J. L. BECK.

FLUSHOMETER.

APPLICATION FILED NOV. 12, 1914.

1,171,085. Patented Feb. 8, 1916.

Fig. 1

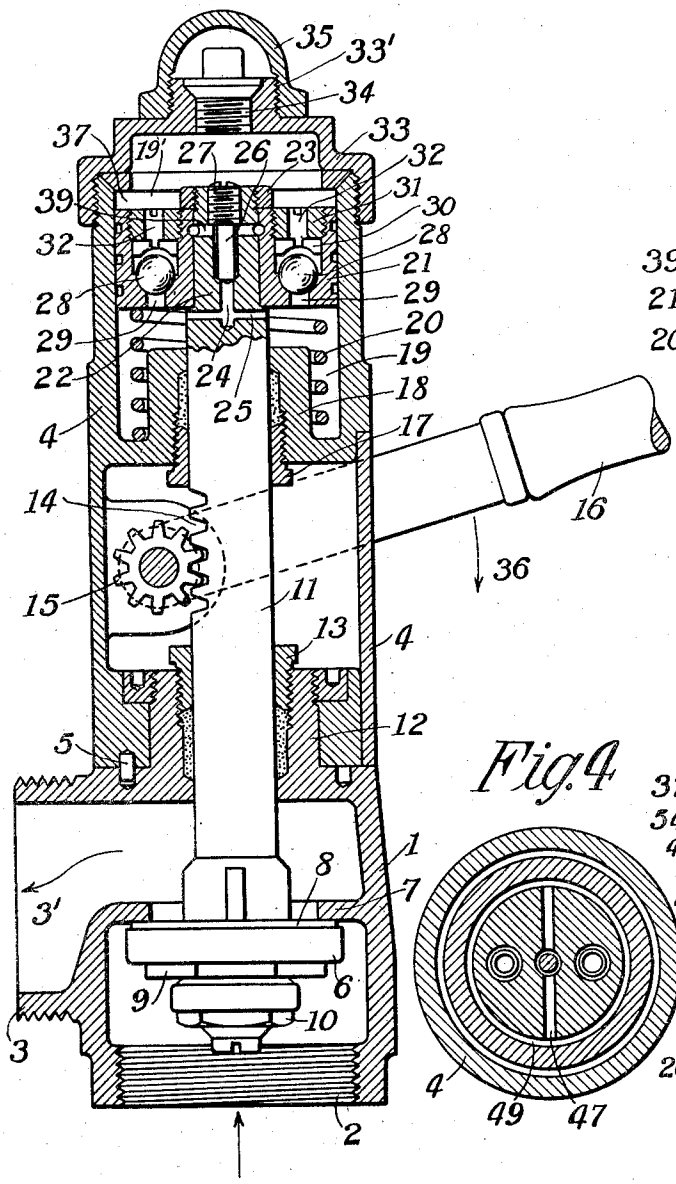


Fig. 2

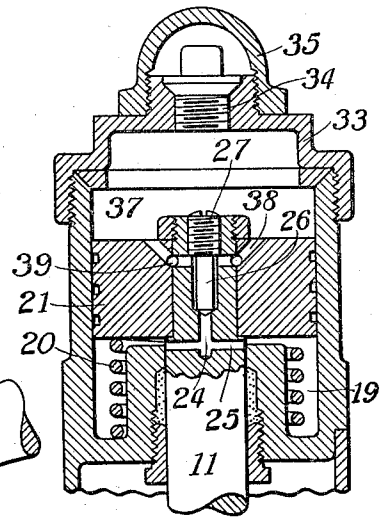


Fig. 3

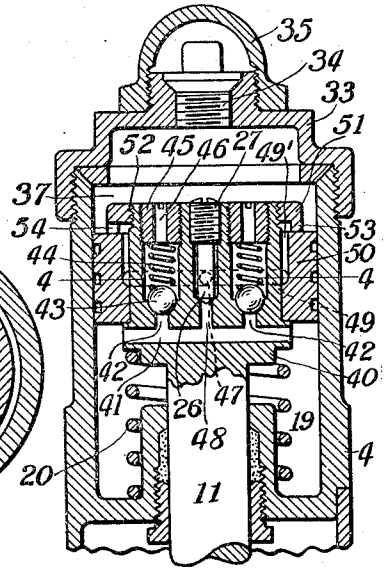


Fig. 4

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FLUSHOMETER.

1,171,085. Specification of Letters Patent. Patented Feb. 8, 1916.

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To all whom it may concern:

Be it known that I, JOHN L. BECK, a citizen of the United States of America, and residing in Springfield, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Flushometers, of which the following is a specification.

This invention relates to improvements in flushometers or devices for supplying water to water-closet bowls, and it is designed to be directly attached to the high pressure or supply service.

The invention is an improvement on my prior United States Letters Patent No. 1,063,639, dated June 3, 1913, in which a casing is provided for direct attachment to the main water supply and bowl. In my prior patented device, the main valve is operated by a hand lever and is closed by two spiral springs which force the main valve back again to its original position after being compressed by the operating handle. It also includes devices associated with a piston attached to the valve stem whereby the rate of travel or the rate of closure of the main valve may be carefully regulated.

One of the many advantages of this form of flushing apparatus is that it does away with the usual tank construction and provides a device that is directly connected to the service pressure and bowl and also one that is compact and easily repaired and examined.

Referring to the drawings, Figure 1 is a vertical sectional view taken through the axis of the valve stem showing the main valve in closed position, the rack and pinion construction for operating the valve-stem, and also the piston attached to the upper end of the valve-stem located in an oil receiving chamber and the devices associated with the piston for regulating the return movement of the main valve; Fig. 2 is a sectional view of the piston receiving portion of my valve and taken at right angles to that shown in Fig. 1. This view clearly illustrates the oil passageways that lead from the upper portion of the oil receiving chamber to the needle-valve that is located in the upper end of the valve-stem; Fig. 3 is a modification of the construction shown in Fig. 1 and illustrating a slightly different construction for varying the flow of oil from one side to the other of the piston that is attached to the upper end of the valve stem; and Fig. 4 is a horizontal sectional view on the line 4—4 of Fig. 3 showing the location of the oil passageways in the piston and stem, the arrangement of the ball-valves in the valve-stem, and the spiral springs for normally holding the balls seated.

Referring to the drawings in detail, 1 designates the base portion of the valve-casing having the threaded portion 2 for attachment to the main service pipe.

3 is the threaded stem to which connection is made with the water-closet bowl. Located on the base portion 1 is a casing 4 that is retained in an adjustable position by means of dowel-pins 5.

6 designates the main valve, 7 the valve-seat, the valve having the usual packing seat 8 and the usual nut locks 9 and 10 for retaining the valve 6 in place on the valve-stem, indicated at 11. This stem extends upward into the casing 4 and passes through a gland or packing box 12 to prevent leakage, the gland proper being indicated at 13. Formed in the side of the valve-stem 11 is a rack 14 which is engaged by a pinion 15 to which the operating-handle 16 is secured. Located above and adjacent the rack 14 is a second packing gland 17 that has a threaded attachment with the chambered part of the casing 4, as indicated at 18, to prevent leakage of oil from the piston-receiving-chamber, to be referred to later.

19 designates an annular space between the part 18 and the casing 4 and in this space is located a spiral compression-spring 20, the upper end of which engages the lower end of the piston 21 which is attached to the upper end of the valve-stem 11 by means of the reduced portion 22 and nut 23. The piston 21 is located in an oil-tight compartment. The upper end of the valve-stem is formed with an axial passageway 24 and a transversely located passageway 25 that connects therewith. The passageway 24 is adapted to be opened or partly closed by means of the adjustable needle-valve 26, the upper end of which is formed with an enlarged threaded portion 27, whereby the position of the lower end of the needle-valve 26 may be moved so as to vary the effective area of the passageway 24. Also located within a chambered or recessed part of the piston 21 are spherical ball-valves 28, which normally rest in the bottom part of the recess as indicated in Fig. 1, to close the ports 29.

30 designates seats against which the balls 28 are forced when the operating-handle is moved downwardly to open the main-valve 6, whereby the oil below the piston 21 can freely flow to the upper side of the piston, as will be fully described in the statement of operation.

31 designates plugs formed with an opening 32 therethrough, whereby the oil that fills the chamber 19 below the piston may freely pass from one side to the other of the piston 21 when the main-valve 6 is operated or moved downward. The upper end of the casing 4 is closed by means of a cap 33 that is attached thereto by means of the threaded connection, and located in the center portion of this cap is a screw-plug 34 which is designed to be removed whenever the needle-valve 36 is to be adjusted and the upper end of the cap 33 is covered by means of a second cap 35 which is threaded onto the cap 33, as shown at 33′.

Referring now to the operation of the construction just described and as shown in Fig. 1, another sectional view of the piston part of which is shown in Fig. 2: When the handle 16 is depressed or moved downwardly in the direction of the arrow 36, the main valve 6 is opened, permitting water to flow through the opening indicated at 3′ which leads to the bowl. At the same time, the oil, which fills the chamber 19 below the piston and also partially fills the space 37 above the piston, lifts the ball-valves 28 from their seats, permitting the oil to freely pass through the openings 29 and 32 into the chamber 37 above the piston 21. During the downward movement of the handle 16, the piston 21, as will be clearly seen, is moved by the valve-stem 11, and, at the same time, the spring 20 is compressed as shown in Fig. 2. When the handle 26 is released, the water-pressure from the source of supply pressing against the bottom of the piston 6, together with the recoil action of the spring 20 serves to return the valve 6 back to its seat 7, but this movement is retarded by the oil flowing from the chamber 37 above the piston 21 back to the chamber 19 below the piston through the passageway 38 (see Fig. 2) into the annular groove 39 and from there into the passageway 24, past the lower end of the needle-valve 26 into the transverse passageway 25 from which it escapes into the chamber 19. It is, of course, understood that during the downward movement of the piston 21 the ball valves 28 are raised to engage the spaced seats 30 to permit the oil to flow from the lower to the upper side of the piston, and, during the return or upward movement of the piston 21, the ball-valves are seated in the position shown in Fig. 1. In the downward movement, the oil can flow freely from the lower to the upper side of the piston, and during upward movement the oil is retarded by the needle-valve 26, from the chamber 37 to the chamber 19 only through the restricted passageway 24; the position of the needle-valve 26 determining the rate of the return movement of the main valve or the time during which the water flows from the source of supply to the bowl before being shut-off. The sectional view shown in Fig. 2 taken at right angles to that shown in Fig. 1 clearly indicates the passageways 38, 24, and 25 from the chamber 37 to the passageway 24, the piston 21 being shown in its lowermost position with the spiral spring 20 compressed.

Referring now to the modification shown in Figs. 3 and 4: in this view, the valve-stem 11 is slightly modified at its upper end, having the flange 40 to receive the upper end of the compression spring 20. The transverse passageway 41 is slightly longer than the passageway 25, and the passageways 42 directly communicate with the passageway 41. The ball-valves 43 are shown seated and in their lowermost position, being held down to their seats by means of the coiled springs 44, the tension of which are adjusted by means of the apertured plug 45 in which is formed the passageway 46. The needle-valve 26 in this modification is substantially the same as that shown in Fig. 1. 47 designates a passageway that communicates with the passageway 48, the opposite ends of which lead into the circular groove or channel 49 which connect with the passageways 49′ in the piston 50. 51 designates a U-shaped cap that is attached to the piston 50 by means of the screw-threads 52. This cap is bored out or grooved on the underside and formed with a rim 53. In this rim is formed an inlet passageway 54 to permit the oil in the upper chamber 37 to flow back through the passageways in the piston and valve-stem into the lower chamber 19 during the return movements of the piston during the closing of the main valve. In this construction, when the valve-stem 11 is moved downward, the ball-valves 43 are raised from their seats permitting the oil from the chamber 19 to flow freely through the passageways 41, 42, and 46 into the chamber 37 above the piston. During the return movements, the ball-valves 43 are again seated by means of the expansive force of the springs 44. The oil now flows through the passageways 54, 49′, and 49, past the needle-valve 26, passageways 24 and 41 to the chamber 19, the spring 20 meanwhile assuming the expanded position shown in Fig. 3. It will be noticed from Fig. 3 that the ball-valves 43 are located in the enlarged upper end of the valve-stem, while in Figs. 1, 2, and 3 the ball-valves are located in the piston 21.

What I claim is,—

1. In a flushometer, the combination with

the casing thereof provided with means for attaching the same to the service supply and bowl, respectively, of a main valve for opening and closing the source of supply, a valve-stem, a piston secured to the upper end thereof, the casing having a chamber above and below the piston to receive a liquid, and the piston having passageways therethrough, balls to permit the liquid from one side of the piston to flow freely through the passageways when the main valve is opened and to cut-off the flow of liquid to the other side of the piston through the passageways when the direction of movement of the piston is changed, the valve-stem having a passageway extending from one side of the piston to the other, a needle-valve for varying the size of the passageway for controlling the flow of the liquid to the lower side of the piston during the return movement of the main valve to its seat, means for adjusting the position of the needle-valve, means for manually moving the main valve from its seat, and a compression spring located on one side of the piston to assist the water pressure in closing the main valve, said spring being located within an annular chamber and directly engaging the lower side of the piston.

2. In a device of the class described, the combination with the casing thereof, means for directly attaching the casing to the water supply and the bowl, respectively, a main valve, a valve-stem, a rack and pinion to move the main valve from its seat, the casing having a closed liquid-receiving chamber, a piston therein and attached to the upper end of the valve-stem, the lower end of the chamber having an annular portion, a compression spring located in the annular portion and engaging the under side of the piston to normally retain the valve on its seat, said piston being formed with a chambered passageway therethrough, a ball-valve located in the chambered portion of the passageway and normally seated to close the passageway when the main valve is closed and the piston elevated but permitting the ball-valve to freely rise from its seat by the force of the liquid below the ball when the piston is lowered to open the main valve, the stem having a passageway formed therein, and two transverse passageways that connect with the ends of the axial passageway, the piston having a passageway that extends from the upper side of the piston to one of the transverse passages, a needle-valve to vary the size of the axial passageway for regulating the flow of the liquid from the upper to the lower side of the piston during the time of the return movement of the main valve.

3. In a flushometer, a casing having chambered portions, a main valve in one of the chambered portions, a valve-stem, a piston on the upper end of the valve-stem and located in another chambered portion, a rack and pinion construction to move the main valve and piston in unison, the piston-receiving portion being sealed to receive a liquid, a spring engaging the lower side of the piston to assist in maintaining the main valve closed, means to permit the liquid to freely flow through the piston during the opening movements of the main valve, means to retard the return movements of the main valve, said means comprising communicating oil passages in the piston and valve-stem and which extend to the opposite sides of the piston and valves movable automatically in the piston passages, a needle-valve in the valve-stem to vary the size of the passageway therein.

4. In a flushometer, the combination with the casing, a main valve, a valve-stem, a rack and pinion to operate the valve, a closed chambered portion in the casing, a piston attached to the valve-stem and located within the closed chambered portion, the upper end of the valve-stem being enlarged and having recesses formed therein, ball-valves in the recesses, springs to force the ball-valves to their seats, there being passageways through the enlarged upper end of the valve-stem which are controlled by the ball-valves, a recessed cap secured to the upper end of the valve-stem the rim of which is apertured to communicate with passageways in the piston and said stem to permit oil to flow from the upper to the lower part of the chamber during the closing of the main valve, and, when the ball-valves are in a closed position, said ball-valves being designed to permit the oil to freely flow from the lower to the upper side of the piston when the main-valve is opened and to close when the main valve is moved to its closed position, and means to vary the size of one of the passageways in the stem to vary the rate of closing of the main valve.

5. In a flushometer, a valved casing provided with a fluid containing chamber, a piston in the fluid containing chamber, a stem connecting the piston and the valve in the valved casing, means to shift the stem to open the valve and slide the piston, and means including communicating passages formed in the valve stem and the piston and also means movable automatically in the piston to retard flow of liquid through the piston passages upon return movement of the valve and thereby retard return movement of the latter.

6. In a flushometer, a casing provided with a water chamber and a fluid containing chamber spaced from the water chamber, a valve in the water chamber, a piston in the fluid chamber, a stem connecting the valve and the piston whereby they move in unison, a spring to assist in maintaining the valve

in closed position, means to shift the stem to open the valve and slide the piston, means to permit the fluid to freely flow through the piston during opening movement of the valve, and means including communicating passages formed in the valve stem and the piston and also means movable automatically in the piston to retard flow of liquid through the piston passages upon return movement of the valve and thereby retard return movement of the latter.

7. In a flushometer, a casing provided with a water chamber and a fluid containing chamber spaced from the water chamber, a valve in the water chamber, a piston in the fluid chamber, a stem connecting the valve and the piston whereby they may move in unison, means to shift the stem to open the valve and slide the piston, means to permit the fluid to freely flow through the piston during the opening movement of the valve, means to retard the return movement of the valve, including constantly communicating passages formed in the stem and the piston, and a needle valve in one of said passages to vary the rate of flow of fluid through the piston and valve stem to regulate the closing of said valve.

8. In a flushometer, a casing provided with a water chamber and a fluid chamber, the water chamber having a valve seat, a valve movable toward and away from said seat, a stem having communication with the valve and extending into the fluid chamber, a piston secured to the valve stem and slidable in the fluid chamber, and means to shift the valve stem to move the valve away from said seat and to slide the piston in the fluid chamber, the piston having valved passages through which the fluid in the fluid chamber freely passes from one side of the piston to the other side thereof upon shifting the valve stem to move the valve away from said seat, the piston and valve stem having constantly communicating passages through which the fluid may pass slowly to retard movement of the valve stem and the valve to normal positions.

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Witnesses:
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