Aug. 4, 1936. W. E. SLOAN 2,049,521

FLUSH VALVE

Filed Feb. 5, 1931

Fig. 1

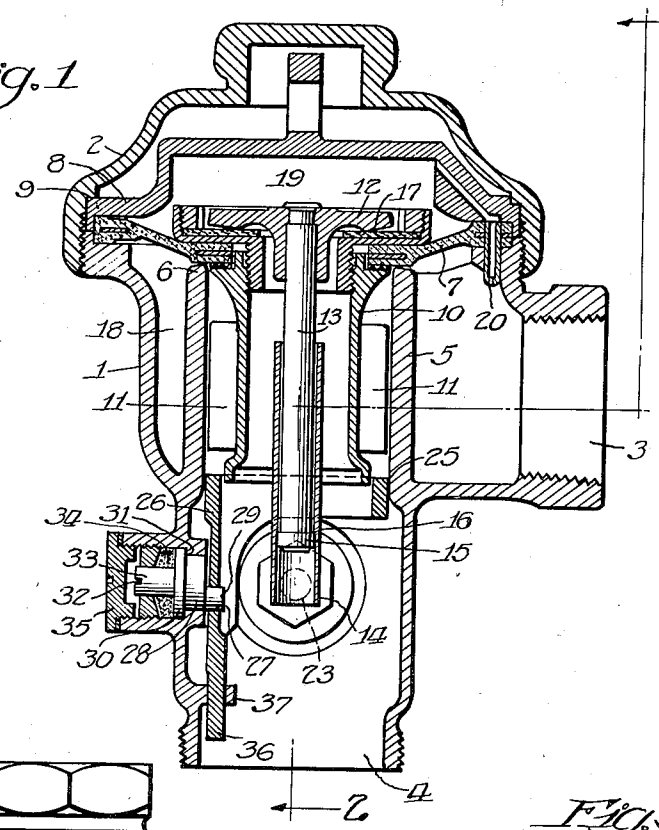


Fig. 2

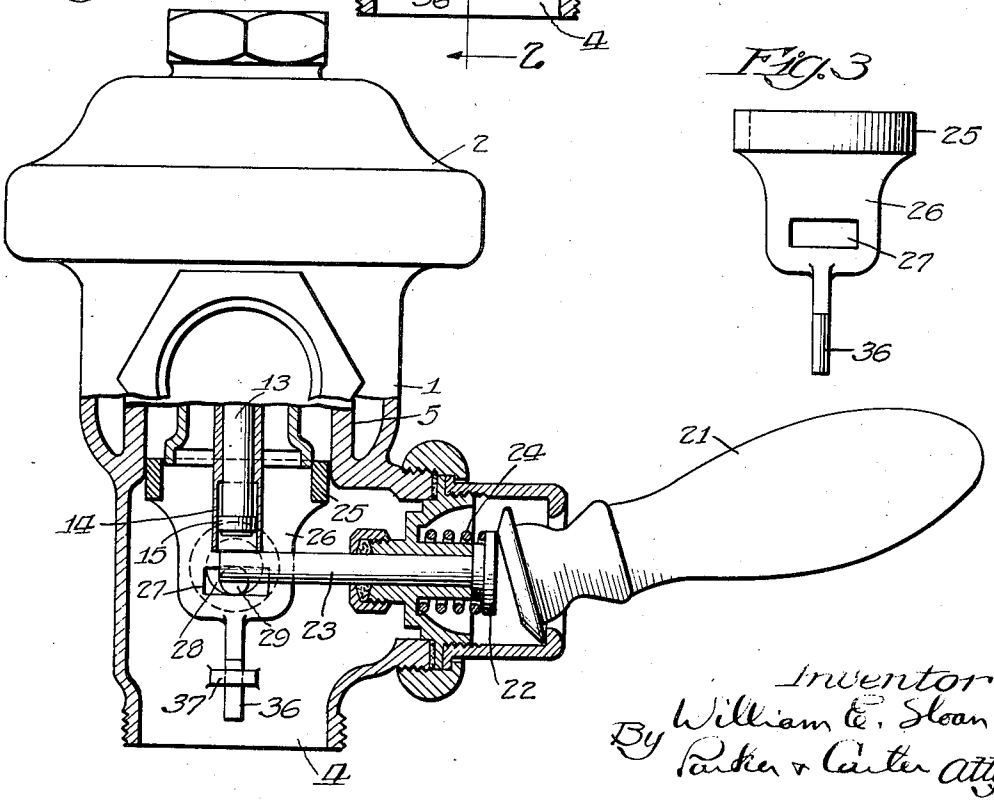


Fig. 3

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FLUSH VALVE

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8 Claims. (Cl. 137—93)

This invention relates to flush valves and has for its object to provide a new and improved device of this description. The invention has as a further object to provide a flush valve wherein the amount of water passing through the valve may be varied as desired. The invention has as a further object to produce this result without changing or varying the by-pass of the valve or the distance through which the valve moves in its cycle of operation, and it has as a further object to provide an adjustment for varying the amount of water passing through the valve, such adjustment being accessible from the outside of the valve. The invention has other objects which are more particularly pointed out in the accompanying description.

Referring now to the drawing, Fig. 1 is a longitudinal sectional view of one form of flush valve embodying the invention;

Fig. 2 is a view of the flush valve in part section showing the operation of the non-hold open feature;

Fig. 3 is a view of the adjusting member.

Like numerals refer to like parts throughout the several figures.

In the construction shown in the drawing, the flush valve is provided with a casing having a lower section 1 and an upper section 2. There is an inlet 3 through which the water enters, and an outlet 4 through which the water is discharged. The casing is provided with an inner cylindrical part 5, the upper edge 6 of which acts as the seat for the main valve which, as herein shown is a diaphragm valve consisting of a diaphragm 7 having its edges clamped between the upper part of section 1 of the casing and a clamping member 8, the clamping member being pressed against the upper part of the diaphragm by the shoulder 9 on the upper casing section 2 when said section is in position.

Connected with the diaphragm 2 is a cylindrical portion 10 which slides in the cylindrical part 5 and which is preferably provided with guiding wings 11. The diaphragm is provided with a central opening, and an auxiliary valve 12 is carried by the main valve and is provided with an actuating member which consists of the parts 13 and 14 slidably connected together. The part 13 is provided with an enlargement 15 which engages a shoulder 16 on the part 14 so as to limit the downward movement of the part 14. The auxiliary valve 12 engages a seat 17. The main valve, consisting of the diaphragm and attached parts, divides the casing into two chambers 18 and 19. A by-pass 20 of small cross sectional area connects the two chambers on opposite sides of the main valve. This by-pass permits water to pass from chamber 18 up into chamber 19 so as to equalize the pressure in the two chambers.

The valve is operated by opening the auxiliary valve 12. This permits the water in chamber 19 to escape down into the discharge 4, reducing the pressure above the diaphragm so that the pressure in chamber 18 below the diaphragm lifts the main valve so as to permit the water to flow from the inlet 3 between the diaphragm 7 and the seat 6, and thence out through the discharge 4. This opening of the auxiliary valve is accomplished by means of a handle 21 which engages an enlarged end 22 of an operating member 23, which operating member engages the actuating member of the auxiliary valve so as to move the lower end thereof laterally to tilt the auxiliary valve to open it. The operating member 23 is moved inwardly when the handle is moved in any direction. There is a retracting spring 24 for returning the parts to their initial position when the handle is released.

When the auxiliary valve is opened, the main valve is lifted, carrying the auxiliary valve with it, and this carries the actuating member of the auxiliary valve above the operating member 23. The auxiliary valve then is moved so as to be closed and the water passing through the by-pass 20 builds up the pressure in the upper chamber 19 and this pressure, together with the weight of the main valve, causes the main valve to move downwardly to its closed position. If, now, the handle 21 is held in its operative position so that the operating member 23 is still under the actuating member of the auxiliary valve, the part 14 of such actuating member will engage the top of the operating member 23 and slide along the member 13 without opening the auxiliary valve 12, thereby permitting the main valve to close. It will thus be seen that this provides a non-hold open feature which prevents the valve from being held open by holding the handle 21 in its operative position.

Means is provided for varying the amount of water passing through the valve without changing or varying the by-pass or the distance through which the main valves moves in its cycle of operation. In the construction shown this result is secured by providing an adjustable control member 25 which assists in controlling the flow of water through the valve. This control member fits in the space between the valve casing and the

cylindrical portion 10, as clearly shown in Figs. 1 and 2. The control member 25 is adjusted from the exterior of the valve so that it may be moved up or down to vary the amount of water passing through the valve. In the construction shown this control member has a projection 26 with a slot 27. Mounted on the casing in proximity to the projection 26 is a rocking member 28 having a pin 29 eccentrically connected therewith and which works in the slot 27. The rocking member 28 is provided with a projection 30 which engages a shoulder 31 which limits its downward movement. The rocking member 28 is rocked in any desired manner, as by applying a tool to the recess 32 in the end 33 which projects through the packing gland 34 so as to be readily accessible from the exterior of the valve. The removable cap 35 normally covers the end 33. The projection 26 has a guide member 36 connected therewith which works in a guide 37.

If it is desired to lift the control member 25 so as to reduce the amount of water passing through the valve, the rocking member 28 is moved so as to bring the pin 29 to a higher position. When it is desired to increase the amount of water passing through the valve, the rocking member is moved so as to bring the pin 29 in a lower position, thus lowering the control member. The use and operation of my invention are as follows:

When it is desired to operate the valve, the handle 21 is moved in any direction, and this causes the member 23 to be moved inwardly so as to engage the stem of the auxiliary valve so as to tilt said valve and permit the water in chamber 19 to escape. The main valve then moves upwardly so as to permit water to flow from the inlet 3 through the valve and out the outlet 4. If, now, the handle 21 is held in its operative position, the valve will go through its cycle and as it lowers, the part 14 engages the operating member 23, as shown in Fig. 2, and slides along the member 13 so as to permit the main valve to sit. This construction provided a non-hold open feature for the valve.

It will be seen that when the end of the part 10 of the main valve, as it is moving towards its closed position, comes opposite the control member 25, the flow of the water is partially or wholly stopped at that point. This, therefore, reduces the amount of water which flows through the main valve before it reaches its closed position. It will thus be seen that by moving the control member 25 upwardly, this closing effect is secured earlier in the movement of the main valve and the amount of water passing through the main valve thus reduced. It will further be seen that by moving this control member downwardly the closing effect is produced later in the cycle of the main valve and therefore more water passes through the main valve. By proper adjustment of this control member, it will be seen that any desired amount of water may be passed through the valve at one cycle of its operation and when the actuating handle 21 is being held in its operative position. In other words, the adjustment of the amount of water flowing through the valve is independent of all of these agencies. The adjustment can be easily and quickly made from the exterior of the casing.

It will be seen that by means of this construction the amount of water passing through the valve in any given cycle of operation is varied by throttling this water. In other words, by means of this device the main valve may be opened a certain amount and yet by one adjustment, while opened this certain amount, less water passes through the main valve than by another adjustment. This lesser amount of water being due to the throttling effect on the main valve.

It will further be seen that this arrangement provides means for varying the amount of water passing through the valve at any given operation without either changing, altering or disturbing the by-pass, as well as without changing the travel of the main valve. Furthermore, this construction is of great assistance in securing the desired amount of refill water, that is water for filling the bowl, for after the main flush has occurred this construction throttles the water so that it does not rush out through the bowl but flows gently into the bowl so as to properly refill it. The packing in the packing gland 34 is kept tight and prevents the part 28 from being accidentally turned.

I claim:

1. A flush valve comprising a casing having an inlet and an outlet, a main valve in the casing dividing it into an upper and lower chamber, a seat therefor, a connection leading from the upper chamber through the main valve to said outlet, an auxiliary valve controlling said connection, an actuating device for said auxiliary valve, said main valve having a downwardly projecting portion extending below the main valve seat separated from the interior wall of the casing by a space, a control member fitting in this space, and means for adjusting said control member to vary the amount of water passing between the main valve and its seat due to the opening of the main valve at any given cycle of its operation.

2. A flush valve comprising a casing having an inlet and an outlet, a main valve in the casing dividing it into an upper and lower chamber, a seat therefor, a connection leading from the upper chamber through the main valve to said outlet, an auxiliary valve controlling said connection, an actuating device for said auxiliary valve, said main valve having a downwardly projecting portion extending below the main valve seat separated from the interior wall of the casing by a space, a control member fitting in this space, and means for adjusting said control member to vary the amount of water passing between the main valve and its seat due to the opening of the main valve at any given cycle of its operation, said adjusting means accessible from the exterior of the casing.

3. A flush valve comprising a casing having an inlet and an outlet, a main valve in the casing dividing it into an upper and lower chamber, a connection leading from the upper chamber through the main valve to said outlet, an auxiliary valve controlling said connection, an actuating device for said auxiliary valve, said main valve having a downwardly projecting portion separated from the interior wall of the casing by a space, a control member fitting in this space, and means for adjusting said control member to vary the amount of water passing between the main valve and its seat due to the opening of the main valve at any given cycle of its operation, said means comprising an engaging part which engages said control member, and means for moving said engaging part to raise or lower the control member.

4. A flush valve comprising a casing having an inlet and an outlet, a main valve in the casing dividing it into an upper and lower chamber, a connection leading from the upper chamber

through the main valve to said outlet, an auxiliary valve controlling said connection, an actuating device for said auxiliary valve, said main valve having a downwardly projecting portion separated from the interior wall of the casing by a space, a control member fitting in this space, and means for adjusting said control member to vary the amount of water passing between the main valve and its seat due to the opening of the main valve at any given cycle of its operation, said means comprising a rocking member, a pin eccentrically connected therewith which projects into a slot in the control member, and means accessible from the exterior of the valve for rocking said rocking member to raise or lower the control member.

5. A flush valve comprising a casing having an inlet of constant cross sectional area and an outlet, a main valve in the casing dividing it into an upper and lower chamber and provided with a hollow annular extension projecting downwardly therefrom, a bypass connecting the two chambers, a connection leading from the upper chamber through the main valve to said outlet, an auxiliary valve controlling said connection, an actuating device for said auxiliary valve, and vertically adjusting means located below the lower end of the bypass and at a distance therefrom and co-acting with the main valve and having a throttling member which extends around the casing near the end of the extension on the main valve to form a throttling passage defined by the extension on the main valve and the throttling member for varying the amount of water passing between the main valve and its seat due to the opening of the main valve at any given cycle of operation thereof, and means for maintaining the distance substantially constant through which the main valve moves in such cycle of operation.

6. A flush valve comprising a casing having an inlet of constant cross sectional area and an outlet, a main valve in the casing dividing it into an upper and lower chamber and provided with a hollow annular extension projecting downwardly therefrom, a bypass connecting the two chambers, a connection leading from the upper chamber through the main valve to said outlet, an auxiliary valve controlling said connection an actuating device for said auxiliary valve, and a concealed adjustable means located below the lower end of the bypass and at a distance therefrom and co-acting with the main valve and having a throttling member which extends around the casing near the end of the extension on the main valve to form a throttling passage defined by the extension on the main valve and the throttling member for varying the amount of water passing between the main valve and its seat due to the opening of the main valve at any given cycle of operation thereof, and means for maintaining the distance substantially constant through which the main valve moves in such cycle of operation, said adjustable means being accessible from the exterior of the casing and being rendered operative by movement of the main valve.

7. A flush valve comprising a casing having an inlet of constant cross sectional area and an outlet, a main valve in the casing dividing it into an upper and a lower chamber, a connection leading from the upper chamber through the main valve to said outlet, an auxiliary valve controlling said connection, an actuating device for said auxiliary valve, a hollow annular extension connected with said main valve and projecting downwardly therefrom and separated by a space from the casing, an annular throttling member separate from the casing and said annular extension and located in proximity to the lower end of said annular extension and forming a throttling passage defined by said annular throttling member and said annular extension for throttling the amount of water passing between the casing and said annular extension during a portion of the closing movement of the main valve.

8. A flush valve comprising a casing having an inlet of constant cross sectional area and an outlet, a main valve in the casing dividing it into an upper and a lower chamber and provided with a hollow annular extension projecting downwardly therefrom, a connection leading from the upper chamber through the main valve to said outlet, an auxiliary valve controlling said connection, an actuating device for said auxiliary valve, and reciprocating throttling means associated with the main valve for throttling the amount of water passing between the main valve and its seat during a portion of the closing movement of said main valve, the main valve being located intermediate said inlet and said throttling means, said throttling means being adjustable toward and away from said main valve, said adjustable means being provided with an annular throttling member extending around the exterior of said annular extension on the main valve to provide a throttling passage defined by said annular extension and the annular throttling member so as to vary the amount of water passing through the main valve in any given cycle of its operation.

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