

Oct. 9, 1928.

1,686,932

M. SCHILLER
FLUSH VALVE MECHANISM
Filed Sept. 26, 1927

Fig. 1.

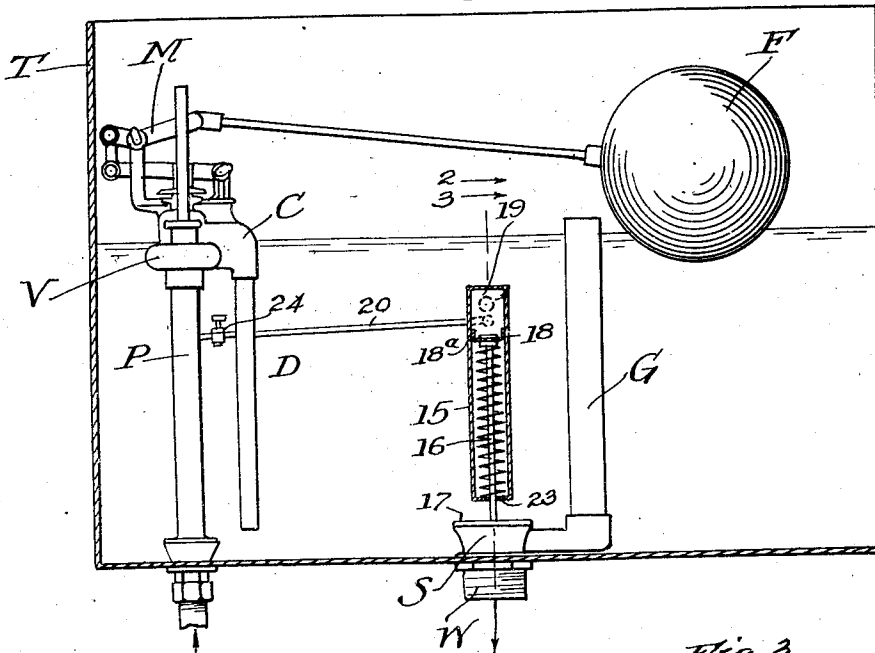


Fig. 2.

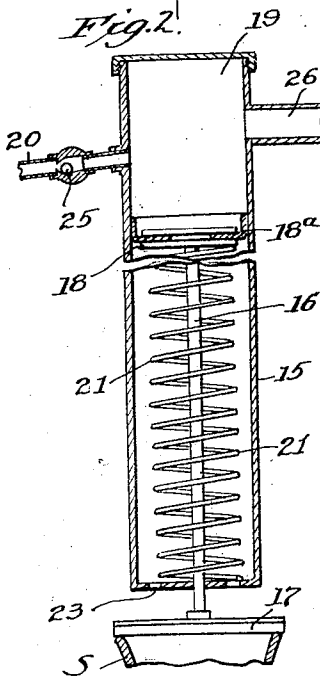


Fig. 3.

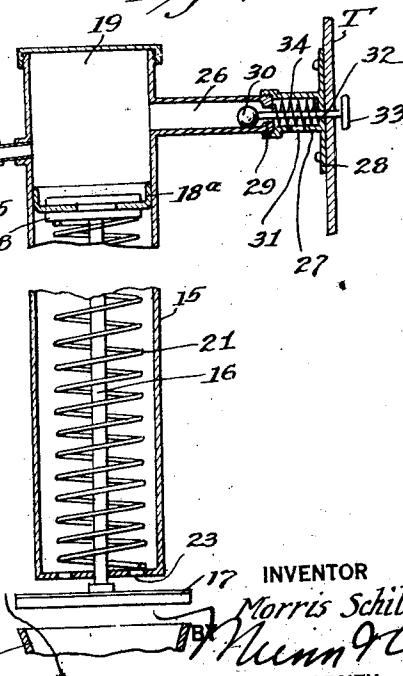
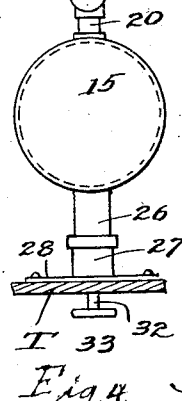


Fig. 4.



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FLUSH-VALVE MECHANISM.

Application filed September 26, 1927. Serial No 222,076.

My invention relates to flush tanks as used in water-closets, and it has particular reference to the flush valves thereof.

In flush tanks as heretofore constructed, the flush valves employed became ineffective after short use to properly close the outlet port or spud, and as a consequence water leaks from the tank into the bowl which is both wasteful and annoying. This defect arises by reason of the failure of the flush valve to properly seat on the spud due to faulty construction of the valve but mainly to the total lack of any means for positively seating the valve.

It is a purpose of my invention to provide a flush valve mechanism by which the liquid-tight sealing of the outlet port or spud is positively effected with each closing of the valve, thus eliminating water waste and the attendant annoyance.

In carrying out my invention, I utilize the pressure of water from the water supply line to actuate and force the flush valve beyond a tight seat on the spud, the water pressure being sufficiently positive in its closing action on the valve to overcome any structural defects which would tend to produce an improper seating.

I will describe only one form of flush valve mechanism embodying my invention and will then point out the novel features in claims.

In the accompanying drawings:

Fig. 1 is a view showing in vertical section and partly in elevation one form of flush valve mechanism embodying my invention in applied position to a flush tank;

Figs. 2 and 3 are vertical sectional views taken on the line 2—3 of Fig. 1, showing the two positions which the movable parts occupy during the operation of the mechanism; and

Fig. 4 is a fragmentary top plan view of the mechanism shown in the preceding views.

Referring specifically to the drawings, my invention in its present embodiment is shown associated with a conventional form of flush tank, although it is to be understood that it is adapted for use with any form of flush tank operating upon the same broad principle. The flushing apparatus, as here shown, comprises a tank T, having a water supply pipe P extending through the bottom thereof and connected at its upper end to a discharge pipe D through a coupling C, the latter containing a cut-off valve V which is operable by a mechanism M through the medium of a float F. Within the tank is an overflow pipe

G connected at its lower end to a spud S which constitutes an outlet port for the water contained in the tank and which is adapted for connection to a standpipe W leading downwardly to the bowl to deliver water from the tank to the bowl.

The flush valve mechanism constituting the subject-matter of my invention comprises, in the present instance, a cylinder 15 suitably secured in upright position within the tank T at a point directly above the spud S. This cylinder is closed at its opposite end, and a stem 16 is movable through the bottom of the cylinder and is fixedly secured to a valve 17 adapted to close the spud S to prevent discharge of water from the tank to the bowl.

The upper end of the stem 16 is provided with a piston 18 movable in the cylinder to occupy a lowered position as shown in Fig. 2 and a raised position as shown in Fig. 3. The piston may be of any suitable construction to prevent leakage of fluid past the piston, and in the present instance the piston is provided with a leather cup washer 18^a arranged as shown to insure a fluid-tight seal against water passing downwardly around the piston. At all times the piston is spaced from the upper end of the cylinder to provide an intervening chamber to which water under pressure is adapted to be delivered from a pipe 20. As shown in Fig. 1, this pipe is tapped into the water supply pipe P at a point below the valve V so that the water pressure of the pipe line can be delivered to the chamber 19 for actuating the piston 18. The piston is yieldably urged to the elevated position shown in Fig. 3 by means of a spring 21 disposed within the cylinder 15 and interposed between the lower end of the cylinder and a spider 22 secured to the stem 16 and slidable in the cylinder. The bottom of the cylinder is provided with vent openings 23 to allow free circulation of water and air into and out of the cylinder so that neither will interfere with the normal operation of the piston.

The quantity of water delivered to the chamber 19 within a given time can be varied through the provision and adjustment of a needle valve 24 in the pipe 20 for the purpose of varying the closing action of the valve 17 as it will be understood that the rate of flow of water to the chamber increases or decreases according as the needle valve is opened or closed thus increasing or decreasing the time required to close the valve 17. By varying the closing movement of the

valve 17, the duration of the flushing interval can be changed accordingly to suit bowls of different construction. Further, variation in closing movement of the valve 17 compensates for differing water pressures to the end of producing the required flushing of a bowl irrespective of the water pressure. Should the water pressure be relatively low, the needle valve can be fully opened thus securing the maximum rate of flow. Conversely, if the water pressure is relatively high, the needle valve is adjusted to reduce the rate of flow. A ball check valve 25 is also interposed in the pipe 20 at a point adjacent the pipe's connection with the cylinder 15. This valve 25 opens in the direction of the cylinder as clearly illustrated in Fig. 2, and is adapted to close only when the pressure of water in the supply pipe P is less than that of the water pressure in the chamber 19. In this manner any reduction in water pressure in the supply pipe will be ineffective to reduce the pressure in the chamber 19.

To permit discharge of water from the chamber 19 in order to relieve the piston 18 of water pressure and thereby permit the spring 21 to function in elevating the piston and consequently opening the valve 17, I provide an outlet pipe comprising a section 26 secured to the cylinder 15 and a section 27 having a closed and flanged end 28 secured to the inner wall of the tank T. The confronting ends of the pipe sections 26 and 27 are connected to each other and at this point a port 29 is provided controlled by a ball valve 30. Within the pipe section 27 an outlet port 31 is formed and through this port water from the chamber 19 can discharge into the tank when the valve 30 is in open position. The valve is normally held in closed position by the pressure of water in the chamber 19, but it is adapted to be manually moved to open position by a short operating rod 32 extending to a point exteriorly of the tank T and provided with a button 33. A spring 34 yieldably urges the rod to a projected position in which the valve 30 is allowed to seat and close the port 29.

In operation, the parts of the flush valve mechanism occupy the positions illustrated in Fig. 2 when the tank T is filled with water. The valve 17 is held in closed position by the pressure of water delivered to the chamber 19 from the pipe P and acting on the piston 18 to move the latter to the position shown in Fig. 2. In this position of the piston the stem 16 is depressed and the spring 21 compressed, and under the water pressure acting through the stem, the valve 17 is pressed into closed position on the spud S with a force sufficient to produce a water-tight seal.

To flush the tank it is only necessary to push the rod 32 inwardly until the valve 30 is unseated when the water in the chamber

19 will be discharged into the tank through the port 31. As the pressure on the piston 18 decreases the spring 21 functions to elevate the piston and move the valve 17 to open position, thus permitting the water to be discharged from the tank into the pipe W. It is important to note that the outlet provided by the pipe sections 26 and 27 and the port 31 are such that the rate of discharge of water from the chamber 19 is greatly in excess of the intake of water into the chamber from the pipe 20 whereby, opening movement of the valve 17 is relatively rapid as compared to its closing movement. However, by adjustment of the needle valve 24, this closing movement can be varied as required as has been previously described. Upon release of the rod 32 the valve 30 closes the port 29 so that water pressure again builds up in the chamber 19. Because of the restricted area of the pipe 20 this building up of pressure occurs slowly so that the piston 18 is gradually moved to its lowermost position thus delaying closing of the valve 17. As the water pressure against the piston is continuous, it will be clear that the valve 17 is positively held in closed position to again produce the water-tight seal and thereby eliminate leakage of water to the bowl and the attendant annoyance.

The situation often occurs where the water pressure in the supply pipe is greatly reduced owing to water being discharged at other points in the water line of a dwelling. This pressure may be reduced to such a degree as to render the water ineffective in maintaining the piston 18 in its lowermost position and consequently the spring 21 will function to open the valve 17. To prevent this accidental opening of the valve 17 the valve 25 has been provided, and as previously described, this valve closes automatically when the pressure of water in the supply pipe P is appreciably reduced, thereby preventing a reduction in water pressure within the chamber 19 so that the piston remains depressed and the valve 17 closed.

Although I have herein shown and described only one form of flush tank for water-closets embodying my invention, it is to be understood that various changes and modifications may be made herein without departing from the spirit of the invention and the spirit and scope of the appended claims.

What I claim is:

1. A flush valve mechanism comprising a spud, a valve yieldably urged to open position with respect to the spud, means for closing the valve, means adapted for connection to a water supply pipe for conducting water to said means so that its pressure actuates said means to effect a positive closing of said valve, means for relieving the first means of water pressure to allow opening of said valve, and a check valve for maintaining a pre-

determined pressure of water in the first means whereby temporary reduction of water pressure in the supply pipe will be ineffective to permit opening the valve.

5 2. A flush valve mechanism comprising a spud, a valve yieldably urged to open position with respect to the spud, means for closing the valve, means adapted for connection to a water supply pipe for conducting water to said means so that its pressure actuates said means to effect a positive closing of said valve, and a valve for controlling the quantity of water delivered to the first means in a given time.

15 3. In a water-closet flushing apparatus, a tank, a water supply pipe, a cut-off valve in the supply pipe, a water outlet through which water is discharged into a bowl, a flush valve for the outlet yieldably urged to open position, a piston for moving the valve to closed position, a pipe for conducting water pressure from the supply pipe at a point in advance of the cut-off valve to the piston to actuate the latter and thus close said valve, and manually operable means for relieving the piston of water pressure to allow opening of the valve.

20 4. In a water-closet flushing apparatus, a tank, a water supply pipe, a cut-off valve in the supply pipe, a water outlet through which water is discharged into a bowl, a flush valve for the outlet yieldably urged to open position, a piston for moving the valve to closed position, a pipe for conducting water pressure from the supply pipe at a point in advance of the cut-off valve to the piston to actuate the latter and thus close said valve, a port for relieving the piston of water pressure, a valve normally closing the port, and manually operable means for opening the port.

35 5. A flush valve mechanism comprising a spud, a valve yieldably urged to open position with respect to the spud, means for opening the valve, a piston for closing the valve, a pipe adapted for connection to a water supply pipe to deliver water pressure to the piston for closing the valve, and manually operable means for relieving the piston of water pressure to allow opening of the valve.

45 6. A flush valve mechanism comprising a spud, a valve yieldably urged to open position with respect to the spud, means for opening the valve, a piston for closing the valve, a pipe adapted for connection to a water supply pipe to deliver water pressure to the piston for closing the valve, a port for relieving the piston for water pressure, a valve normally closing the port, and manually operable means for opening the port.

60 7. A flush valve mechanism comprising a spud, a valve yieldably urged to open position with respect to the spud, means for closing the valve, a piston for closing the valve, a pipe adapted for connection to a water supply

ply pipe to deliver water pressure to the piston for closing the valve, manually operable means for relieving the piston of water pressure to allow opening of the valve, and a valve in the pipe for controlling the quantity of water delivered to the piston in a given time.

8. A flush valve mechanism comprising a spud, a valve yieldably urged to open position with respect to the spud, means for closing the valve, a piston for closing the valve, a pipe adapted for connection to a water supply pipe to deliver water pressure to the piston for closing the valve, manually operable means for relieving the piston of water pressure to allow opening of the valve, a valve in the pipe for controlling the quantity of water delivered to the piston in a given time, and a check valve for maintaining a predetermined water pressure against the piston when the relief is closed whereby temporary reduction of water pressure in said pipe will not reduce the pressure exerted against the piston.

9. A flush valve mechanism comprising a spud, a closed cylinder secured above the spud, a piston in the cylinder, a valve for the spud, a stem movable in the cylinder and operatively connected to the piston, a spring within the cylinder associated with the stem to yieldably urge the valve to open position and to elevate the piston, a pipe communicating with the cylinder above the piston and adapted for connection to a source of water supply to deliver water pressure to the piston and thus actuate the latter to move the valve to closed position against the action of said spring, an outlet pipe in communication with the cylinder above the piston for relieving the cylinder of water pressure, a valve normally closing the pipe, and manually operable means for opening the valve.

10. A flush valve mechanism as embodied in claim 9 wherein the first-mentioned pipe is provided with a valve for controlling the quantity of water supplied to the cylinder in a given time.

11. A flush valve mechanism as embodied in claim 9 wherein the first-mentioned pipe is provided with a check valve opening toward the cylinder and closing when the pressure of water within the pipe is less than that within the cylinder.

12. A flush valve mechanism comprising a valve normally urged to an open position with respect to an outlet, a piston for moving the valve to a closed position with respect to the outlet, means adapted for connection to a source of water supply under pressure for conducting the water to the piston so that the water actuates the piston to effect a positive closing of the valve, and means for relieving the piston of the water pressure to allow opening of the valve.

13. A flush valve mechanism comprising

a valve normally urged to an open position with respect to an outlet, a piston for moving the valve to a closed position with respect to the outlet, means adapted for connection to a source of water supply under pressure for conducting the water to the piston so that the water actuates the piston to effect a positive closing of the valve, a port for relieving the piston of water pressure, a valve normally closing the port, and means for actuating the last mentioned valve to open the port.

14. A flush valve mechanism comprising a valve normally urged to an open position with respect to an outlet, a piston for moving the valve to a closed position with respect to the outlet, means adapted for connection to a source of water supply under pressure for conducting the water to the piston so that the water actuates the piston to effect a positive closing of the valve, means for relieving the piston of the water pressure to allow closing of the valve, and means by which the quantity of water delivered to the piston in a given time can be varied at will.

15. A flush valve mechanism comprising a valve normally urged to an open position with respect to an outlet, a piston for moving the valve to a closed position with respect to the outlet, means adapted for connection to a source of water supply under pressure for conducting the water to the piston so that the water actuates the piston to effect a positive closing of the valve, means for relieving the piston of the water pressure to allow closing of the valve, and means for maintaining a predetermined water pressure against the piston when the relieving means is inactive, whereby a temporary reduction in pressure of the water from the source of supply will be ineffective to reduce the pressure exerted against the piston.

16. A flush valve mechanism comprising a valve normally urged to an open position with respect to an outlet, a cylinder, a piston in the cylinder operatively connected to the

valve for moving the valve to a closed position with respect to the outlet, the piston and cylinder co-operating to provide a chamber between the two, means adapted for connection to a source of water supply under pressure for conducting water to the chamber so that the water will act against and move the piston to effect a positive closing of the valve, and means for relieving the chamber of the water pressure to thereby allow the valve to move to open position.

17. A flush valve mechanism comprising a valve normally urged to an open position with respect to an outlet, a cylinder, a piston in the cylinder operatively connected to the valve for moving the valve to a closed position with respect to the outlet, the piston and cylinder co-operating to provide a chamber between the two, a pipe adapted for connection to a source of water supply under pressure for conducting water to the chamber so that the water will act against and move the piston to effect a positive closing of the valve, the chamber having a port, a valve normally closing the port, and means for actuating the valve to open the port and thereby relieve the piston of the water pressure acting thereon so that the first mentioned valve is free to move to open position.

18. A flush valve mechanism comprising a valve normally urged to an open position with respect to an outlet, a piston for moving the valve to a closed position with respect to the outlet, means adapted for connection to a source of water supply under pressure for conducting the water to the piston so that the water actuates the piston to effect a positive closing of the valve, means for relieving the piston of the water pressure to allow closing of the valve, and adjustable means for controlling the rate of flow of water to the piston, so that the time required for the water to actuate the piston and close the valve can be varied.

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