April 12, 1927. 1,624,130

T. R. BEGGS

FLUSH VALVE

Filed March 20, 1925 3 Sheets-Sheet 1

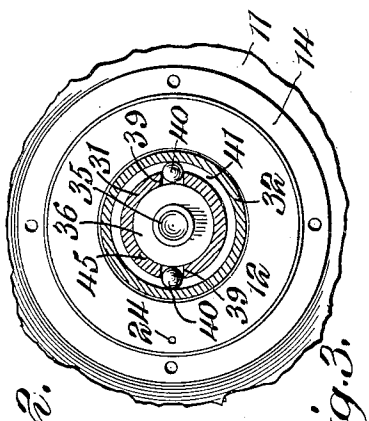


Fig. 2.

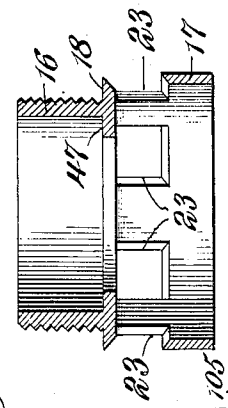


Fig. 3.

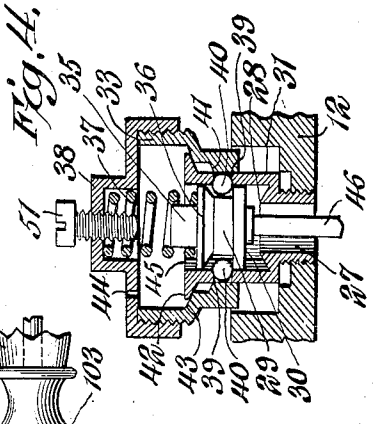


Fig. 4.

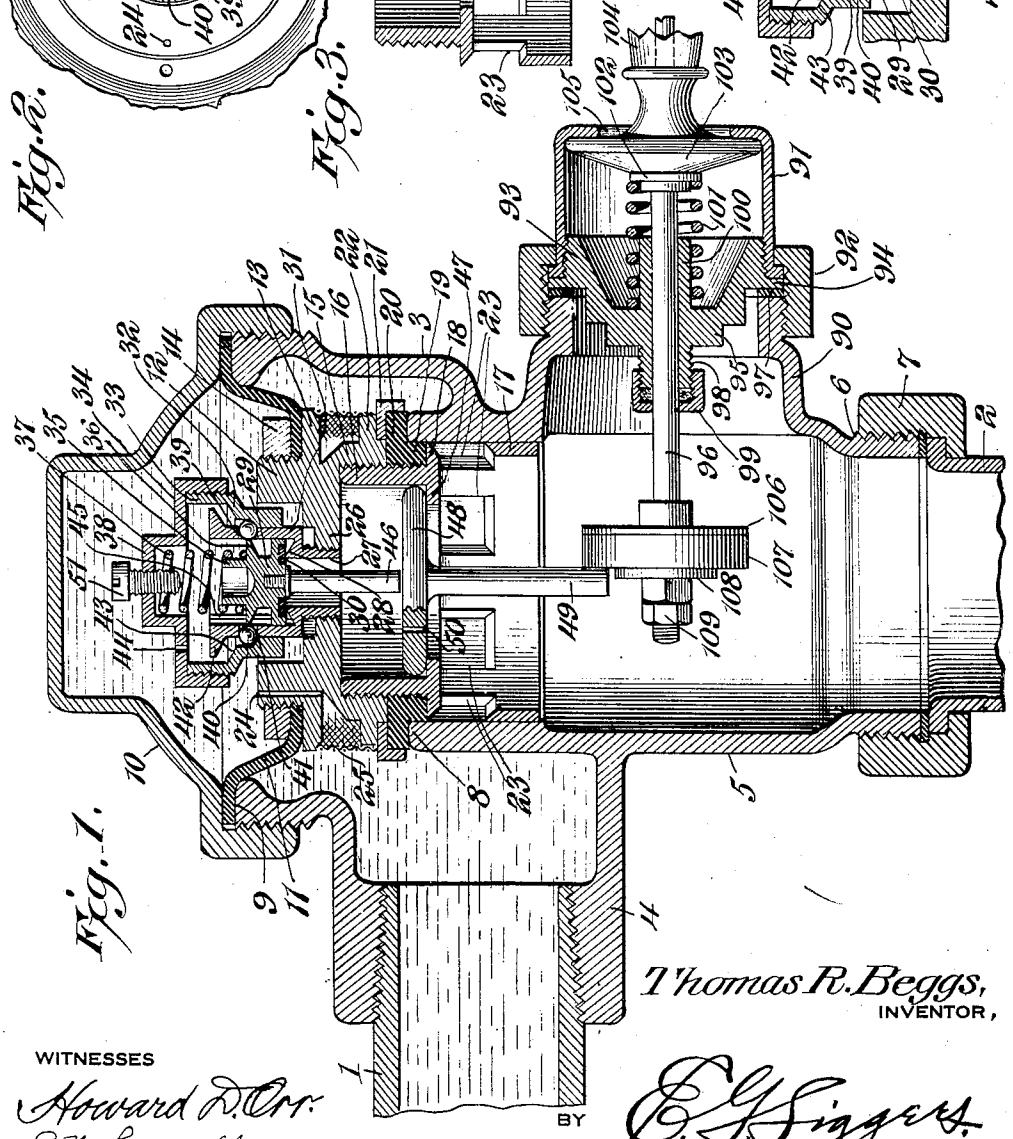


Fig. 1.

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FLUSH VALVE

Filed March 20, 1925 3 Sheets-Sheet 2

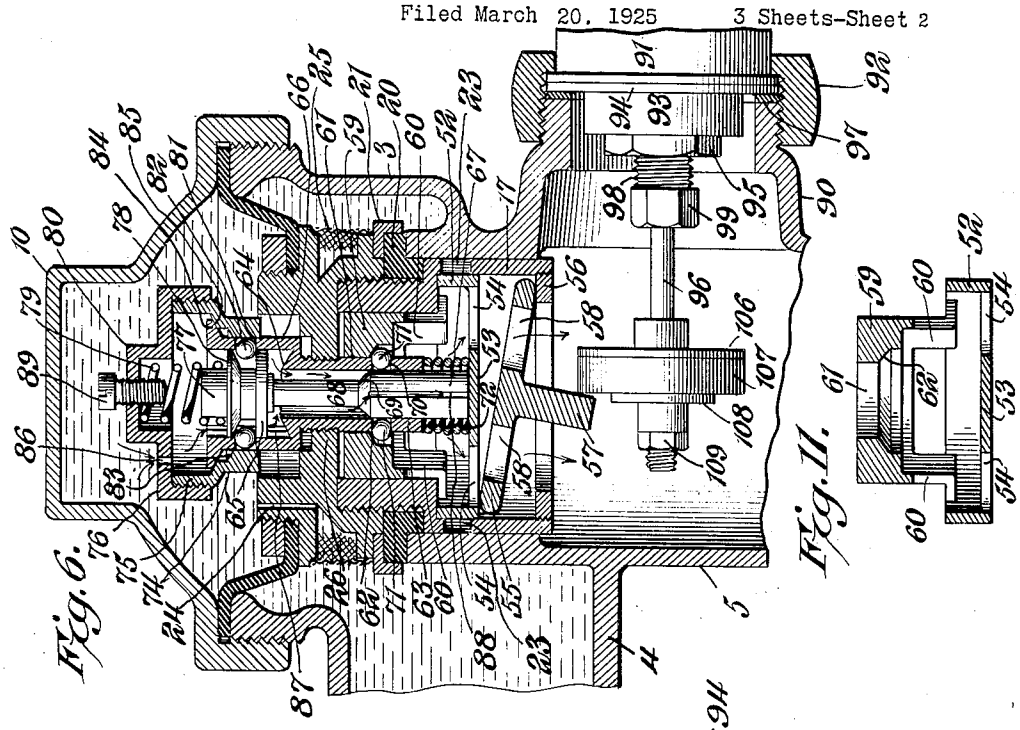


Fig. 6.

Fig. 11.

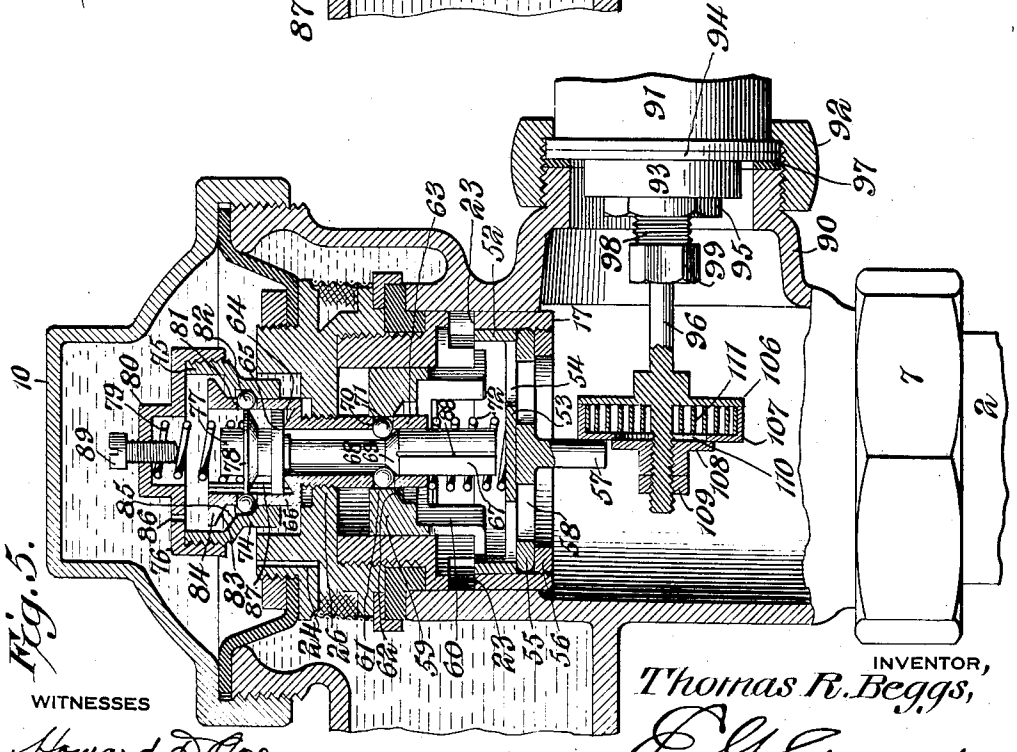


Fig. 5.

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FLUSH VALVE

Filed March 20, 1925 3 Sheets-Sheet 3

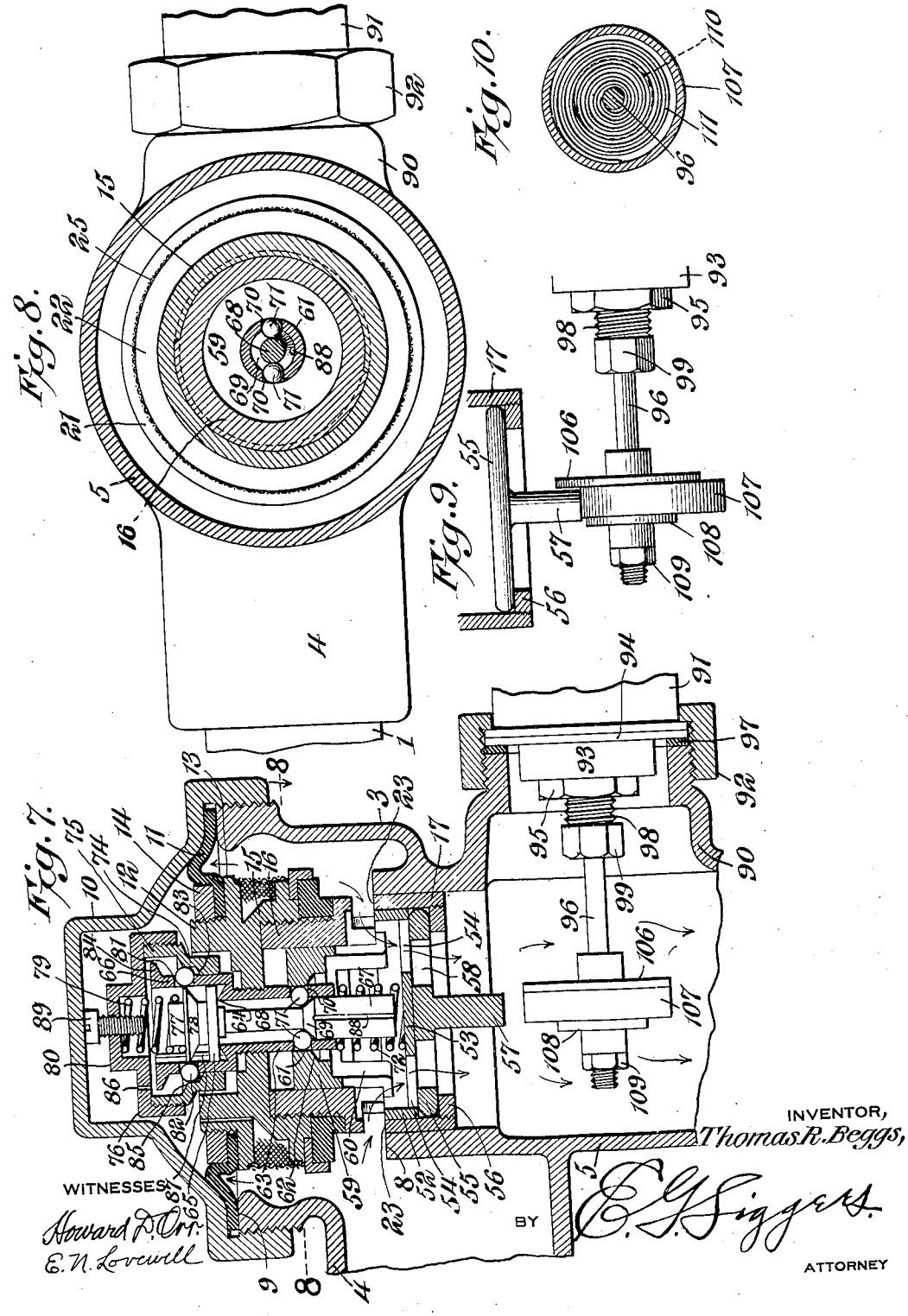


Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

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Patented Apr. 12, 1927. 1,624,130

UNITED STATES PATENT OFFICE.

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FLUSH VALVE.

Application filed March 20, 1925. Serial No. 16,960

This invention relates to flush valves such as are adapted to be used in connection with water closets and the like.

The general object of the present invention is to provide a valve of this type, which will be positive in its operation, and which will discharge a uniform predetermined amount of water regardless of how far the handle is moved, or how long it is held. The fundamental features of the invention may be used with either high or low pressure with equally good results.

In the specific adaptation of the invention, as herein described, it is associated with certain features which are disclosed in my Patent No. 1,561,504, Nov. 17, 1925. It is apparent, however, that the structure and arrangement of the various elements of the invention may be modified in a great many different ways without any material departure from its basic conception, and it is my purpose, therefore, to include all such modifications within the scope of the appended claims.

The specific construction of the invention and the principles upon which its operation is based will be more fully explained in connection with the accompanying drawings forming a part of this specification.

In the drawings:

Figure 1 is a vertical section illustrating the invention in a form suitable to be used with a high pressure system, the valve being in a closed or dormant position.

Figure 2 is a horizontal section illustrating the device for controlling the position of the relief valve.

Figure 3 is a detail sectional view of the main outlet valve.

Figure 4 is a sectional view taken on the same plane as Figure 1 showing the relief valve and parts associated therewith, the relief valve being shown in open position.

Figure 5 is a sectional view similar to Figure 1, but showing a modified form of the invention particularly adapted to be used with a low pressure water system, the valve being shown in closed or dormant position.

Figure 6 is a view similar to Figure 5, but showing the parts in the position which they assume when the handle is actuated.

Figure 7 is a similar view showing the position of the parts as the water begins to discharge.

Figure 8 is a horizontal section taken on the line 8—8 of Figure 7.

Figure 9 is a detail view showing the position of the valve actuating member when the flushing operation has been completed and the handle is still depressed.

Figure 10 is a detail sectional view of a portion of the plunger shown in Figure 9.

Figure 11 is a detail sectional view of a secondary valve used with the form shown in Figures 5 to 8.

The invention is herein shown in connection with a water supply pipe 1, and an outlet pipe 2 leading to the bowl. The valve mechanism is enclosed by a housing 3, having a laterally extending sleeve 4 threaded to the supply pipe 1, and having a downwardly extending outlet portion 5 terminating in a threaded nipple 6, which may be connected by the usual union 7 to the pipe 2.

The outlet portion 5 is extended upwardly within the housing 3 to provide a seat 8 for the outlet valve. The housing 3 is extended upwardly and terminates in a seat 9, externally threaded to receive a cap 10, which cooperates therewith to clamp a circular diaphragm 11. This diaphragm has a circular central opening which receives a collar 12 having a peripheral flange 13, which cooperates with a ring 14 threaded to the upper end of the collar to clamp the inner edge of the diaphragm 11, so that the collar is securely attached thereto.

The collar 12 has a downwardly extending internally threaded portion 15 adapted to receive a threaded boss 16, which forms an integral upward extension of the main outlet valve 17. At the base of the boss 16, the valve is formed with a shoulder 18, which engages a suitable gasket 19, clamping the same against the lower end of the downwardly extending collar portion 15. The gasket 19 is extended circumferentially, as at 20, so that it is adapted to engage the seat 8, and its outer edge is protected by a flanged ring 21, which engages a circumferential flange 22 formed on the downwardly extending sleeve portion 15. The outlet valve 17 is cylindrical in shape, and is adapted to slide vertically to lift the gasket 19 from its seat, so that the water

from the supply pipe 1 may be discharged through ports 23 to perform the flushing operation.

The position of the outlet valve 17 is determined by the pressure of the water above and below the diaphragm 11. In the position shown in Figure 1, the outlet valve is closed, and there is pressure against the outer portion of the under side of the diaphragm. The water in the supply pipe 1 is also in communication with the space above the diaphragm through a restricted port or bleed duct 24, which is protected against clogging by a cylindrical screen 25 extending between the flange 13 and ring 21. There is pressure, therefore, upon the entire upper surface of the diaphragm, and this overbalances the pressure beneath the same, and holds the outlet valve upon its seat until such time as the water in the space above the diaphragm is discharged by means of a relief valve, to be presently described.

The collar 12 has an internal threaded flange 26, which, in the construction shown in Figure 1, receives a threaded nipple 27 having an upwardly disposed knife-edge seat 28 for receiving a relief valve 29, the latter being provided on its under face with an annular rubber insert 30 to prevent leakage. Surrounding the relief valve 29, the nipple 27 has an upwardly extending cylindrical cage 31 in which the valve may reciprocate, and surrounding this cage is a slidable casing 32, having an enlarged threaded upper portion 33 which receives a cap 34. The valve 29 has an upwardly projecting boss 35, at the base of which is a peripheral flange 36 forming a shoulder on which is seated an expansile coiled spring 37, the upper end of the spring being seated within a socket 38 formed in the cap 34. The cage 31 has a plurality of holes 39, each of which receives a ball 40, the diameters of the balls being somewhat greater than the thickness of the wall of the cage.

When the relief valve is closed, the flange 36 is directly opposite the balls 40, and the balls, therefore, project outwardly beyond the wall of the cage 31. The slidable casing 32 is formed with an internal shoulder 41 which engages against the projecting balls, and is locked in its lower position although the spring 37 tends to move it upwardly. The moment the relief valve is raised slightly, however, by means hereinafter described, the flange 36 is lifted above the balls, and the casing 32 being urged upwardly by the spring 37, its inclined shoulder 41 forces the balls inwardly beneath the inclined lower face of the flange 36 permitting the casing 32 to rise, and at the same time locking the balls in their inner position underneath the flange 36, as shown in Figure 4, and positively preventing the return of the valve 29 to its seat until the casing 32 has been lowered. The upward movement of the casing 32 with respect to the cage 31 is limited by a flange 42 at the upper end of the cage, which is engaged by an internal shoulder 43 of the casing.

The moment that the valve 29 leaves its seat, the water above the diaphragm begins to discharge through a port 44 in the cap 34, and through a channel 45 in the cage 31. This discharge port and channel are somewhat larger than the duct 24, so that the water above the diaphragm will gradually become less, and the pressure above the diaphragm being relieved, the pressure underneath the same will lift the outlet valve to perform the flushing operation.

The relief valve 29 is lifted from its seat through the medium of a stem 46, which extends downwardly into the boss 16, the latter, as shown in Figures 1 and 3, being formed with an internal flange 47, which forms a seat for a tilting head 48. This tilting head has a downwardly projecting stem 49, by means of which it is actuated to lift the valve 29 from its seat. A port 50, through the head 48, permits the discharge of the water from the space above the diaphragm as it escapes beneath the valve 29.

As soon as the valve 29 leaves its seat, it is positively locked by the balls 40 against reseating, as explained above, until the casing 32 is again lowered relatively to the cage 31. Upon a very slight actuation of the relief valve, therefore, even though the handle be immediately released, the operation will continue through a predetermined cycle. The water from above the diaphragm will be gradually discharged, and the outlet valve 17 will be raised by the pressure beneath the diaphragm. As soon as the ports 23 rise above the valve seat 8, the flushing operation will begin, and will continue until the relief valve 29 has been restored to its seat, and until the space above the diaphragm has again been filled with water through the duct 24. For effecting the restoration of the valve 29 to its seat, a timing screw 51 is adjustably mounted in the cap 34, and when the head of this screw strikes the top of the housing cap 10, the casing 32 is immediately lowered with respect to the cage 31, allowing the balls 40 to move outwardly, whereupon the pressure of the spring 37 immediately lowers the valve 29 to its seat. The space above the diaphragm then begins to fill, and in doing so, restores the outlet valve 17 to its seat.

The construction shown in Figure 1 is primarily intended for use where the water pressure is rather high. In low pressure systems, when the water commences to flow through the ports 23, it may be the case that there is not sufficient pressure left to continue the raising of the diaphragm sufficiently to bring the screw 51 into contact

with the top of the cap 10. Under such conditions, it is, therefore, preferable to use the construction shown in Figures 5, 6 and 7, in which a secondary valve, in the form of a ring or sleeve 52, is used inside of the main valve 17 to close the ports 23 from the inside, thus delaying the beginning of the flushing operation after the valve 17 has been raised until the venting of the space above the diaphragm has been completed.

The lower end of the ring or sleeve 52 is partially closed by a head 53, having openings 54 sufficiently large to permit the water to pass therethrough during the flushing operation. In this form of the invention, the actuation of the valve is effected through the medium of a tilting head 55, which is seated upon a ring 56 threaded into the lower end of the valve 17. The tilting head 55 has a downwardly projecting stem 57, and is provided with openings 58 to allow the water to pass through. The secondary valve 52 is formed with an upward cylindrical extension 59 of reduced diameter which extends upwardly within the threaded portion 15 of the outlet valve, the extension 59 being connected to the secondary valve by spaced arms 60. The extension 59 is formed with a central bore 61, at the base of which is an internal sloping shoulder 62. A sleeve 63 has a threaded connection with the flange 26 extending inwardly from the collar 12. The lower portion of the sleeve 63 slidably receives the extension 59 of the secondary valve, and the upper portion of the sleeve forms a knife-edge seat 64, similar to the valve seat 28, which receives a relief valve 65. The sleeve 63 has an upward extension 66, which forms a cage for the valve similar to the cage 31. The relief valve 65 has a downwardly extending stem 67, which has a sliding fit within the sleeve 63, the stem 67 having a shank 68 of reduced diameter, at the base of which is a sloping shoulder 69. The sleeve 63 has a plurality of holes 70 adapted to receive balls 71, which operate in a similar manner to the balls 40 above described.

When the valve is in dormant or closed position, as shown in Figure 5, the secondary valve 52 is held downwardly within the lower portion of the outlet valve 17 by an expansile coiled spring 72, which surrounds the stem 67, and acts between the head 53 and the lower end of the sleeve 63. In this position, the bore 61 of the extension 59 is opposite the balls 71, and the latter project inwardly against the sloping shoulder 69, and hold the relief valve 65 positively on its seat. As the head 55 is tilted to the position shown in Figure 6, the spring 72 is compressed, the secondary valve 52 is raised to cover the ports 23 from the inside, the extension 59 is raised permitting the balls 71 to move outwardly underneath the shoulder 62, and the head 53, as it contacts with the lower end of the stem 67, raises the latter and opens the relief valve 65.

The cage 66 is surrounded by a slidable cylindrical casing 74, which is similar to the casing 32, and has an enlarged threaded upper end 75 adapted to receive a cap 76. The stem of the valve 65 is extended upwardly, as shown at 77, and has a circumferential flange 78 forming a seat for an expansile coiled spring 79, which acts between the flange 78 and a socket 80 formed centrally of the cap 76. The cage 66 has a plurality of holes 81 in which are balls 82. In the dormant or closed position of the valve, the flange 78 is opposite the balls 82, and the latter project outwardly beyond the cage 66 and engage the sloping internal shoulder 83 formed on the casing 74, holding down the casing and the cap 76, the latter in turn holding the spring 79 which bears against the flange 78. When the relief valve is raised, as shown in Figure 6, the balls 82 move inwardly underneath the sloping lower face of the flange 78, positively locking the valve 65 in its upper position, and permitting the casing 74 to rise. The upward movement of the casing 74 is limited by a flange 84 formed at the upper end of the cage 66, which is engaged by an intermediate internal shoulder 85 formed within the casing 74.

When the relief valve 65 has been opened, as shown in Figure 6, the water in the space above the diaphragm 11 commences to discharge through a port 86 in the cap 76, which is somewhat larger than the duct 24 provided for refilling the space at the conclusion of the flushing operation. The water above the diaphragm, after passing through the port 86, passes downwardly through a channel 87 in the inner face of the cage 66, and through a channel 88 formed in the stem 67, and passes into the outlet pipe 5. As the water is gradually discharged from the space above the diaphragm 11, relieving the pressure on the upper side of the diaphragm, the pressure beneath raises the latter and the outlet valve 17. At this time, it will be observed that the ports 23 are covered on the inside by the secondary valve 52, so that no water is discharged through these ports at this time, but the entire pressure of the water system is directed against the diaphragm. No matter how low the pressure is, therefore, the diaphragm will continue to rise until the secondary valve 52 has been shifted to uncover the ports 23, as illustrated in Figure 7. This shifting occurs when the timing screw 89, adjustably mounted in the center of the cap 76, strikes the upper wall of the cap 10. When this occurs, the casing 74 moves downwardly on the cage 66 against the pressure of the spring 70 until

the balls 82 can move outwardly upon the sloping shoulder 83. This permits the relief valve 65 to move downwardly within the cage 66 under influence of the spring 79, until it is again seated and the flange 78 is opposite the balls 82. At this time, the stem 67 has moved downwardly, releasing the balls 71, and permitting the same to move inwardly. This unlocks the secondary valve 52, and permits the same to be moved downwardly under influence of the spring 72, and permits the flushing operation to take place, as indicated by the arrows in Figure 7. The flushing now continues until sufficient water passes through the duct 24 to refill the space above the diaphragm, and to restore the pressure on the upper side thereof, causing the outlet valve 17 to settle back upon its seat.

It will be noted that the raising of the relief valve 29 or 65 for a very small distance is sufficient to permit the balls 40 or 82, respectively, to move underneath the same, and positively prevent the relief valve from becoming reseated until the complete cycle of operation has taken place. It matters not, therefore, to what extent the tilting head 48 or 55 is actuated, or how long it is held in its tilted position. A predetermined amount of water will always be discharged into the bowl. The duration of the flushing operation, and consequently the amount of water discharged may be adjusted by means of the timing screw 51 or 89 to secure the correct operation of the valve.

For actuating the valve, the lower portion 5 of the housing is provided with a laterally projecting threaded nipple 90 to which a cup-shaped casing 91 is connected by means of a suitable union 92. The inner end of the casing 91 is internally threaded to receive a guide member 93, which has a circumferential flange 94 adapted to seat against the rim of the casing. The guide member 93 has a polygonal head 95 adapted for engagement by a wrench, and is provided with a central bore in which a plunger rod 96 is guided for movement longitudinally. A gasket 97 may be inserted between the flange 94 and the outer end of the nipple 90, and the inner end of the guide member is formed with a threaded boss 98 for receiving a stuffing box 99. The opposite end of the guide member is formed with a boss 100 adapted to receive an expansile coiled spring 101, the outer end of the spring being seated against a head 102 formed on the outer end of the plunger rod 96. Loosely mounted within the casing 91 is a circular head 103 having its inner face convex for engaging the head 102 of the plunger rod, and having a handle 104 projecting outwardly through an opening 105 in the casing. It will be seen, therefore, that upon rocking the handle 104 in any direction the head 103 will be tilted, and will move the plunger rod 96 inwardly against the pressure of the spring 101.

The inner portion of the plunger rod 96 is formed with a circular head 106, adjacent which is a loosely mounted cup-shaped casing 107. The casing 107 is retained on the inner end of the plunger rod 96 by a flanged nut 108, which is secured in proper position by means of a lock nut 109. The nut 108 is so arranged that the casing 107 may move with freedom transversely of the plunger rod, and the casing 107 is provided centrally with a comparatively large orifice 110 to permit such movement, the orifice being covered by the flange on the nut 108. A spiral spring 111, in the nature of a clock spring, is housed within the casing 107, and normally holds the latter concentric to the plunger rod 96. If the plunger rod is moved inwardly, therefore, by the rocking of the handle 104 from the position shown in Figure 1 or 5 to the position shown in Figure 6, the valve will be actuated, and if the handle is still held in its tilted position until after the flushing operation has been concluded, the outlet valve will nevertheless be closed at the conclusion of this operation. As shown in Figure 9, when the valve 17 drops downwardly, the strength of the spring 37 or 72, and the pressure on the upper side of the diaphragm 11 is sufficient to cause the stem 49 or 57, striking against the periphery of the casing 107, to move the latter to an eccentric position against the tension of the spring 111.

From the foregoing description, it will be understood that the basic principles of my invention are adapted to be used under various conditions, either with high or low pressure. The same actuating mechanism and the same relief valve locking device may be used in connection with an outlet valve controlled by a reciprocable plunger, as well as with a diaphragm controlled outlet valve. Even if the handle 104 is rocked only slightly and immediately released, the entire flushing operation will take place, and the predetermined amount of water will be discharged. The duration of the flushing operation and the consequent amount of water discharged may be regulated by means of the timing screw 51 or 89. By reason of the yieldably mounted casing 107 forming the actuating head on the plunger rod 96, the flushing operation will always cease after the normal cycle of operation, even though the handle 104 is still held in its tilted position.

What is claimed is:

1. In a device of the character described, the combination of a housing having an inlet and an outlet, an outlet valve normally seated on said outlet, means operable by fluid pressure for unseating said valve and

slowly raising it, locking means carried by said valve and controlling the application of pressure so as to temporarily prevent the return of said valve to its seat, and means for releasing said locking means when the valve has been raised a predetermined distance, said releasing means being adjustable to vary the distance through which the valve must be moved before the release of the locking means.

2. In a device of the character described, the combination of a housing having an inlet and an outlet, a pressure operated member extending across the space enclosed by said housing, an outlet valve secured to said member and normally seated on said outlet, a passageway leading from the space above said member to the outlet, a relief valve, normally closed, controlling said passageway, means for opening said relief valve, means for temporarily locking the relief valve in open position, and a timing screw engageable with the top of the housing for releasing said locking means when the pressure operated member has been raised a predetermined distance, said timing screw being adjustable to vary the distance through which the valve must be moved before releasing the locking means.

3. In a device of the character described, the combination of a housing having an inlet and an outlet, an outlet valve associated with said outlet, a diaphragm connected to said outlet valve and operable by differences of pressure on its upper and lower surfaces to open and close said valve, a relief valve for relieving the pressure above said diaphragm, said relief valve being normally closed, means for opening said relief valve, means for temporarily locking the relief valve in open position, a timing screw connected with said locking means and engageable with the top of the housing to release said locking means when the diaphragm has been raised a predetermined distance, said timing screw being adjustable to vary the distance through which the diaphragm must be moved before releasing said locking means.

4. In a device of the character described, the combination of a housing having an inlet and an outlet, an outlet valve controlling communication between said inlet and outlet, a member extending across the interior of the housing and connected to said valve and operable by differences of pressure on its upper and lower surfaces to open and close said valve, a valve cage connected with said member and having a passageway leading from the space above said member to the outlet, said cage having holes through its wall, balls seated in said holes, a relief valve normally closing said passageway and having a flange which engages the inner wall of the cage and is opposite said balls when the valve is seated, means for lifting said relief valve from its seat, means for moving said balls inwardly underneath said flange as soon as the relief valve is lifted, thereby locking the relief valve against returning to its seat, and means for returning the locking means to its normal position and closing said relief valve after a predetermined movement of said pressure operated member.

5. In a device of the character described, the combination of a housing having an inlet and an outlet, an outlet valve controlling said outlet, a pressure operated member for actuating said outlet valve, means for relieving the downward pressure on said member to permit the outlet valve to be lifted, said relieving means including a valve cage with a relief valve normally seated therein, movable locking members carried by said cage, means for lifting the relief valve from its seat and at the same time moving said locking members into position to lock said relief valve open, and means for returning the locking means to its normal position and closing said relief valve after a predetermined movement of said pressure operated member.

6. In a device of the character described, the combination of a housing having an inlet and an outlet, an outlet valve controlling said outlet, a pressure operated member for actuating said outlet valve, means for relieving the downward pressure on said member to permit the outlet valve to be lifted, said relieving means including a valve cage with a relief valve normally seated therein, movable locking members carried by said cage, means for lifting the relief valve from its seat and at the same time moving said locking members into position to lock said relief valve open, and means engageable with the top of the casing for restoring said locking means to normal position and closing said relief valve after a predetermined movement of said pressure operated member.

7. In a device of the character described, the combination of a housing having an inlet and an outlet, an outlet valve controlling communication between said inlet and outlet, a pressure operated member for actuating said outlet valve, means for relieving the downward pressure on said member to permit the outlet valve to be lifted, said relieving means including a valve cage with a relief valve normally seated therein, movable locking members carried by said cage, means for lifting said relief valve from its seat and at the same time moving said locking members into position to lock said relief valve open, and a timing screw engageable with the top of the housing when the pressure operated member has been raised a predetermined distance, and at the

same time closing said relief valve, said timing screw being adjustable to vary the distance through which the pressure operated member must be moved before releasing the locking means.

8. In a device of the character described, the combination of a housing having an inlet and an outlet, an outlet valve associated with said outlet, a pressure operated member for actuating said outlet valve, means for relieving the downward pressure on said member to permit the outlet valve to be lifted, said relieving means including a valve cage having a passageway leading from the space above the pressure operated member to the outlet, said cage having holes through its wall, balls seated in said holes, a relief valve normally closing said passageway and having a flange which engages the inner wall of the cage and is opposite said balls when the valve is seated, means for lifting said relief valve from its seat, means for moving said balls inwardly underneath said flange as soon as the relief valve is unseated, thereby locking the relief valve open, and means for returning the locking means to its normal position and closing said relief valve after a predetermined movement of said pressure operated member.

9. In a device of the character described, the combination of a housing having an inlet and an outlet, an outlet valve controlling said outlet, a pressure operated member for actuating the outlet valve, means for relieving the downward pressure on said member to permit the outlet valve to be lifted, said relieving means including a valve cage having a passageway leading from the space above the pressure operated member to the outlet, said cage having holes through its wall, balls seated in said holes, a relief valve normally closing said passageway and having a flange which engages the inner wall of the cage and is opposite said balls when the valve is seated, means for lifting said relief valve from its seat, a casing surrounding said cage and engageable with said balls to move them inwardly underneath said flange as soon as the relief valve is lifted, thereby locking the relief valve against returning to its seat, means for engaging the top of the housing for returning said casing to its normal position relative to the cage, thereby causing the relief valve to be closed after a predetermined movement of said pressure operated member.

10. In a device of the character described, the combination of a housing having an inlet and an outlet, a pressure operated member extending across the space enclosed by said housing, an outlet valve secured to said member and normally seated on said outlet, a relief valve, normally closed, controlling the release of pressure from the space above said pressure operated member, means for opening said relief valve, means temporarily locking the relief valve in open position, means engageable with the top of the housing for releasing said locking means when the pressure operated member has been raised a predetermined distance, a secondary valve adjacent the outlet valve, and means for actuating said secondary valve to prevent any discharge of water through the outlet valve until said locking means has been released and the relief valve closed.

11. In a device of the character described, the combination of a housing having an inlet and an outlet, an outlet valve controlling said outlet, a pressure operated member for actuating said outlet valve, means for relieving the downward pressure on said member to permit the outlet valve to be lifted, said relieving means including a valve cage with a relief valve normally seated therein, movable locking members carried by said cage, means for lifting the relief valve from its seat and at the same time moving said locking members into position to lock said relief valve open, means for returning the locking means to its normal position and closing said relief valve after a predetermined movement of said pressure operated member, a secondary valve adjacent the outlet valve, and means for actuating said secondary valve to prevent any discharge of water through the outlet valve until the relief valve has been closed.

12. In a device of the character described, the combination of a vertically movable pressure operated member, a valve cage having a relief passageway leading therefrom through said member, a relief valve normally seated within said cage and controlling said passageway, means for lifting said valve from its seat to relieve the pressure on the upper side of said member, means movably mounted with respect to said cage and valve and operable as soon as said valve is lifted to temporarily lock the same against closing, means for releasing said locking means when the pressure operated member has been raised a predetermined distance, and means for automatically returning the relief valve to its seat as soon as the locking means is released.

13. In a device of the character described, the combination of a vertically movable pressure operated member, a valve cage having a relief passageway leading therefrom through said member, a relief valve normally seated within said cage and controlling said passageway, means for lifting said valve from its seat to relieve the pressure on the upper side of said member, means movably mounted with respect to said cage and valve and operable as soon as said valve is lifted to temporarily lock the same against closing, a timing screw connected with the locking means, and means cooperating with

the timing screw to release said locking means and to return the relief valve to its seat when the pressure operated member has been raised a predetermined distance, said timing screw being adjustable to vary the distance through which said member must be moved before releasing the locking means.

14. In a device of the character described, the combination of a vertically movable pressure operated member, a valve cage having a relief passageway leading therefrom, said cage having holes through its wall, balls seated in said holes, a relief valve normally closing said passageway and having a flange which engages the inner wall of the cage and is opposite said balls when the valve is seated, means for lifting said valve from its seat, means for moving said balls inwardly underneath said flange as soon as the valve is lifted, thereby locking the valve against returning to its seat, and means for returning the locking means to its normal position and closing said valve after a predetermined movement of said pressure operated member.

15. In a device of the character described, the combination of a housing having an inlet and an outlet, an outlet valve controlling said outlet, a pressure operated member for actuating said outlet valve, a relief valve for relieving the downward pressure on said member, a tiltable member supported by said outlet valve beneath the relief valve and having a depending stem, a slidably mounted rod having a head thereon which is movable transversely but not longitudinally of said rod, means for moving the rod longitudinally to bring said head into engagement with said depending stem to actuate the tiltable member and lift the relief valve, thereby permitting the raising of said pressure operated member and the outlet valve, and yieldable means for normally holding said head concentric with said rod but permitting the head to be displaced by said depending stem in case the flushing operation is completed before the rod is released.

16. In a device of the character described, the combination with a vertically movable valve, of a tiltable member seated beneath said valve and having a depending stem, a slidably mounted rod having a head thereon which is movable transversely but not longitudinally with respect to said rod, means for moving the rod longitudinally to bring the head into engagement with said depending stem to actuate said tiltable member and lift the valve, and yieldable means for normally holding said head concentric with the rod.

17. In a device of the character described, the combination with a vertically movable valve, of a tiltable member seated beneath said valve and having a depending stem, a slidably mounted rod having a cylindrical head loosely mounted near its inner end and normally concentric therewith, a spiral spring within the head connecting it to the rod, means preventing movement of the head longitudinally with respect to the rod, and means for moving said rod longitudinally to bring the head into engagement with said depending stem to actuate said tiltable member and lift the valve.

18. In a device of the character described, the combination of a housing having an inlet and an outlet, an outlet valve normally seated on said outlet, means operable by fluid pressure for unseating said valve and slowly raising it, a relief valve adapted to be opened to relieve the pressure above the outlet valve to permit the latter to open, a shoulder on said relief valve, locking means engageable behind said shoulder as soon as the relief valve is unseated, and means for positively holding the locking means behind the shoulder so as to prevent the return of said relief valve to its seat until the outlet valve and relief valve have been raised a predetermined distance.

19. In a device of the character described, the combination of a vertically movable pressure operated member, a relief passageway through said member, a relief valve normally closing said passageway, means for lifting said valve from its seat to relieve the pressure on the upper side of said member, a shoulder on the relief valve, locking means engageable behind said shoulder as soon as the relief valve is unseated, and means for positively holding said locking means behind said shoulder to prevent the return of the relief valve to its seat until the outlet valve has been raised a predetermined distance.

In testimony, that I claim the foregoing as my own, I have hereto affixed my signature.

THOMAS ROBERT BEGGS.