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FLUSH VALVE FOR WATER CLOSETS.

APPLICATION FILED JUNE 21, 191.

1,217,183.

Patented Feb. 27, 1917.

Fig. 1

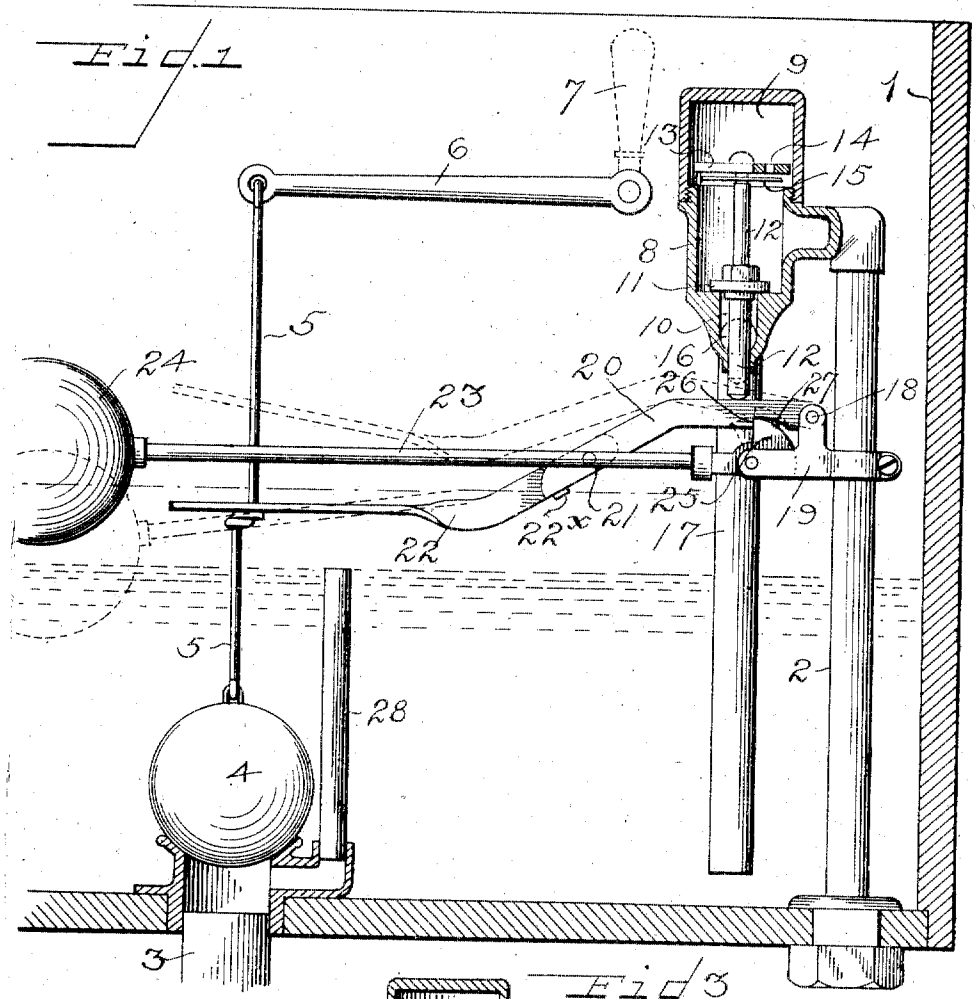


Fig. 3

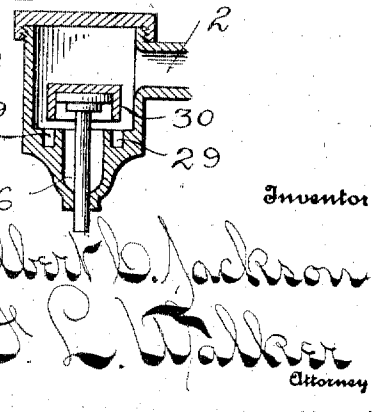
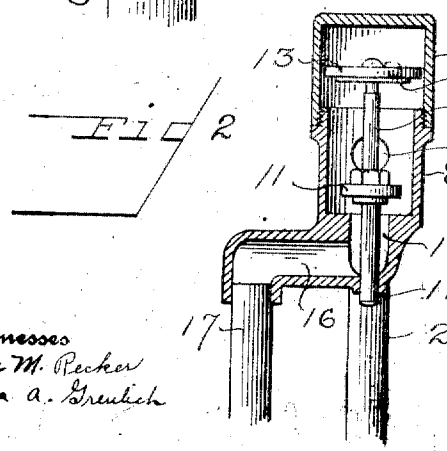


Fig. 2



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UNITED STATES PATENT OFFICE.

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FLUSH-VALVE FOR WATER-CLOSETS.

1,217,183. Specification of Letters Patent. Patented Feb. 27, 1917.

Application filed June 21, 1915. Serial No. 35,403.

To all whom it may concern:

Be it known that I, ALBERT C. JACKSON, citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Flush-Valves for Water-Closets, of which the following is a specification.

My invention relates to automatically controlled valves particularly adapted for use as supply or inlet valves for flush tanks of water closets but equally applicable to other constructions.

The object of the invention is to simplify the structure as well as the means and mode of operation of such devices whereby they will not only be cheapened in construction, but will be more efficient in use, positive in action, automatically controlled and unlikely to get out of repair.

As usually constructed, the supply or inlet valves of flush tanks are controlled by a float, which, as the water in the tank rises, gradually closes the valve until the predetermined level is reached, at which point the valve will be completely seated. In such constructions the relation of the inlet valve with the seat constantly varies in proportion to the height of the water within the tank. As the water level approaches the predetermined level, the supply valve is caused to gradually approach its seat thereby diminishing the water supply. This method of valve control prolongs the period of the filling operation and as the capacity of the inlet is reduced causes the valve to produce a shrill disagreeable whistling or screeching sound.

The primary object of the present invention is to provide means by which the tank will be rapidly refilled, thus reducing the period of filling to minimum. This is accomplished by maintaining the supply or inlet valve wide open during the entire filling operation and releasing it only when the tank has been filled. This will eliminate the disagreeable noise before mentioned. However, if the valve is permitted to close too suddenly it will cause a thud or loud sound as the valve strikes its seat.

A further object of the present invention is to provide means for automatically controlling the seating of the valve when released at the completion of the filling operation, whereby the flush tank will be rendered practically noiseless.

The present invention is supplemental to that shown and described in my copending application Serial No. 864516.

With the above primary and other incidental objects in view, as will more fully appear in the specification, the invention consists of the features of construction, the parts and combinations thereof, and the mode of operation, or their equivalents, as hereinafter described and set forth in the claims.

Referring to the drawings, Figure 1 is a vertical sectional view of the operating mechanism of a flush tank embodying the construction forming the subject matter hereof. Fig. 2 is a detail sectional view of the inlet valve and housing in a plane at right angles to that shown in Fig. 1. Fig. 3 is a detail sectional view of a modification of the valve control means.

Like parts are indicated by similar characters of reference throughout the several views.

As before stated, it has been customary to control the movement of a supply inlet valve of this character by means of a float so connected as to actuate the valve throughout its opening or closing movement or both. It is to be noted in the construction forming the subject matter hereof that while a float is employed, it does not actuate the valve in either direction. The supply or inlet valve herein described is opened by manual effort and is closed at the termination of the filling period by gravity assisted by the pressure of the water supply upon the valve. Thus both the opening and closing movements are accomplished independent of the float, the sole object of which is to lock the valve in its open position, after having been initially operated, and to release the valve when the water within the tank has reached a predetermined level. As a result of this construction the loss of water is reduced to a minimum as the supply valve will not be opened in the event the water level within the tank is lowered through leakage.

In the drawings, 1 is the tank provided

with an inlet conduit 2 and an outlet or flush conduit 3. The flush conduit 3 is controlled by the ordinary ball valve 4 connected by a jointed link 5 with one end of an operating lever 6. This operating lever may be oscillated to lift the ball valve 4 by means of a handle 7 on the outside of the tank or by means of a cord or chain as commonly employed. This is the usual construction and operation of flush tank outlet valves and forms no part of the present invention. It is obvious, however, that any other form of outlet valve and operating means may be employed in lieu thereof.

The inlet or supply conduit 2 terminates in a chambered head 8 provided with a closed dome 9. The dome 9 has been shown in the drawing in the form of a cap screw threaded to the housing 8. It is obvious, however, that any convenient construction and mode of attachment may be employed. The chamber of the head 8 is provided with a downward extension 10 normally closed by a valve 11 carried upon a vertically moving stem 12. The valve stem 12 extends downward through the extension 10 of the head 8 and projects through an opening at the lower end of said head.

The stem 12 also projects upward above the valve 11 and at its upper end carries a piston head 13 movable within the cylindrical dome 9. The piston head 13 is rigidly secured to the upper end of the stem 12 and is of a diameter slightly less than the interior bore of the dome 9. There is thus provided a clearance space or annular bypass of small proportion between the periphery of the piston head 13 and the interior face of the wall of the dome. This permits the water to gradually pass to and fro between opposite sides of the piston head.

In addition to the annular bypass formed by the clearance space surrounding the piston head there is provided a port 14 in said head closed during the downward movement of the piston by a movable disk 15 of comparatively thin material carried upon the valve stem 12 immediately below the piston head 13.

The disk 15 is controlled by water pressure whereby in the downward movement of the piston 13 it will close the port 14 compelling the water in passing from one side of the piston head to the other to pass intermediate the periphery of the head and wall of the dome. This will retard the movement of the valve, causing it to seat itself more slowly. However, in the upward movement of the valve and piston the movable disk 15 will be forced away from the piston head 13 by water pressure, permitting free flow of water through the port 14 thereby reducing the resistance to the movement of the valve and piston.

Leading from the extension 10 of the head 8 is an outlet 16 communicating with a downwardly extending discharge pipe 17 terminating adjacent to the bottom of the tank and below the low water level.

Pivoted at 18 to a suitable bracket 19 which may be attached to the wall of the tank but is preferably carried by the inlet conduit 2 is an oscillatory arm 20 extending beneath the lower end of the valve stem 12 of the valve 11 and adapted in its upward oscillation to engage said valve stem and elevate the valve 11 off its seat. The arm 20 may consist of a single integral member continuous throughout but is preferably formed in two sections pivoted one to the other as at 21. The terminal section 22 is capable of oscillatory movement about the pivotal connection 21 in a downward direction independent of the primary section 20 but is provided with a lug 22× adapted to engage the primary section 20 in the upward oscillation of the extension 22 to cause said parts to move in unison. At its outer end the extension arm 22 is provided with a slotted perforation through which the jointed links 5 extend.

There is also pivotally mounted in the bracket 19 an oscillatory arm 23 carrying at its outer end a float 24 which acts by gravity to lock the valve in open position. The arm 23 is provided with a sector shaped head 25 having a shoulder 26 engaging in a notch 27 in the lower edge of the oscillatory arm 20. The construction is such that so long as the shoulder 26 of the sector shaped head is engaged in the notch the float arm 23 will be held in its elevated position. In order that the float 17 may act quickly to lock the valve after its initial operation the float is normally maintained in an elevated position above the normal fluid level, from which it falls by gravity when released at the opening of the valve. The float may be said to be a buoyant weight falling by gravity to lock the valve and lifted by its buoyancy to release the valve. The flush tank is provided with an outlet or overflow bypass conduit 28 at normal water level of less capacity than the inlet conduit 2. The construction is such that during the filling operation an excess of water will be delivered to the tank sufficient to cause the float 24 to rise above the normal level of the water. The shoulder 26 is so located on the head 25 that it will not engage in the notch 27 until the float 24 has been elevated above the normal water level. When the shoulder 26 and notch 27 have interengaged and the inlet valve 11 has seated itself and arrested the inflow of water, the excess will be drained away through the outlet bypass 28, leaving the float 24 maintained in its elevated position by the engagement of the shoulder 26 of the sector shaped head with the notch 27 of the arm 20.

The operation of the device is as follows: The oscillation of the operating lever 6 by means of the handle 7 elevates the jointed links 5 to lift the ball valve 4 from off its seat. This permits the escape of water from the tank. During the upward movement of the jointed links 5 the joint 29 thereof or a button or similar projection carried by the links engages the extremity of the extension 22 of the arm 20 and carries said arm 20 and its extension upward in unison with the links 5. The upward movement of this arm to the position shown in dotted lines in Fig. 1 elevates the valve 11 off its seat. This permits the water supply to discharge into the tank from the conduit 2 through the head 8 and extension 10 thereof and thence through the outlet 16 and discharge conduit 17 to the bottom of the tank. The water within the dome 9 which is under pressure affords no material resistance to the upward movement of the valve inasmuch as the pressure is equal on opposite sides of the piston and during the upward movement the port 14 in the piston head 13 is open. The water within the dome above the piston head 13 escapes through said port 14 and through the annular bypass or clearance space surrounding the piston.

Upon such elevation of the oscillatory arm 20 the notch 27 is lifted out of engagement with the shoulder 26 of the head 25 and the float 24, being no longer supported thereby, falls from its elevated position. As the float descends the sector shaped head oscillates beyond the notch 27 and serves as a stop to hold the arm 20 elevated. By holding the arm 20 elevated the head 25 maintains the inlet valve 11 open until the float is returned by the rising water level to a point where the shoulder 26 is moved past the shoulder of the notch 27 whereupon the arm 20 will fall into engagement with the head 25 and again lock the float in its elevated position. As before stated, the float 24 at the time of engagement of the shoulder 26 and notch 27 is elevated above the normal water level by the excess water admitted which subsequently escapes through the outlet 28 leaving the float supported solely by the shoulder 26. When the arm 20 descends to locking position it leaves the inlet valve 11 in open position and suspended upon the water within the head 8. It will be noted that the inlet valve was locked during the entire discharge and filling operations. At the termination of the filling operation the inlet valve is unlocked but does not close immediately as the water pressure within the head 8 and dome 9 resists rapid movement of the piston 13 and the descent of the valve to its seat will be gradual. During this closing movement the movable disk 15 will have moved into contact with the piston head 13 and closed the port 14 under the influence of the water pressure and the water will pass but slowly from the under side of the piston head 13 to the upper side or dome 9 thereby controlling the seating movement of the valve 11 and preventing a sudden movement thereof. The inlet valve is thus maintained at maximum opening during its operative period and at the termination of this period is closed quickly but not suddenly. The valve is under control during its closing operation and the speed with which it reaches its seat is dependent upon the rapidity with which the water is permitted to pass from the under side of the piston head 13 to the upper side thereof.

It is obvious that the provision for a supplemental water supply by which the float is elevated above the normal level is unnecessary if means is provided for maintaining the flush valve 4 open for a sufficient period of time to permit the float 24 to fall with the water level sufficient to bring the sector shaped head 25 into locking position. It will likewise be unnecessary if the handle 7 is held for sufficient length of time to permit the necessary movement of the float and locking head.

In the construction above described the valve is cushioned in its seating movement by the body of water under pressure within the chamber head. The water being normally under equal pressure on opposite sides of the piston head 13, the seating of the valve will be effected solely by gravity. The valve, however, will be prevented from operating suddenly for if the valve and attached piston should descend at a too rapid rate or faster than the water can pass through the annular by-pass to the upper side of the piston head, the tendency will be for the piston head to create a partial vacuum or to reduce the pressure within the dome. The pressure upon the opposite side of the piston head would thus be unequal and the water below the piston exerting its pressure upward would arrest the valve and piston. The valve is thus under constant control and is permitted to settle gradually to its seat under the influence of gravity at a rate proportionate to the passage of water through the annular bypass from the lower side of the piston to the upper side thereof. The seating of the valve is thus controlled directly by the escape of water past the piston during the seating movement.

In Fig. 3 there has been shown a modification of this construction in which the bottom of the chamber 8 is provided with an annular recess 29 surrounding the seat of the valve 11. The valve 11 is provided with a flanged head 30, the flange of which projects within the annular recess 29 when the valve 11 is seated. The flange of the head 30 substantially conforms in cross section to the cross section area of the recess 29 leaving a

slight clearance space for the escape of the water from the recess 29 as the flange 30 settles thereinto. In this construction as the valve 11 approaches its seat the flange of the head 30 encounters the resistance of the water confined within the recess 29 which tends to retard the movement of the valve, permitting it to settle to its seat at a rate proportionate to the escape of the water from the recess 29 through the clearance space about the flange of the head 30. While in this construction the particular means for accomplishing the result is different, the principle involved is quite similar. In both instances the valve is controlled by the pressure of a confined body of water which permits the valve to seat itself as the water escapes through the bypass.

The purpose of joining the arms 20 and 22 is to prevent the float 24 being accidentally supported upon the extension of the arm and so held against operation. In the construction as described the extension 22 of the arm 20 being free to swing downward would move down in unison with the float in the event the latter was accidentally engaged therewith.

From the above description it will be apparent that there is thus provided a device of the character described, possessing the particular features of advantage before enumerated as desirable but which obviously is susceptible of modification in its form, proportion, detail construction, or arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute the invention has been described in language more or less specific as to certain structural features, it is to be understood that the means and construction herein described comprise but one mode of putting the invention into effect and the invention is therefore claimed broadly in any of its possible forms or modifications within the scope of the appended claims.

Having thus described my invention, I claim:

1. In an apparatus of the character described, a reservoir, an inlet valve therefor, a reciprocatory piston controlling the movement of said valve, a gravity controlled lock for maintaining the piston in an inoperative position, and a float adapted to release said piston when the fluid within the reservoir has reached a predetermined level, whereby said piston will be permitted to govern the subsequent movement of the valve.

2. In an apparatus of the character described, a reservoir, an inlet valve therefor, manually operated valve opening means, a fluid pressure controlled piston governing the movement of said valve, a gravity operated lock for maintaining the piston inoperative, and a float adapted to release the piston when the fluid within the reservoir reaches a predetermined level.

3. In an apparatus of the character described, a reservoir, an inlet valve therefor, an oscillatory lever adapted by its oscillatory movement to unseat the valve, means for locking the lever in its operated position, and means for unlocking the lever when the water within the tank reaches a predetermined level.

4. In an apparatus of the character described, a reservoir, an inlet valve therefor, a weighted arm, a manually operated lever normally engaged with the weighted arm and holding the arm in elevated position, means for manually disengaging the lever and arm, said lever being adapted to unseat the valve in its disengaging movement, the weighted arm being adapted to hold the lever in operated position, substantially as specified.

5. In an apparatus of the character described, a reservoir, an inlet valve therefor, a valve operating lever, a weighted arm normally engaged by the lever to hold said arm in an elevated position, said lever being adapted to simultaneously unseat the valve and release the arm, and a lock for said lever actuated by the movement of the arm.

6. In an apparatus of the character described, a reservoir, an inlet valve therefor, an operating lever for said valve having a detent shoulder thereon, a weighted arm, an oscillatory segmental head carrying the weighted arm and engaging the detent shoulder of the lever to hold the weighted arm in elevated position, and disengaged therefrom by the oscillation of the lever, said segmental head being adapted to project into the path of the lever upon its release therefrom to lock the lever against return movement.

7. In an apparatus of the character described, a reservoir, an inlet valve and an outlet valve therefor, an operating arm moving in both directions in unison with the outlet valve and adapted when moved in one direction to open said inlet valve, but adapted upon the return movement of the outlet valve to return independent of said inlet valve, means for temporarily locking the inlet valve in open position to which it is moved by the operation of said arm and means for releasing said valve.

8. In an apparatus of the character described, the combination with a reservoir having inlet and outlet valves, of a jointed operating lever for the inlet valve comprising a pair of arms pivotally engaged one with the other at a point removed from their common fulcrum, interengaging means between the arms of said lever whereby said arms when oscillated in one direction will move in unison, the terminal arm being

adapted to move about their pivotal joint in the opposite direction in unison with the movement of the outlet valve independent of the movement of the other arm about the common fulcrum.

9. In an apparatus of the character described, a reservoir having an inlet valve, operating means for said valve including a pivoted arm, an operating arm pivoted to said first mentioned arm at a point removed from the fulcrum of the latter, and interengaging means between the operating arm and first mentioned arm whereby said arms will move in unison about a common fulcrum when moved in one direction but permitting said operating arm to return independent of said locking arm.

In testimony whereof, I have hereunto set my hand this 18th day of June A. D. 1915.

ALBERT C. JACKSON.

Witnesses:
HARRY F. NOLAN,
F. L. WALKER.