No. 873,766. PATENTED DEC. 17, 1907.

C. I. MATSON.

FLUSH VALVE.

APPLICATION FILED NOV. 19, 1906.

Fig. 1.

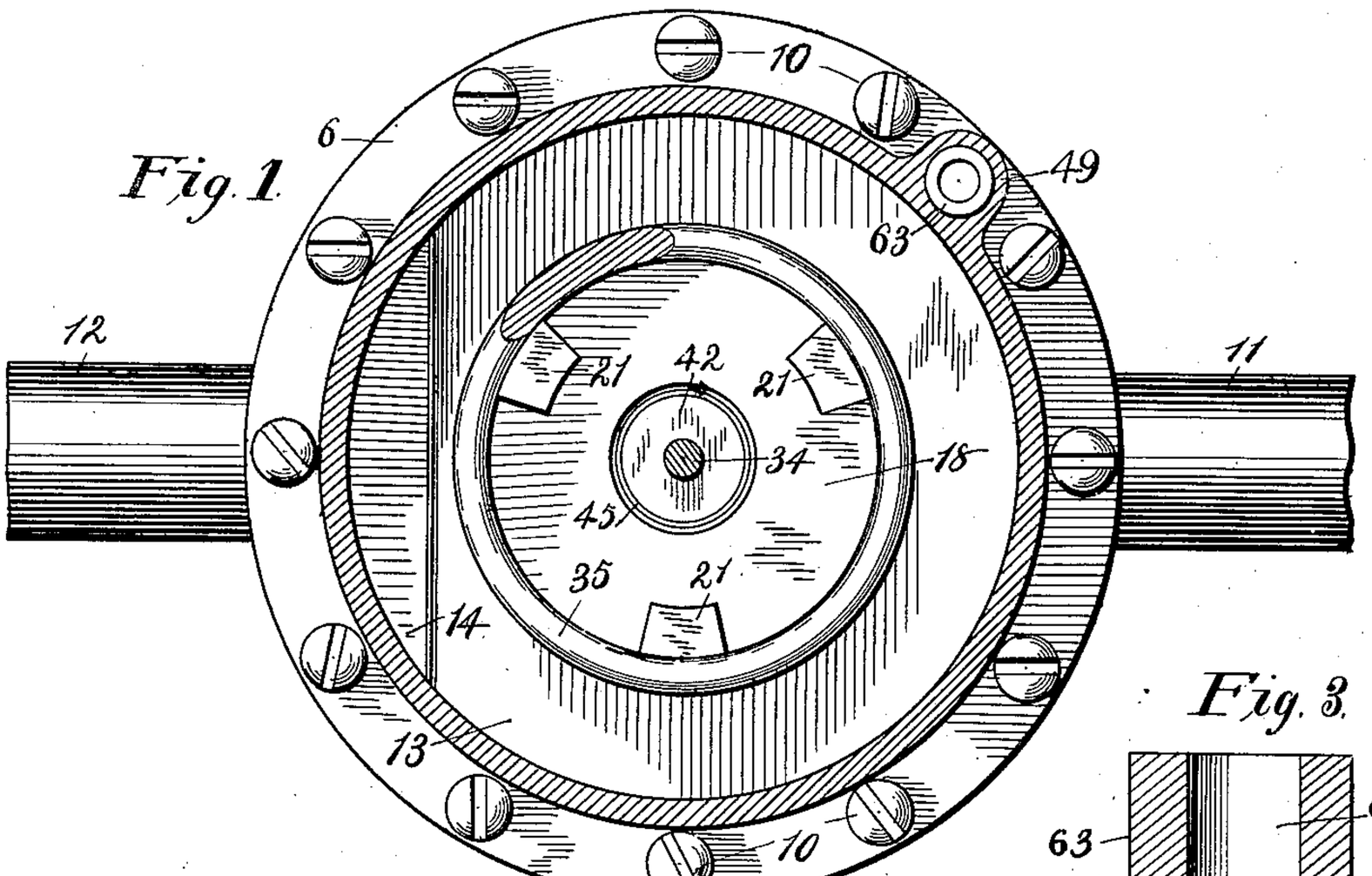

Fig. 3.

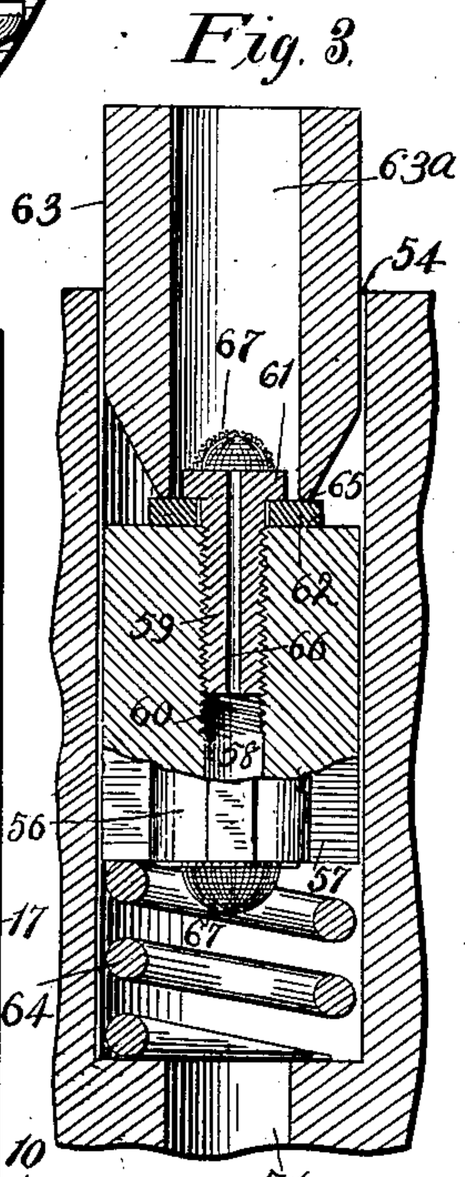

Fig. 4.

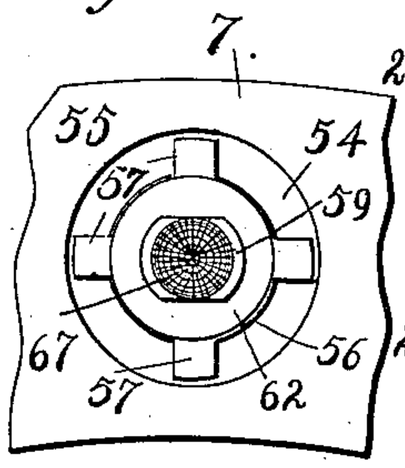

Fig. 2.

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FLUSH-VALVE.

No. 873,766. Specification of Letters Patent. Patented Dec. 17, 1907.

Application filed November 19, 1906. Serial No. 344,012.

To all whom it may concern:

Be it known that I, CHARLES I. MATSON, citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Flush-Valves, of which the following is a specification.

My invention relates to valves for controlling the flow of water in pipes and refers especially to that class known as automatic time wash valves.

My device is primarily designed to be used for washing the bowls of urinals although it may be put to a variety of uses and may be employed to regulate the flow of water in closets and in any location where an intermittent current is desired.

The chief objects of my invention are to produce a time wash valve that will automatically produce an intermittent flow of water for the purpose of washing or cleansing the bowl of a urinal, closet or other appliance to which it may be applied; to provide a valve that will be simple in construction and that can be readily taken apart or assembled; to provide a valve for the purpose stated in which there will be a minimum amount of wear thus rendering the device durable and increasing its efficiency; to furnish means for preventing the introduction of foreign material which would tend to clog the check valve duct; to provide means for automatically controlling the valve movements for the purpose of preventing pounding; to so design the casing that all the parts may be entirely inclosed therein thus preventing any interference with the adjustment when the valve is assembled; to arrange the mechanism so that the appliance can be placed in any position without affecting the working of the valves; and to provide means for quickly opening the main valve in order to produce a maximum flow of water.

I obtain the above and other minor results by the appliance illustrated in the accompanying drawing which forms a part of this specification, and in which:—

Figure 1 is a horizontal sectional view taken on a plane just above the junction of the casing with the base; Fig. 2 is a vertical section, a portion of the wall being broken away to disclose the spring check valve; Fig. 3 is an enlarged, fragmentary view showing the spring check valve, and Fig. 4 is a fragmentary top plan view, also enlarged, showing the same valve in position in the base wall.

Referring to the drawing the numeral 5 indicates a cylindrical casing, closed at one end and provided at the other with a flange 6 which rests upon a corresponding flange 7 formed integral with a base 8. Between the said flanges is interposed a gasket 9 and the two flanges are securely held together by screws 10 to form a tight joint. The base 8 is furnished with an inlet pipe 11 and diametrically opposite is a discharge pipe 12. A partition 13 placed above the inlet pipe 11 and formed integral with the base extends nearly to the opposite side. A similar partition 14 placed below the outlet pipe 12 extends horizontally inwards and these two structures are joined by a vertical wall 15 thus separating the inlet from the outlet pipe and dividing the interior of the valve into two compartments 16, 17. The partition 13 has an opening concentric with the walls of the casing, which is closed by a cap 18 provided with screw threads 19 which engage internal threads in the partition 13. The said cap has a shoulder 20 which engages the upper face of the partition 13 to make a tight joint. The upper surface of the cap is furnished with lugs 21 to afford a purchase for a wrench, these lugs being so spaced that a straight rod may be used for this purpose without interfering with other parts of the mechanism.

In the upper compartment 17 is a piston 22 composed of two superimposed hollow cylinders 23, 24, and a ring 25, between which are held packing rings 26 formed of leather, the whole being solidly fastened together by bolts 27. The upper cylinder 23 is closed at one end by a cover 28 reinforced in the center by a boss 29, which is countersunk upon the under side and threaded to receive the threaded end 30 of a pendent tube 3, the lower end of which is provided with an internal flange 32, which engages the head 33 of a rod or stem 34 adapted to reciprocate within said tube 31. A coiled spring 35 fits within the bore of the piston 22, its upper end engaging the under surface of the cover 28 while its lower end rests upon the partition 13, and is engaged and kept from lateral displacement by the lugs 21 and the shoulder 20. This spring exerts a constant pressure against the piston thus tending to keep it in its extended position, as shown in Fig. 2. The lower end of the stem 34 passes through

a central aperture 36 in the cap 18 and is secured to the plunger 37 of a dash pot 38 which is formed integral with the floor 39 of the base 8. The lower margin 40 of the aperture 36 is made comparatively thin and slightly rounded to form a suitable valve seat for engagement with a gasket 41 secured between a flange 42 and the face of the plunger 37 by lock nuts 43 which engage threads 44 on the lower end of the said stem. When the piston is in its highest position as shown in Fig. 2, the adjustment is such that the gasket 41 is held firmly against the valve seat 40, and the flange 32, provided with a beveled edge 45, lies within the aperture 36. A comparatively light spring 46 is interposed between the cap 18 and the plunger 37 and serves to hold the gasket 41 free from the valve seat 40 against the action of gravity and the flow of water, when the valve is open. The lower end of said spring 46 is received in an annular groove 47 formed in the upper surface of the plunger 37 to prevent displacement during the movement of the plunger which might injure the gasket by friction of the spring upon its edge. Surrounding the pendent tube 31 is a coiled spring 47 which is fixed to the piston cover 28 by a screw 48. The lower end of this spring projects for a considerable distance below the end of the tube 31 and is adapted to engage the said flange 42 when the piston has descended to a sufficient extent and force the gasket 41 away from its valve seat 40.

To make provision for a by-pass between the upper and lower chambers the wall of the casing is made thicker at one point by a reinforcement 49 in which is formed a passage way 50, which registers with a similar passage 51 in the base wall. The upper end of the passage 50 terminates in an opening 52, which communicates with the upper compartment above the highest point reached by the piston, the lower end of the by-pass, which is the passage 51, communicating with the lower compartment 16 by means of the opening 53. The passages 50, 51, are enlarged at their junction to form a chamber 54 for the reception of a spring check valve 55. The check 56 of this valve is provided with radial ribs 57, which allow a free flow of water when the valve is unseated. The check fits loosely in its chamber and is furnished with a central bore 58, which receives a screw 59 adapted to engage internal threads 60 in the said bore. This screw has a head 61, between which and the upper end of the check is securely held a gasket 62. This gasket is pressed lightly against a valve seat 63 by a spring 64 placed below the check. This spring must necessarily be very weak in order that it may not interfere with the action of the spring 35 upon the piston when forcing the water out of the upper compartment. The valve seat 63 has a bore 63ª which registers with the passage 50 and the lower margin 65 is reduced to a thin edge to assist in making a tight joint when the valve is closed. The screw 59 is provided with a longitudinal duct 66, the diameter of which is relatively small compared with that of the passages 50, 51. This duct is constantly open and its ends are covered by perforated screens 67 to prevent the entrance of foreign matter into the duct which would tend to clog it.

The operation of the apparatus is as follows: The working parts of the valve are seen in their initial positions in Fig. 2. This will be their relation before the wate is turned on. If, now, water under pressure is allowed to enter the inlet pipe, it will quickly fill the lower compartment 16 and add its effect to that of the springs 46 and 64, to hold the main and check valves more firmly to their seats. As soon as the lower compartment is filled the water will be forced slowly through the by-pass, entering the upper compartment 17 above the piston, through the orifice 52, forcing the piston gradually downward against the resistance of the spring 35. The piston will continue to descend under this action until the lower end of the pendent spring 47 presses against the flange 42 with sufficient force to overcome the upward pressure of the water in the lower compartment. As the descent of the piston is comparatively slow and the combined pressure of the spring 46 and that of the water upon the main valve is considerable, the spring 47 will be compressed to a marked degree before the valve will be opened. The instant the contact between the gasket 41 and the valve seat is broken the spring 47 will have only the resistance of the dash pot to overcome and in consequence the reaction of the spring 47 will quickly throw the valve open to a sufficient extent to permit a free flow of water directly through the opening 36 into the compartment 17 and thence out through the discharge pipe 12. Were no provision made to prevent it this sudden and forceful opening of the valve would result in an undesirable pounding or hammering. This is avoided by the action of the dash-pot 38, the space between the plunger and the walls being relatively small so that the flow of water therethrough is retarded and the valve movement correspondingly decreased. This inhibitory action of the dash pot is also exercised when the valve is closing as hereinafter described. If, for any reason, the pressure of the spring 47 alone should prove insufficient to force the valve from its seat, the contact of the under surface of the boss 29, which forms a closure for the tube 31, with the head 33 of the stem 34 will force the gasket 41 from its seat and permit the water to flow with full force through said opening 36, modified, as before,

by the influence of the dash-pot. This on-rush of water into the compartment below the piston will immediately equalize the pressure due to the head, and the piston will begin to rise under the action of the spring 35, forcing the water above it through the orifice 52 into the by-pass, opening the spring check valve 55 and thus allowing all the surplus water above the piston to flow into the lower compartment much more rapidly than it was introduced through the narrow orifice of the duct 66. It will thus be seen that the duration of time for the discharge will be much shorter than the time of filling, and this ratio can be varied in two ways in the same apparatus. Thus we may replace the valve seat 63 by another having a bore of different capacity which will change the time of discharge or the size of the duct 66 can be changed by inserting another screw and thus vary the time between the discharges. When the piston 22 approximates its highest limit of travel the flange 32 of the tube 31 will engage the head 33 of the stem 34 and thus raise the main valve until it is seated, stopping the flow of water through the aperture 36. To prevent a too sudden closure which would cause water hammering the action of the dash-pot comes into play as heretofore stated and in addition the beveled edge of the flange 42 will produce a still further reduction in the rate of closing by gradually cutting off the flow of water. As soon as the main valve is seated the back pressure will force the water upward in the passage 51, closing the check valve and reversing the flow in the by-passage which will again be limited by the capacity of the duct 66. Although this duct has a great length compared with its caliber the constant flow of water under pressure will keep it well scoured and prevent fouling. In addition the screens placed over its ends, having a very large area compared with that of said duct will continue to afford an abundant supply of water even should a large proportion of their orifices become completely stopped up with sediment.

It is obvious that many changes may be made in the devices of my invention as herein disclosed without departing from the spirit and scope thereof, and I do not wish, therefore, to be limited to the precise construction herein set forth.

Having thus described my invention what I claim as new, is:—

1. A time flush valve, including a high pressure chamber, a variable pressure chamber, a flush valve located between said chambers, a timing valve located in said variable pressure chamber and arranged to open and close said flush valve, a by-pass in constant communication with said chambers, and a check valve for said by-pass.

2. A time flush valve, including a high pressure and a variable pressure chamber, a valve located between said chambers, a timing piston situated in said variable pressure chamber and arranged to open and close said valve, means for inhibiting the valve action, a by-pass constantly communicating with both of said chambers and a check valve for said by-pass.

3. A valve for the purpose specified, including a casing having a high pressure and a variable pressure compartment, a flush valve between the compartments, a timing piston situated in the variable pressure chamber, yielding means for operating said piston in one direction, means for automatically operating said valve by the piston in another direction, a dash pot for inhibiting the valve movement, a by-pass between the compartments and a check valve for said by-pass.

4. A valve for the purpose specified, including a casing provided with a plurality of chambers, a flush valve located between said chambers, a piston adapted to reciprocate in one of said chambers and arranged to actuate said valve, a spring for operating said piston in one direction, a dash pot for retaining the valve movement, a by-pass between the chambers, and a check valve for the by-pass, said by-pass having a continuously open duct extending therethrough.

5. A valve for the purpose specified, including a high pressure and a variable pressure chamber, a flush valve located between said chambers, a piston adapted to reciprocate in said variable pressure chamber, a spring arranged to actuate said piston in one direction, operative connection between said piston and the flush valve, a dash pot for regulating the valve movement, a by-pass between the chambers, and a check-valve for the by-pass, said check valve and by-pass having a continuously open duct extending therethrough.

6. A valve for the purpose specified, including a high-pressure and a variable pressure chamber, a flush valve located between said chambers, a piston adapted to recipro cate in said variable pressure chamber, a spring adapted to operate the piston in one direction, operative connection between said piston and the flush valve, said connection consisting of a tubular member inclosing the stem of said valve and surrounded by a spring attached at one end to said piston, a dash pot adapted to retard the valve movement, a by-pass between the said chambers, and a check-valve for said by-pass, said valve and by-pass having a continuously open duct extending therethrough.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES I. MATSON.

Witnesses:

CHAS. F. BASSETT,

GEO. L. PATTERSON.