termed a ball, being hollow and having lower wall portions 24 substantially spherical, the upper part being continued, so that the resultant shape in the present instance is substantially parabolic in vertical section. The wall portions 24 may be of suitable thickness to readily adapt themselves to the seat 22, and afford reasonable wear and resistance to distortion, although it is an advantage of my invention that the walls may be comparatively thin as compared to prior practice in such devices without liability of their failure to seat satisfactorily throughout the circumference of the seat 22. An integral thickened head or crown portion 25 is formed at the upper part of the valve, completely closing the space within the wall 24, and being suitably thickened to resist distortion and to afford anchorage for the screw socket or nut 26, customarily set in place in the molding of the valve. In the present instance, the head 25 is formed with an annular channel 27 in its upper side, adapted to hold a substantial amount of water for purposes to be explained, and its central portion is extended upwardly above the lip 28 at the outer side of the channel, the nut element 26 being set

flush with the top of this upwardly extending portion of the valve.

At the lower part of the valve, the wall 24 is thickened substantially, to afford a boss 29 which is centrally apertured and has tightly engaged therethrough a buoyancy control tube 30 of such length that while still snugly held in the aperture of the boss, it may be moved slidably therein until it approaches close to or against the head portion 25 of the valve. If desired, the mounting of the tube 30 may consist of a bushing or grummet 31 of somewhat stiffer material than the rubber of the body of the valve, and suitably engaged in the lower part of the valve, as shown in Figure 3, the tube 30 functioning therein in the same manner as it would in the valve boss 29. Screwed into the nut 26, there is a valve stem 32 of a size corresponding to that customarily employed in ordinary flush valves, but slightly longer and provided with screw threads extending throughout its lower half, as at 33. The upper end of this stem is also threaded as customary, and provided with nuts 34', the stem being inserted through the usual eye 35 of the link 21 and the nuts 34' used over the eye to regulate the height at which the eye will engage to lift the valve. The link 21 may be shortened to compensate for the greater length of the stem 32, if necessary.

A float 34 is vertically slidable on the stem 32 above the valve 35, this float in the present instance being a simple metallic chamber comprising a lower cup portion 35 and a lid 36, having an upwardly projecting flange fitted snugly in the wall of the cup 35, the lid body being planiform as well as the bottom of the cup 35. Nuts 37 and 38 are disposed over and under the float, arranged to hold the float in adjusted position, and interposed between these nuts and the float body there are ceiling and wear washers, as at 39, so that when the nuts are screwed snugly upon the washers, the chamber within the float is completely sealed. The float 35 is comparatively shallow, and of a diameter closely approximating that of the valve, although it may be of greater diameter than the valve if found expedient. Upon the stem a distance above the valve, there is secured a stop nut 40, adapted to engage the lower eye 26 of the bracket arm 16, to limit upward movement of the valve when the tank is flushed.

In the use of this valve, the tank 10 may be equipped with the usual water supply connection and float valve or other means, by which a water level is established approximately at 41, in Figure 2, such devices being familiar in the art and therefore not illustrated herein. This water level, as usual, is slightly below the top of the stand-pipe 14.

In operation, the valve being assembled substantially as shown in Figure 1, the channel 27 and the recessed lid 36 will become filled with water, so that the valve is weighted to a certain extent thereby, as will be appreciated. Additional weight may be added to the valve 23 by the adjustment of the pipe 30, through which water may be introduced into the valve to a level substantially as shown in Figure 1, where it will remain throughout operation of the device over a long period. The float 35 is adapted to sustain the valve either at the upper limit of its movement or with the float 35 at the surface, when the valve is above the vortex area indicated by the dotted outline 42 in Figure 2, approximately, and by the adjustment of the height of the float 35, the entry of the valve into this zone may be

determined with respect to the water level, so that at one adjustment of the float the valve will reach the zone while a comparatively high level is maintained in the tank, and with the float adjusted at a lower point on the stem, the valve will reach the vortex zone when the water is at a lower level in the tank. This is also contributed to in a measure by the quantity of water which is maintained in the valve by means of the pipe 30. By adjusting the pipe 30 at a low level the valve may be kept empty, and consequently more buoyant, which will be advantageous when the valve is adjusted or discharged at a low level of water in the tank, while when the float is adjusted at a higher point on the stem 32, it may be found desirable to maintain a larger quantity of water in the valve, so that its tendency toward lateral movements through buoyancy will be offset while it is deeply submerged.

With the device adjusted as shown in full lines in Figure 1, and the valve comparatively heavy, when the tank is flushed, by raising of the valve in the usual way, it will remain in elevated position with the stop 40 against the bracket 15 until the water level passes below the top of the float 35, whereupon the valve will be permitted to descend until at a point slightly above the dotted line B of Figure 1, the valve will have entered the vortex area 42 and will then be drawn precipitously to the seat 22, the water level at that time having reached the line B. If the float is adjusted at a higher point of the stem 32, the valve will function as indicated at a water level above the line B. By decreasing the amount of water in the valve by lowering the tube 30 therein, the buoyancy of the valve is so increased that it will operate at lower water levels than the line B, and when the valve is completely emptied, it will function to close when the water level is approximately at the line C illustrated, or indicated in Figure 1. The adjustment of the tube is made manually, and the tube is held frictionally in place with adequate security in all adjustments.

A benefit resulting from the formation of the channel 27 is manifest when the device is adjusted for maximum volume of discharge. It will be understood that seating of the valve effectively for complete closure of the seat 22 may be best effected while there is a substantial flow of water passing through the port, but if the seating of the valve is delayed until too small a quantity of water is above the seat the valve may engage the seat slightly off center, and because of increased friction with the seat due to absence of interposed water, may fail to slip sufficiently thereon to become best adjusted for complete circumferential engagement with the seat, or there may be a decrease of pressure of the valve against the seat at one side, which will permit a "slip stream" leak. This condition is not likely to occur when the device is adjusted for a small volume discharge, because then my valve seats while deeply submerged, and with a quantity of water in the valve around the pipe 30, pressure of this water will force the wall of the valve against the seat throughout its circumference, even if there is a slight eccentricity of the valve with respect to the seat—which is less likely to occur when maximum volume discharge is effected. In the latter adjustment of the device, when the water falls to a very low level the buoyancy of the valve is then greater and an ordinary valve would float high in the water, its seating being delayed until there would be liability of the valve engaging the seat without sufficient flow of water therearound

to insure its ready centering by gravity and syphonage. In my device, however, while the valve may have equal buoyancy while submerged, when the water falls to a level where the upper part of the valve tends to rise above the water, the weight of water in the channel 27 counteracts the buoyancy of the valve and causes it to become seated while there is still a substantial flow of water over the seat.

10 If the rubber of the valve tends to become excessively soft after long submergence, and from this or any other cause the wall tends to buckle inward, when the tube 30 is adjusted so as to maintain a substantial volume of water in the valve, the weight of this water, its momentum at the time of seating, together with syphon suction in the discharge port and the remaining strength in the wall of the valve, will insure its proper fit throughout the circumference of the seat.

20 The slightly cupped form of the top of the float 35 has a function somewhat similar to that of the channel 27, and enables the use of a maximum buoyancy in the valve assembly on the stem while the device is submerged, but preventing an excessive buoyancy when the water level falls below the top of the float, overcoming tendency to lack of prompt response of the valve to given adjustments, as well as other advantages. A further advantage lies in the fact that the high buoyancy of the assembly on the stem will cause very prompt rise of the valve from the vortex area and very certain flushing of the valve with all advantage of the full initial head of water over the discharge port; and especially will secure this action in case of incomplete operation of the operating handle 18, when with ordinary valves an incomplete flushing might occur.

I claim:

1. A float valve for the uses described comprising a stem, a hollow valve fixed on the lower end thereof, adjustable means to maintain water at a predetermined level in the valve, and a float 5 thereover adjustable vertically on said stem.

2. The structure of claim 1 in which said valve consists of a hollow elastic body, as a means for maintaining a water level therein consists of a tube engaged slidably through the lower part of 10 the valve.

3. The structure of claim 1 in which said float comprises a chamber having a closed bottom and head, and receiving head stem slidably there- 15 through, said stem being threaded, nuts being engaged upon the stem over and under the float, and means to seal the float around the stem.

4. The structure of claim 1 in which said valve is formed with a lower flexible seat-engaging wall portion centrally apertured and having a 20 thick apertured central part, a vertical rigid tube slidable therethrough, of a length to extend from the bottom of the valve to the top, the top of the valve comprising a stiff head portion having a central recess to receive the upper end of the 25 said tube therein at one adjustment, said tube being manually slidable in the valve.

5. A flush valve device of the character described comprising a stem, a hollow valve at the lower end thereof, a float on the stem above the 30 valve, said float having a cupped top adapted to hold a substantial quantity of water, the float being slidable on the stem, and means to secure the float at adjusted positions on the stem. 35

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