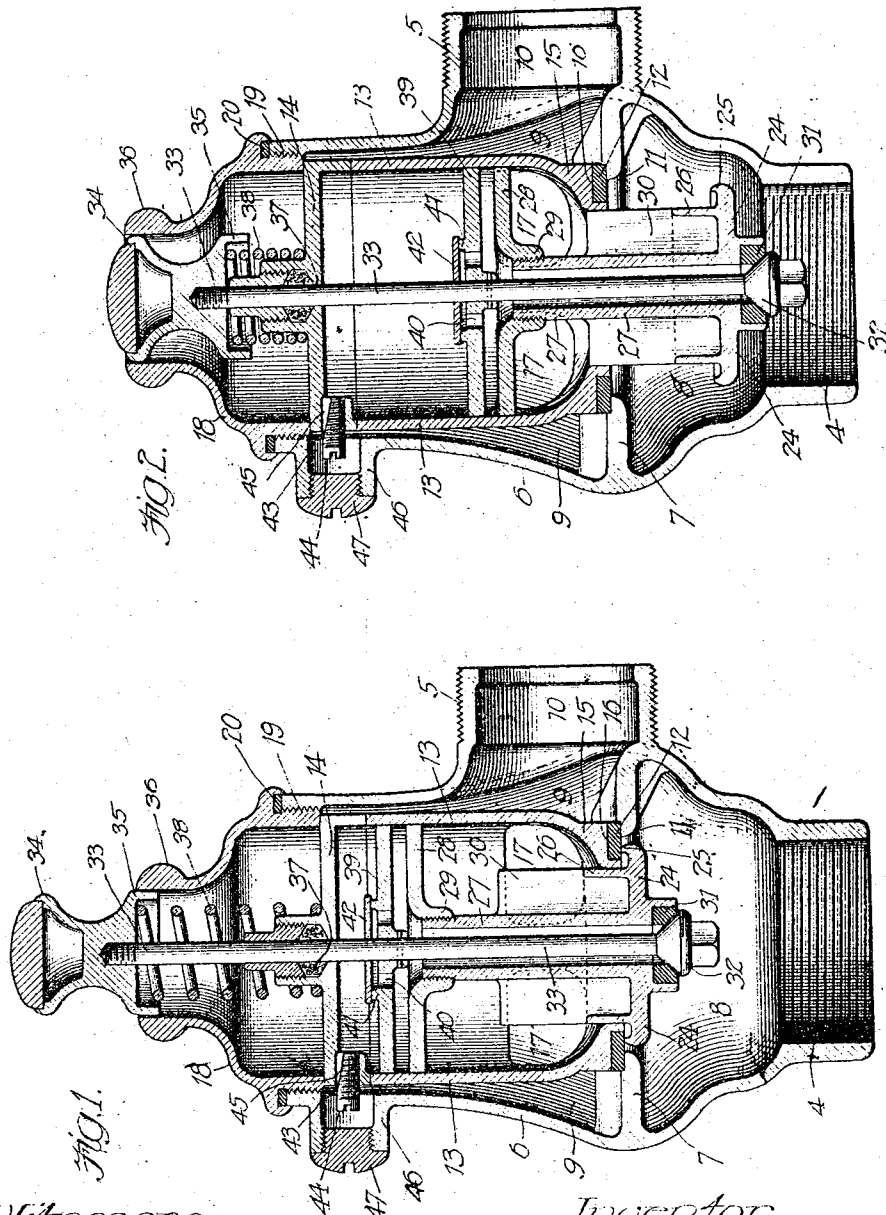


E. G. WATROUS.
FLUSHING VALVE.
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UNITED STATES PATENT OFFICE.

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FLUSHING-VALVE.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, EARL G. WATROUS, a 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 Flushing-Valves, of which the following is a specification, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to that class of flushing valves known as slow-closing valves, which may be quickly opened to their full extent or substantially so, by the movement of an easily manipulated part, to produce a maximum flow of water for a brief period, and then closed slowly to produce a relatively prolonged and gentle flow gradually decreasing during the automatic closing of the valve.

The novelty of my invention will be hereinafter more fully set forth, and particularly pointed out in my claims.

In the accompanying drawings Figure 1 is a vertical central section of my improved valve in closed position, some of its parts, however, being shown in elevation; and Fig. 2 a similar view, with the valve in open position.

The same reference numerals are used to indicate corresponding parts in both views.

In the particular embodiment of my invention chosen for the purposes of the foregoing illustrations, an exterior casing is provided at its bottom with an inlet connection 4, at one side with an outlet connection 5, and with a body portion 6 which is of generally cylindrical form and co-axial with the inlet 4, and open at its upper end. A diaphragm 7, cast integral with the casing and transversely of the body thereof below the outlet 5, separates the inlet chamber 8 from the main chamber 9 and discharge passage 10, but is provided with a central circular opening 11 which forms the valve passage for the water. A valve seat 12, consisting of a leather or other packing ring, is compressed between the diaphragm (which is rabbeted to receive it) and the contracted lower end of an inner cylinder 13 whose upper end is closed by a flanged head or cap 14, and whose contracted lower end constitutes a ring 15 which is rabbeted to receive the packing ring 12. The cylinder 13 is provided in its lower portion, above the ring 15, with ports 17 for the free passage

of water through it from the inlet 4 to the outlet 5 when the main valve is open, and is clamped in position within the outer casing by means of a screw cap 18 which is screwed into the upper end of said casing and is provided with an internal depending flange which bears upon the upper end of the cylinder head 14, and also has an outwardly projecting recessed flange between which and the upper end of the casing is confined a packing ring 20.

The main valve comprises a circular disk 24, the edges of which are turned upward to bear against the valve seat 12, as at 25, and a short cylindrical portion 26 fitting within the ring 15 of the cylinder 13. An integral hollow stem 27 connects the valve 24 with a piston 28 working within the cylinder 13 and provided with a central internally threaded depending hub 29 into which the upper end of the valve stem 27 is screwed. Wings 30 integral with the valve 24 and stem 27 serve the usual purpose of guiding the valve with respect to its seat.

Located within an annular recess formed to receive it on the bottom of the main valve 24 is a valve seat 31, the passage through which is co-axial with that through the hollow valve stem 27, and a supplemental relief valve 32 carried by a valve stem 33 co-operates with said seat. The valve stem 33 extends vertically through the valve structure to the upper end thereof, where it has secured to it a push button 34 which is guided at its lower end 35 in the cylindrical upper end 36 of the casing cap 18 before mentioned. A coiled spring 38 confined between the push button 34 and the head 14 of the cylinder 13 yieldingly holds the push button and valve stem 33 and valve 32 in their upper position, with the valve 32 seated against its seat 31, and serves to return them to such position when they are depressed therefrom and released. A packing gland 37 surrounding the stem 33 upon the upper side of the cylinder head 14 serves to prevent leakage around the valve stem at that point.

Within the cylinder 13 and above the piston 28 therein is a supplemental piston 39, which is pinned or otherwise rigidly secured to the valve stem 33, such supplemental piston being so located that in the normal position of the parts it is slightly separated from the piston 28, as shown. The piston 110

39 is provided upon its upper side with a raised circular valve seat 41 upon which rests a check valve 42 consisting of a flat disk loose upon the valve stem 33 and free to rise and fall thereon and with reference to its seat 41. A series of openings 40 through the supplemental piston 39, within the circular valve seat 41, permit free passage of water therethrough in an upward direction, its passage in the opposite direction being prevented by the check valve 42.

A restricted and adjustable escape passage 43 for the water from the upper end of the cylinder 13, above the supplemental piston 39, is provided by a regulating screw 44 which is screwed into a threaded opening formed in the depending flange of the cylinder head 14 at one side thereof and provided with a tapered slot 45. A hollow boss 46 formed upon the exterior casing 6 concentrically with the regulating screw 44, and normally closed by a screw plug 47, affords access to the screw 44 for the purpose of adjusting the same.

The operation of the valve, under the construction and arrangement of parts above described, is as follows: A slight depression of the push button 34 at the top of the valve serves to open the relief valve 32 at the under-side of the main valve and permit free passage of water from the inlet chamber 8 through the hollow valve stem 27 to the upper side of the piston 28, as well as to the upper side of the piston 39. This pressure, exerted upon the upper side of the piston 28, which is of considerably greater area than the main valve 24, will overcome the pressure of the water against the under-side of the main valve and unseat the latter, the gravity of the parts also assisting in the operation. The pressure upon the push button 34 being continued, so as to hold the valve 32 away from its seat 31 as the main valve descends, the latter will be moved downward by the pressure upon the upper side of its piston 28, aided by the gravity of the parts, until it reaches its fully open position shown in Fig. 2, at which time there will be a free passage of water through the valve structure from the inlet chamber 8 to the discharge passage 10, the interior of the cylinder above the supplemental piston 39 being also filled with water which has passed upward into the same through the openings 40 in said piston. Upon releasing the pressure on the push button 34 the spring 38 will lift the valve stem 33 and valve 32 until the latter seats against its seat 31 on the under-side of the main valve 24, as shown in Fig. 2, and thereby cuts off further passage of the water through the hollow valve stem 27 to the upper side of the pistons 28 and 39. The water above said pistons, within the cylinder 13, being free to escape slowly through the restricted

passage 43, the main valve 24 will be slowly lifted and closed by the action of the spring 38 aided by the pressure and flow of the water beneath and around said valve. The supplemental piston 39, fastened to the valve stem 33, is the controlling piston in this upward movement of the parts, since said piston (and consequently the valve stem and relief valve 32,) cannot move upward any faster than permitted by the escape of water through the restricted passage 43. In event the main valve, under the pressure and flow of the water beneath and around it, should at any time be moved upward faster than the escape of the water from the upper end of the cylinder 13 permits the piston 39 and valve stem 33 and valve 32 to move upward, and consequently be moved upward independently of and relatively to said parts, the valve seat 31 carried by the main valve 24 will be lifted away from the relief valve 32, whereupon water under pressure will be instantly readmitted through the hollow valve stem 27 to the upper side of the piston 28 and serve to arrest such independent upward movement of the main valve and its connected parts, and cause the slowly rising relief valve to again be seated against its seat 31 and cut off further admission of water under pressure through the hollow valve stem 27 to the upper side of the piston 28. In this manner the closing movement of the main valve is effectively regulated and controlled, by means of the supplemental piston 39 and the relief valve 32 and their control, in the manner described, of the admission of water under pressure to the upper side of the piston 28, with the result that all hammering or chattering of the main valve, during its closing movement, is eliminated, and said valve moves quietly and smoothly to its seat and cuts off the flow of water without any objectionable noise.

In many valves of this general character the main valve is opened, or at least unseated, by direct manual pressure, and against the full head of the water exerted upon the entire area of the main valve, with the result that a very considerable manual pressure is required to open the valve. In my improved valve all the manual pressure required to open the valve is an amount sufficient to depress the push button 34 against the resistance of the coiled spring 38 and the comparatively slight pressure of the water exerted against the under-side of the small relief valve 32, so that the valve may be opened with much greater ease and with the exertion of only a small fraction of the manual pressure required in the other valves described. Furthermore, inasmuch as the valve stem to which the push button is secured carries abutments upon opposite sides of the main valve structure (the piston 39

above it and the relief valve 32 below it) the main valve is placed to a considerable extent under the manual control of the operator, so that if it sticks or moves sluggishly it may be forced downward or pulled upward by manual manipulation of the push button.

After the valve has been opened and been allowed to close the water in the upper end of the cylinder 13, above the pistons 28 and 39, quickly escapes around said pistons and out through the ports 17 through the discharge passage 10, with the result that in the normal condition of the valve the cylinder in which the pistons work is free from water, and there is therefore less tendency to the accumulation of products of oxidation and other accretions which tend to interfere with the operation of the valve and to limit the period of its efficiency than there is where the cylinder in which the piston works is normally filled with water.

I claim:

1. In a flushing valve, the combination of a cylinder, a piston therein, a main valve connected to said piston, a supplemental valve controlling a passage leading from the pressure supply through the main valve to the cylinder, a supplemental piston located in the same cylinder as the main piston and connected to the supplemental valve, and means for manually opening the supplemental valve; substantially as described.

2. In a flushing valve, the combination of a cylinder, a piston therein, a main valve having a tubular valve stem connecting it with said piston, a supplemental valve controlling a passage leading from the inlet side of the main valve through said valve and its tubular stem to the cylinder and having a stem extending longitudinally through the same and through the cylinder to the upper side of the latter, and a supplemental piston fast upon the supplemental valve stem above the main piston and within the same cylinder; substantially as described.

3. In a flushing valve, the combination of a cylinder, a piston therein, a main valve having a tubular stem connecting it with said piston, a supplemental valve having a valve stem extending longitudinally through the main valve and its tubular stem and the cylinder to the upper side of the latter and operating to control a passage leading from the pressure supply through the main valve and its tubular stem to the cylinder, a supplemental piston fast upon the supplemental valve stem above the main piston and within the same cylinder, a push button upon the upper end of the supplemental valve stem for depressing the latter to open the supplemental valve, and a spring operating to close said supplemental valve; substantially as described.

4. In a flushing valve, the combination of

a cylinder, a piston therein, a main valve connected to said piston, a supplemental valve controlling a passage leading from the pressure supply through the main valve to the space within the cylinder above the main piston, a supplemental piston located within said space in said cylinder and constructed to permit the water to freely pass it in an upward direction but not in the reverse direction, and a manually operable valve stem connecting said supplemental piston with the supplemental valve; substantially as described.

5. In a flushing valve, the combination of a cylinder, a piston therein, a main valve having a tubular valve stem connecting it with said piston, a supplemental valve controlling a passage leading from the inlet side of the main valve through said valve and its tubular stem to the space within the cylinder above the main piston, a supplemental piston located in said space within the cylinder above the main piston and constructed to permit the water to pass it freely in an upward direction but not in the reverse direction, and a manually operable valve stem extending longitudinally through the cylinder and the tubular stem of the main valve and having the supplemental valve and the supplemental piston secured to it below the main valve and above the main piston, respectively; substantially as described.

6. In a flushing valve the combination of a cylinder, a piston therein, a main valve having a tubular stem connecting it with said piston, a supplemental valve having a valve stem extending longitudinally through the main valve and its tubular stem and the cylinder to the upper side of the latter and operating to control a passage leading from the pressure supply through the main valve and its tubular stem to the cylinder, a supplemental piston fast upon the supplemental valve stem above the main piston and within the same cylinder and constructed to permit the water to freely pass it in an upward direction but not in the reverse direction, a push button upon the upper end of the supplemental valve stem for depressing the latter to open the supplemental valve, and a spring operating to close said supplemental valve; substantially as described.

7. In a flushing valve, the combination of a cylinder in open communication at its lower end with the outlet chamber of the valve, a piston in said cylinder, a main valve connected to said piston and controlling communication between the inlet and outlet chambers of the valve, a supplemental valve controlling a passage leading from the inlet chamber through the main valve to the space within the cylinder above said piston, a supplemental piston located above the main piston within the same cylinder and constructed to permit the water to freely pass

it in an upward direction but not in the reverse direction, and a manually operable valve stem connecting said supplemental piston with the supplemental valve; substantially as described.

8. In a flushing valve, the combination of a cylinder in open communication at its lower end with the outlet chamber of the valve, a piston in said cylinder, a main valve controlling communication between the inlet and outlet chambers of the valve and having a tubular valve stem connecting it with the piston, a supplemental valve controlling communication through said tubular valve stem between the inlet chamber and the space above the piston within the cylinder, a supplemental piston located in said space above the piston within the cylinder and constructed to permit the water to freely pass it in an upward direction but not in the reverse direction, the supplemental valve stem extending longitudinally through the tubular stem of the main valve and through the cylinder and having the supplemental valve secured to it below the main valve and the supplemental piston secured to it above the main piston, a push button upon the upper end of said valve stem, and a spring exerting an upward pressure upon said push button and valve stem; substantially as described.

9. In a flushing valve, the combination of a cylinder, a piston therein, a main valve connected to said piston, a supplemental valve controlling a passage leading from the pressure supply through the main valve to the cylinder, a supplemental piston connected to and moving with said supplemental valve within the cylinder, a check valve controlling passages through said supplemental piston, and means for manually opening the supplemental valve; substantially as described.

10. In a flushing valve, the combination of a cylinder, a piston therein, a main valve having a tubular valve stem connecting it with said piston, a supplemental valve controlling a passage leading from the pressure supply through the main valve and its tubular stem to the cylinder and having a stem extending longitudinally through the same and through the cylinder to the upper side of the latter, a supplemental piston fast upon the supplemental valve stem within the cylinder, and a check valve controlling passages through said supplemental piston; substantially as described.

11. In a flushing valve, the combination of the cylinder 13, the piston 28 therein, the main valve 24 having the tubular stem 27 connected at its upper end with the piston 28, the supplemental valve 32 controlling the passage of water from the inlet to the upper side of the piston 28 and having a stem 33 extending longitudinally through the main

valve and its tubular stem and the cylinder 13 to the upper side of the latter, and the supplemental piston 39 fast upon the valve stem 33 above the main piston 28 within the cylinder 13; substantially as described.

12. In a flushing valve, the combination of the cylinder 13, the piston 28 therein, the main valve 24 having the tubular stem 27 connected at its upper end to the piston 28, the valve stem 33 extending longitudinally through the main valve and its tubular stem and the cylinder 13 to the upper side of the latter, the supplemental valve 32 carried by the stem 33 and controlling the passage of water from the inlet to the upper side of the piston 28, the supplemental piston 39 fast upon the supplemental valve stem 33 above the main piston 28, and the check valve 42 controlling passages through said supplemental piston; substantially as described.

13. In a flushing valve, the combination of the cylinder 13, the piston 28 therein, the main valve 24 having the tubular stem 27 connected at its upper end to the piston 28, the valve stem 33 extending longitudinally through the main valve and its tubular stem and the cylinder 13 to the upper side of the latter, the supplemental piston 39 fast upon the supplemental valve stem 33 above the main piston 28, the check valve 42 controlling passages through said supplemental piston, the push button 34 upon the upper end of the valve stem 33, and the spring 38 interposed between said push button and the cylinder 13; substantially as described.

14. In a flushing valve, the combination of the cylinder 13 having the contracted lower portion forming the ring 15 and provided with the ports 17, the piston 28 in the cylinder 13, the main valve 24 connected with said piston by the tubular stem 27, the supplemental valve 32 having the stem 33 extending through the main valve and its tubular stem and the cylinder 13 to the upper side of the latter, the supplemental piston 39 fast upon the supplemental valve stem 33 above the main piston 28 and the check valve 42 controlling passages through said supplemental piston 39; substantially as described.

15. In a flushing valve, the combination of the cylinder 13, having the contracted lower end forming the ring 15 and provided with the ports 17, the piston 28 in said cylinder, the main valve 24 connected with said piston by the tubular stem 27 and provided with the wings 30 guided within the ring 15, the supplemental valve 32 having the stem 33 extending longitudinally through the main valve and its tubular stem and the cylinder 13 to the upper side of the latter, the supplemental piston 39 fast upon the stem 33 above the main piston 28, the check valve 42 controlling passages through said supplemental piston, and the push button

34 and spring 38 at the upper end of the valve stem 33 for operating the latter; substantially as described.

16. In a flushing valve, the combination
5 of the outer casing 6 having the inlet 4 at its lower end and outlet 5 at one side and provided with the diaphragm 7 between the two, the cylinder 13 located within the casing 6 and having the contracted lower portion forming the ring 15 seated upon the diaphragm 7 with the interposed valve seat 12, and provided with the ports 17, the cap 18 screwed into the upper end of the casing 6 and engaging the upper end of the cylinder 13, the piston 28 in the cylinder 13, the main valve 24 cooperating with the valve seat 12 and having the tubular stem 27 connecting it with the piston 28, the supplemental valve 32 cooperating with the valve seat 31 on the under side of the main valve 24 and having the stem 33 extending longitudinally through the main valve and its tubular stem and the cylinder 13 to the upper side of the latter, and the supplemental piston 39 fast upon the stem 33 above the main piston 28; substantially as described.

17. In a flushing valve, the combination
30 of the outer casing 6 having the inlet 4 at its lower end and outlet 5 at one side and provided with the diaphragm 7 between the two, the cylinder 13 located within the casing 6 and having the contracted lower portion forming the ring 15 seated upon the diaphragm 7 with the interposed valve seat 12, and provided with the ports 17, the cap 18 screwed into the upper end of the casing 6 and engaging the upper end of the cylinder 13, the piston 28 in the cylinder 13, the main valve 24 cooperating with the valve seat 12 and having the tubular stem 27 connecting it with the piston 28, the supplemental valve 32 cooperating with the valve seat 31 on the under side of the main valve 24 and having the stem 33 extending longitudinally through the main valve and its tubular stem and the cylinder 13 to the upper side of the latter, the supplemental piston 39 fast upon the stem 33 above the main piston 28, the check valve 42 controlling passages through said supplemental piston, and the push button 34 and spring 38 at the upper end of the valve stem 33 for operating the latter; substantially as described.

55 18. In a flushing valve, the combination of an outer casing 6 having an inlet 4 at its lower end and an outlet 5 at one side and provided with an intermediate diaphragm 7, the cylinder 13 located within the casing 6 and having the contracted lower portion forming the ring 15 seated upon the dia-

phragm 7 with the interposed valve seat 12, and provided with the ports 17, the cap 18 screwed into the upper end of the casing 6 and engaging the cylinder 13, the piston 28 within said cylinder, the main valve 24 comprising the disk having the upturned outer edge 25 for engagement with the valve seat 12 and provided with the flange 26 and the integral wings 30 for guiding it within the ring 15, the tubular stem 27 connecting said main valve with the piston 28, the supplemental valve 32 cooperating with the seat 31 on the under side of the main valve and extending longitudinally through the latter and its tubular stem 27 and the cylinder 13 to the upper side of the latter, the supplemental piston 39 fast upon the stem 33 above the main piston 28, the check valve 42 controlling passages through said supplemental piston, and the push button 34 and spring 38 at the upper end of the valve stem 33, within the cap 18, for operating the supplemental valve; substantially as described.

19. In a flushing valve, the combination of the outer casing 6 having an inlet 4 at its lower end and an outlet 5 at one side and an intermediate diaphragm 7, and provided near its upper end with the tubular boss 46 closed by the screw-plug 47, the cylinder 13 located within the casing 6 and having the contracted lower portion forming the ring 15 seated on the diaphragm 7, and provided with the ports 17, and having also a restricting escape passage 43 from its upper end controlled by a regulating screw 44 in axial line with the tubular boss 46 and accessible thereto upon removal of the screw-plug 47, the screw cap 18 forming the upper end of the outer casing and engaging the cylinder 13, the piston 28 within said cylinder, the main valve 24 cooperating with the seat upon the under side of the ring 15 of the cylinder and connected by a tubular stem 27 with the piston 28, the supplemental valve 32 having the stem 33 extending longitudinally through the main valve and its tubular stem and the cylinder 13 to the upper side of the latter, the supplemental piston 39 fast upon the stem 33 above the piston 28, the check valve 42 controlling passages through said supplemental piston, and the push button and spring at the upper end of the valve stem 33 for operating the supplemental valve; substantially as described.

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