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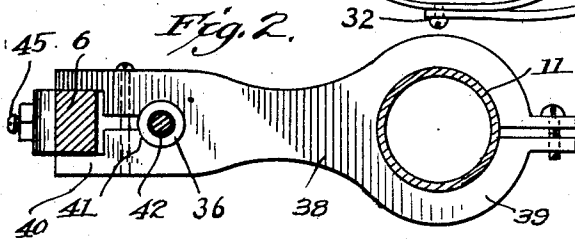
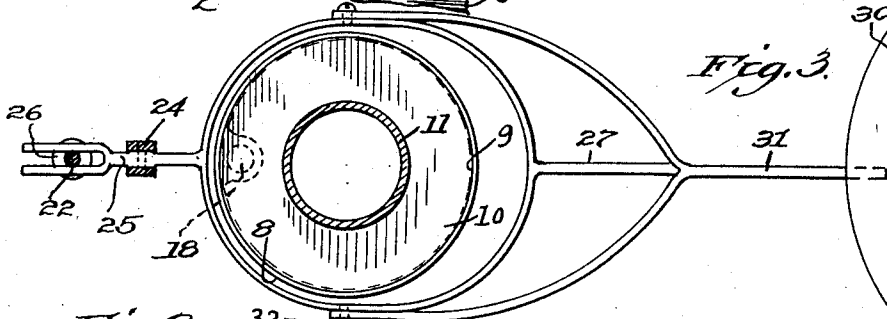
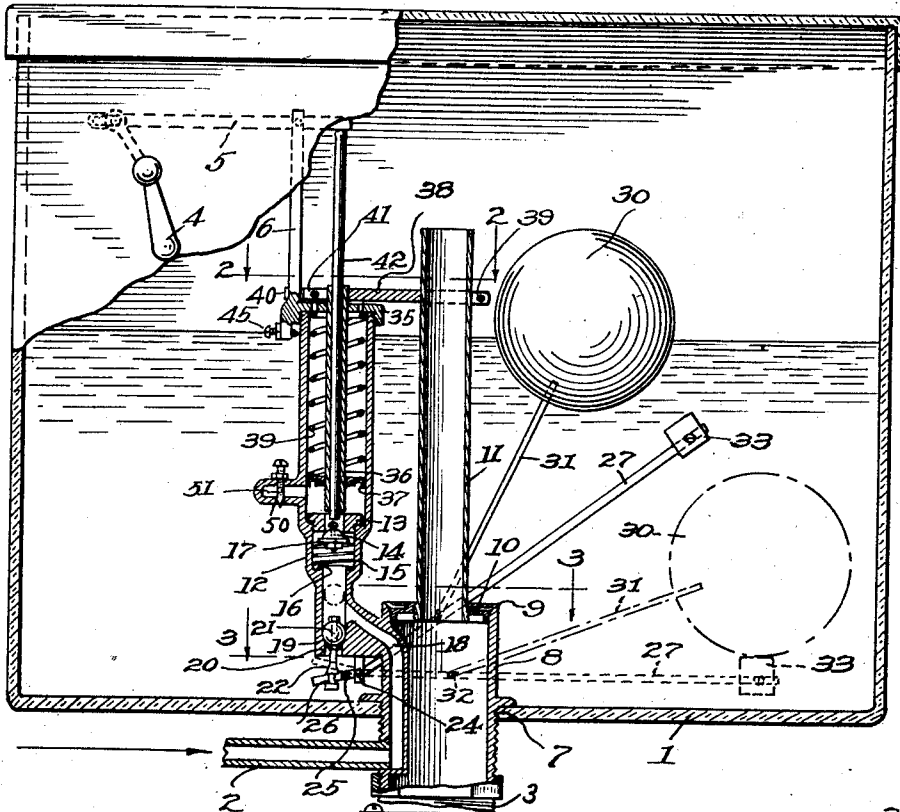
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FLUSH VALVE

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Fig. 1.



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FLUSH VALVE

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This invention is a flush valve for water closets and the like; and has for its object to provide improved means for maintaining the discharge outlet in open position for a predetermined interval and to then reclose the outlet with certainty of action.

It is a further object of the invention to utilize the service pressure for opening the discharge outlet, and to provide improved means for controlling the service pressure so as to insure positive operation of the flush valve.

It is another object of the invention to provide a reliable control for the water supply admitted to the flush tank and to insure positive but noiseless operation of the valvular means for cutting off the supply when the tank is filled.

It is a still further object of the invention to provide an extremely simplified construction permitting convenient assembly of its parts and including convenient adjustments for adopting the flush valve to various tanks and regulating its period of discharge.

Further objects of the invention will be readily understood from the following description of the accompanying drawings, in which:

Fig. 1 is a fragmentary front elevation of a water closet tank partly broken away and showing the flush valve partly in axial section.

Figs. 2 and 3 are transverse sections on the lines 2—2 and 3—3 respectively of Fig. 1.

The flush valve is illustrated as employed in a usual water closet tank 1 which is adapted to be supplied with water through pipe 2 and is arranged for flushing discharge through a pipe 3. The flush valve may be actuated by a usual hand lever 4 controlling a rock arm 5 which in the present instance is pivoted on a rod 6 projecting upwardly from the flush valve mechanism. The outlet 7 from tank 1 which is adapted for communication with discharge pipe 3 is shown as centrally positioned in the base of the tank, and is preferably threaded for engaging and supporting the entire flush valve mechanism.

The valve mechanism comprises an outlet pipe 8 threaded in opening 7 and connected

to discharge pipe 3, with the end of pipe 8 which extends into the tank forming a seat 9 for the discharge valve 10. A stand pipe 11 forming an overflow outlet is mounted on and opens through valve 10, and a cylinder 12 for the control mechanism may be formed integral with pipe 8 and is shown as projecting upwardly in tank 1 alongside the stand pipe 11.

A transverse valve seat 13 is provided in cylinder 12 intermediate of its ends, and a valve 14 is adapted to close upwardly against this seat and may be yieldably urged to closed position by a coil spring 15 mounted in the lower end of cylinder 12 and abutting at its respective ends against an internal shoulder 16 in cylinder 12 and against a washer 17 at the underside of valve 14 and for free flow of water past the same. A water supply conduit 18 is preferably formed in the wall of outlet pipe 8, and extends axially of the bore of the pipe so as to open through the side thereof at its lower end for communication with supply pipe 2, with the upper end of this supply conduit opening into the bore of cylinder 12 below shoulder 16 and in slightly spaced relation above the upper edge of a semi-spherical seat 19 which is formed in the base of cylinder 12 and which opens there-through into tank 1 as shown at 20.

A spherical valve 21 is vertically movable in the lower end of cylinder 12 so as to open or close outlet 20, with the valve when in open position permitting discharge of water from conduit 18 through the outlet 20 so as to refill the tank 1, and so arranged that just before it engages seat 19 the upper side of the valve is subjected to the service pressure in conduit 18 for quickly forcing the valve to its seat so as to close outlet 20 and thereby shut-off the water supply to the tank 1. The valve 21 is actuated by a float mechanism in tank 1, and is shown as mounted on a rod 22 which depends through outlet 20. An actuating lever is pivoted intermediate of its ends to a lug 24 which depends from cylinder 12, with short arm 25 of the lever engaging the lower end of rod 22 as shown at 26, and the long arm 27 of the lever carrying the float mechanism.

The float mechanism comprises a usual

hollow globe 30 mounted on a rod 31 which is pivoted at 32 to the long arm 27 of the actuating lever. This pivoted connection is spaced from both the free outer end of arm 27 and from its pivoted mounting 24, and is so positioned that when the tank 1 is full the float 30 will have swung 31 upwardly with relation to lever arm 27 and will have also rocked the lever arm so as to close valve 21 as shown in Fig. 1. When outlet valve 10 is opened for discharge of the water from tank 1, the resulting depression of float 30 will immediately swing lever arm 27 downwardly so as to open valve 21, and when the lever arm is in substantially horizontal position with valve 21 fully open the continued depression of float 30 produces a lost motion connection as a result of the pivoted connection 32 whereby the valve 21 will remain stationary in its open position until the float is at the bottom of the tank. As the tank is refilled through the open outlet 20, the float will rise, but due to the lost motion pivoted connection 32 will not move the lever arm 27 until after the rod 31 is substantially vertical with the tank nearly full, and the continued elevation of the float will then swing lever arm 27 upwardly to close valve 21 and shut-off the water supply to the tank. The swinging outer end of lever arm 27 may be adjustably counter-balanced as shown at 33 to insure lost motion operation of the float mechanism as has been described.

The upper end of cylinder 12 may be provided with an apertured cover plate 35 which may carry the upstanding supporting rod 6 for the rock arm 5, and a tube 36 is slidable through plate 35 with its lower end carrying a piston 37 operative in the upper end of cylinder 12 in spaced relation above valve seat 13. A transverse arm 38 is mounted on the end of tube 36 which projects above cover plate 35, and the tube and arm are normally depressed by a spring 39 mounted in cylinder 12 between piston 37 and cover plate 35, but are adapted for elevation relative to cylinder 12 for opening outlet valve 10 when rock arm 5 is actuated.

As an instance of this arrangement one end of arm 38 forms a split ring 39 adapted to be clamped on stand pipe 11, and the opposite end of the arm is preferably vertically guided on rod 6 by means of a fork 40, with the arm preferably vertically adjustable on tube 36 by means of a split clamp 41. A rod 42 extends through tube 36 and rests at its lower end on valve 14, and with valve 14 in normal closed position the upper end of rod 42 is positioned below and immediately adjacent the end of rock arm 5 as shown in Fig. 1, so that rocking the arm 5 by actuating the hand lever 4 will depress rod 42 and thereby open valve 14 against the tension of its spring 15. The cover plate 35 may be locked in rotatably adjusted position on cylinder 12 by means of a set screw 45, in

order to aline the upstanding rod 6 with the rock arm 5 and with the forked end of transverse arm 38.

Elevation of piston 37 on the cylinder 12 and against the tension of spring 39 is thus adapted to open valve 10 through the operating connection formed by tube 36, arm 38 and stand pipe 11; and the bore of cylinder 12 is provided with a bleeder port 50 opening to tank 1 and controlled by a needle valve 51, with said port communicating with the bore of cylinder 12 between the valve seat 13 and the normal depressed position of piston 37 shown in Fig. 1, so that after elevation of the piston for opening outlet valve 10, the pressure in cylinder 12 above valve seat 13 which has caused said movement of the piston, will gradually escape through bleeder port 50 and will thereby permit spring 39 to gradually depress piston 37 for closing the outlet valve 10 after a predetermined interval of time which is regulated by the adjustment of needle valve 51.

The parts are normally in the position shown in Fig. 1 with the water tank filled and ready for flushing discharge through pipe 8 and the outlet valve 10, intake valve 21 and control valve 14 all in closed position. To effect the flushing action arm 5 is rocked so as to depress rod 42 and open valve 14, whereupon the water supply from conduit 18 flows past the washer 17 and through the valve seat 13 so that service pressure is directed against piston 37 for elevating the same and thereby opening the outlet valve 10 for discharge of the water in the tank through the flush pipe 3. The float 30 is thereby lowered and immediately swings lever arm 27 so as to open valve 21 and permit the water supply from conduit 17 to flow through outlet 20 for maintaining the water supply for the flushing discharge. As soon as hand lever 4 is released, the spring 15 recloses valve 14 and the water above valve seat 13 then slowly drains through bleeder port 50 to permit corresponding gradual descent of piston 37 responsive to its spring 39. After a predetermined flushing interval, valve 10 will thus be reclosed, and the water supply continuing from conduit 18 through the open outlet 20 into the tank 1, will thus refill the tank. When float rod 31 has been swung to substantially vertical position relative to lever arm 27, further elevation of the float will swing the arm 27 upwardly and will thereby move valve 21 to closed position, and just prior to the seating of the valve the pressure in conduit 18 is directed against the upper side of the valve for positively shifting it to fully closed position so as to shut off the water supply to tank 1. The parts are then again in normal position ready for flushing action.

The improved mechanism is thus positive in operation and of simplified construction, and permits adjustment of the flushing interval by adjusting needle valve 51, and also provides for adaption of the device to various tanks and for adjustment to compensate for wearing of valve 10 by means of the adjustable mounting of arm 38 on both tube 36 and stand pipe 11. The stand pipe provides the usual overflow for limiting filling of tank 1 in the event of failure of valve 21 to properly close, and the positioning of the stand pipe on valve 10 adapted it for use as a part of the operating mechanism for the valve and also eliminates the necessity for a separate connection between the stand pipe and the flush pipe 3.

We claim:

1. Flush valve mechanism comprising a tank, a fluid supply to the tank, a discharge valve for the tank, a piston controlling the discharge valve, a control valve normally seated by pressure of the fluid supply so as to shut off said pressure to the piston, means for opening the control valve for directing the pressure of the fluid supply against the piston for actuating the piston to open the discharge valve, a valvular control for the fluid supply to the tank, and a float in the tank for actuating said valvular control.

2. Flush valve mechanism comprising a fluid supply, a discharge valve, a piston controlling the discharge valve, a control valve normally seated by pressure of the fluid supply so as to shut off said pressure to the piston, means for opening the control valve for directing the pressure of the fluid supply against the piston for actuating the piston to open the discharge valve, a valvular control for the fluid supply, and means for actuating said valvular control, the said pressure of the fluid supply being adapted to complete the closing of said valvular control.

3. Flush valve mechanism comprising a cylinder, a control valve in the cylinder, a piston in the cylinder at one side of the control valve, a fluid supply to the cylinder at the opposite side of the control valve tending to close said control valve for shutting off the pressure of the fluid supply to the piston, operating means extending into the cylinder for opening the control valve for actuating the piston by the pressure of the fluid supply, a discharge valve, and an operating connection between the piston and the discharge valve.

4. Flush valve mechanism comprising a tank, a discharge valve for the tank, a cylinder in the tank, a control valve in the cylinder, a piston in the cylinder at one side of the control valve, a fluid supply to the cylinder at the opposite side of the control valve, an outlet to the tank at said opposite side of the control valve, a valvular control for said outlet, operating means extending into the cylinder

for opening the control valve for actuating the piston by the pressure of the fluid supply, an operating connection between the piston and the discharge valve for opening the discharge valve by said actuation of the piston, and means for operating said valvular control in accordance with the level of the fluid in the tank.

5. Flush valve mechanism comprising a cylinder, a discharge valve, an operating member on the discharge valve, actuating means in the cylinder including an operating member, means for connecting said operating members, a support on the cylinder, and a rock arm pivoted to the support for controlling said actuating means, the said connecting means being guided by the support.

6. Flush valve mechanism comprising a tank, a fluid supply to the tank, a discharge valve for the tank, a piston controlling the discharge valve, a valve controlling pressure of the fluid supply to the piston for opening the discharge valve, means for opening the control valve, a valvular control for the fluid supply to the tank, and means for operating said valvular control in accordance with the level of the fluid in the tank, the said pressure of the fluid supply being adapted to complete the closing of said valvular control.

7. Flush valve mechanism comprising a tank, a fluid supply to the tank, a discharge valve for the tank, a piston controlling the discharge valve, a control valve normally seated by pressure of the fluid supply for shutting off said pressure to the piston, means for opening the control valve to permit pressure of the fluid supply against the piston for opening the discharge valve, a valvular control for the fluid supply to the tank, and means for operating said valvular control in accordance with the level of the fluid in the tank.

8. Flush valve mechanism comprising a tank, a fluid supply to the tank, a discharge valve for the tank, a piston controlling the discharge valve, a valve controlling pressure of the fluid supply to the piston for opening the discharge valve, means for opening the control valve, means for reclosing the control valve, a bleeder for the pressure against the piston, means for moving the piston to reclose the discharge valve in accordance with relief of the pressure against the piston, a valvular control for the fluid supply, and means for operating said valvular control in accordance with the level of the fluid in the tank.

9. Flush valve mechanism comprising a fluid supply, a discharge valve, a piston controlling the discharge valve, a valve controlling pressure of the fluid supply to the piston for opening the discharge valve, means for opening the control valve, means for reclosing the control valve, a bleeder for the pressure against the piston, means for moving the piston

ton to reclose the discharge valve in accordance with relief of the pressure against the piston, a valvular control for the fluid supply, and means for actuating said valvular control, the said pressure of the fluid supply being adapted to complete the closing of said valvular control.

In testimony whereof they have affixed their signatures to this specification.

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