S. W. LEWIS.

FLUSHING VALVE.

APPLICATION FILED JULY 7, 1910.

1,014,072. Patented Jan. 9, 1912.

Fig. 1

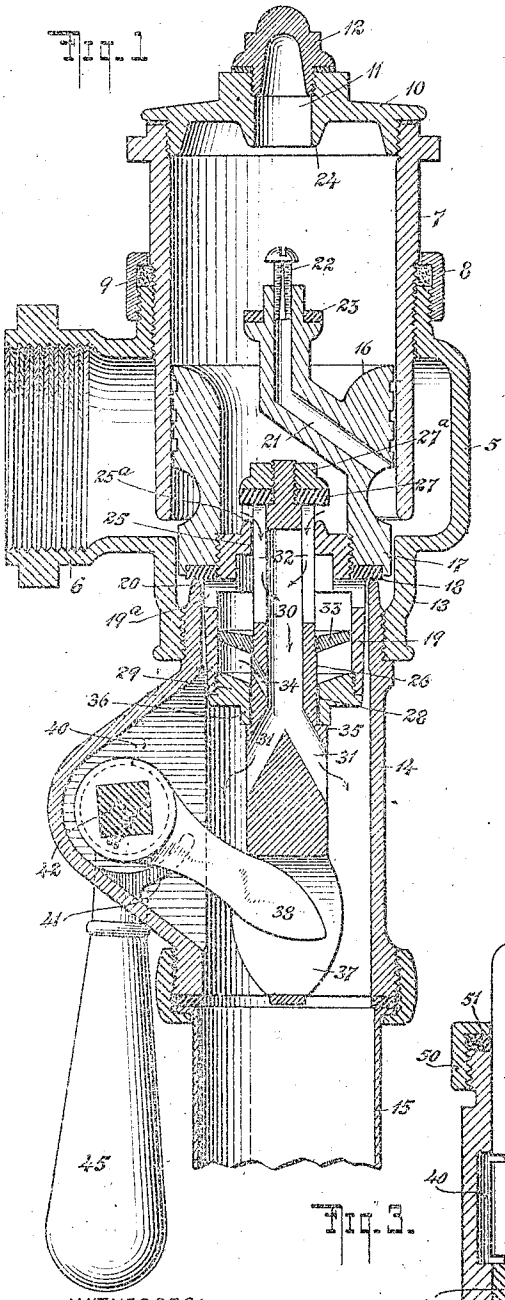


Fig. 2.

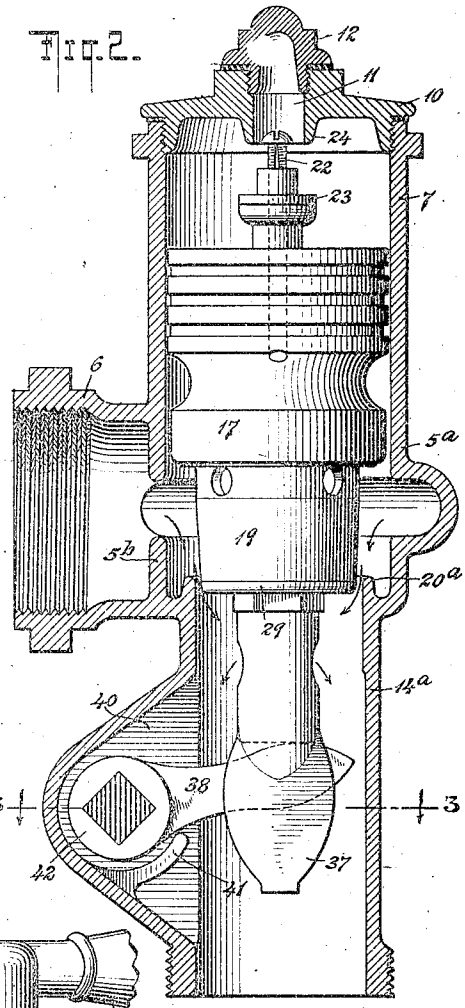
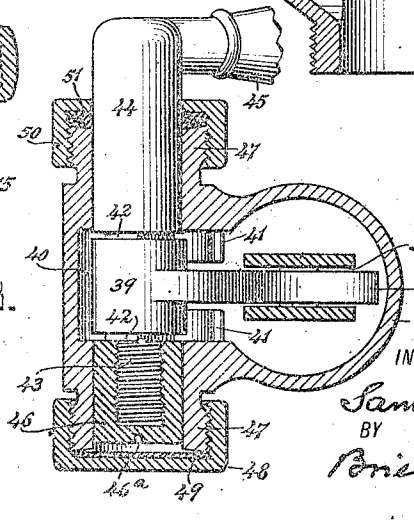


Fig. 3.



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FLUSHING-VALVE.

1,014,072. Specification of Letters Patent. Patented Jan. 9, 1912.

Application filed July 7, 1910. Serial No. 570,718.

To all whom it may concern:

Be it known that I, SAMUEL W. LEWIS, a citizen of the United States, and resident of the borough of Brooklyn, county of Kings, city and State of New York, have invented certain new and useful Improvements in Flushing-Valves, of which the following is a specification.

My invention relates to flushing valves of the kind described, shown and claimed in my prior Patents No. 715,675 of December 9, 1902 and No. 947,183 of January 18, 1910, and has for its object the general improvement of valves of this description; also to simplify the construction thereof and to increase the effectiveness and serviceability of such valves and to prevent hammering as the valve closes and to improve the operating mechanism.

My invention will be fully described hereinafter and the features of novelty will be pointed out in the appended claims.

Reference is to be had to the accompanying drawings in which—

Figure 1 is a central longitudinal section of my improved flushing valve showing the valve in the act of being opened; Fig. 2 is a similar view of a valve showing a slightly different form of casing and illustrating the valve in its open position and Fig. 3 is a sectional view on the line 3—3 of Fig. 2.

Referring more particularly to Fig. 1 of the drawings 5 represents the valve body or casing which is provided with the usual inlet 6 adapted for ready connection with a source of water supply. The said body is further provided with an internally screw-threaded aperture for the accommodation of the axially movable independent cylinder 7 which may be adjusted to regulate or completely shut off the water supply as clearly shown and described in my Patent No. 947,183 hereinbefore referred to. A stuffing box comprising a collar or hub 8 is arranged to screw on said casing and a packing 9 is provided to render the connection between the said cylinder and the valve body water tight. The upper end of said cylinder 7 is closed by means of a screw-threaded cap 10 having a central aperture 11 in turn closed by a screw-threaded cap 12 the purpose of which is also disclosed in my Patent No. 947,183 and will be referred to more in detail hereinafter. The casing 5 may further be formed with a downwardly projecting internally screw-threaded neck 13 into which the discharge chamber 14 is screwed, said chamber having its free end suitably connected by means of a pipe 15 with a water closet bowl. A tubular valve piston 16 of such construction as to be movable within the cylinder 7 carries a preferably integral main valve 17 said valve being preferably of slightly less diameter than said piston 16 and cylinder 7. A main valve washer 18 is located on the lower surface of said main valve and is held in position by means of a chambered controller 19 which is in screw-threaded engagement with said piston 16. This main valve washer 18 is arranged to coöperate with the valve seat 20 located in the casing 5 and preferably formed on the upper end of the discharge chamber 14 as clearly shown in Fig. 1. The tubular valve piston 16 is further provided with a by-pass 21 the upper end of which is controlled by a time screw 22 for regulating the length of flush. The said by-pass also carries a valve washer 23 adapted to coöperate with a valve seat 24 formed on the interior surface of the cap 10. Thus by bringing this valve washer 23 into engagement with the seat 24 and removing the cap 12 the screw 22 may be adjusted as desired without necessitating the shutting off of the water. These features are also clearly shown and described in my Patent No. 947,183.

The controller 19 is of a diameter to permit it to freely enter the discharge chamber 14 when the valve is closing and is provided with a longitudinal central passage 25 at its upper portion and a valve seat 25ª adjacent to the exterior end thereof. A valve stem 26 projects through said opening 25 and carries a relief valve 27 secured in position by means of a nut 27ª and adapted to coöperate with the seat 25ª and further extends through a central aperture 28 located in a removable plug or head 29 which is secured in the lower end of said controller and closes same. The valve stem 26 is formed with a central passage 30 terminating in branches 31 which connect it with the interior of the discharge chamber at a point below the controller 19. The upper portion of said valve stem 26 is provided with longitudinal slots 32 which connect with said passage 30. Said valve stem 26 further carries at a point within the controller a septum or pressure head 33 having a loose

piston fit in said controller and which may be simply slipped on said stem and held by friction or screwed thereon as desired. In the specific form illustrated a small water passage 34 is provided in said stem immediately below said septum and arranged at a proper angle to act as an exhaust ejector, as will be more fully described hereinafter. An annular shoulder 35 is formed on said valve stem 25 and acts in conjunction with an annular stop 36 forming part of the plug or head 29 to limit the movement of the valve stem 26 relatively to the controller 19.

At its lower end the valve stem 26 is recessed or provided with a loop as indicated at 37 to receive the end of an operating or lifting arm 38. This arm is connected with or forms part of a hub 39 located in a lateral chamber 40 forming part of the discharge chamber 14 in which retaining guards 41 are also located in close proximity to said hub. The hub 39 is provided with a central axially extending angular opening into which extends the angular shaft 42 forming part of or secured to the bearing portion 44 of the operating handle 45. The end of the shaft 42 opposite to that at which the handle is located is provided with a screw-threaded extension 43 arranged to engage a bearing sleeve 46 which together with the bearing portion 44 of the handle, is journaled in suitable externally screw-threaded collars 47 forming part of the chamber 40. The bearing sleeve 46 may be connected to the shaft 42 other than by screw-thread if desired, the only requirement being that said shaft and bearing sleeve engage each other detachably. The said bearing sleeve 46 is provided with a lateral recess or slit 46ª for the accommodation of a screw driver or other suitable instrument to facilitate the connection and disconnection of the parts. A screw-threaded cap 48 covers the said bearing sleeve 46 and is removably secured to the one collar 47 the connection being rendered water tight by means of a washer 49, a similar cap 50 being likewise secured to the opposite collar 47 and forming with the packing 51 a stuffing box to prevent leakage between the handle at this point. It will be seen that the sleeve 46 when screwed up terminates short of the end of the collar 47 so that when the cap 48 is in position it does not exert any pressure on said sleeve to cause friction.

In operation the handle 45 is moved so as to rock the operating shaft and raise the lifting arm 38 and valve stem 26 until the shoulder 25 abuts against the stop 36 on the controller. This operation at the same time raises the relief valve 27 from its seat 25ª and relieves the pressure above the valve piston so that the whole pressure of the water will be exerted to lift the main valve, it being only necessary to keep the relief valve open until the main valve is at the limit of its upward stroke. The discharge chamber is by this means brought into communication with the source of water supply which flushes the closet bowl. In the preferred form of construction, the space above the valve seat 20, which may be termed a valve chamber is at all times of sufficient dimensions to permit the main valve and controller, in operation, to be raised entirely out of the discharge chamber and above the outlet and valve seat 20 to permit a free flow of water through said outlet when the valve is fully open. In this condition of the parts at the upper end of the stroke the body of the valve is filled with water under pressure, so that if the handle is released, the pressure of the said water on the septum instantly closes the relief valve, while the main valve moves toward its seat. The speed with which said main valve closes is retarded by the water which passes through the by-pass 21 and is governed by the position of the time screw 22. As soon as the controller enters the discharge chamber and throttles the same, the pressure of the water is instantly and greatly increased owing to the resistance of the parts to its passage and entering through the ports 19ª acts directly upon the said septum to seat the main valve. This increased pressure exerted upon the greater area of the septum holds the relief valve so firmly upon the seat itself, that it cannot yield to the increased pressure of the water as just described, or to the effect of the vacuum which forms above the piston and tends to lift said relief valve as the main valve thus closes, whereby water hammering is prevented and the operation of the valve is substantially noiseless. In low water pressures, the septum thus affords an additional element and provides an increased surface or area in addition to the area of the main valve upon which the pressure of the water is exerted to bring the main valve to its seat so that any tendency of the main valve to bind or stick during its closing operation is overcome even with a low water pressure. The position of the cylinder 7 relatively to the inlet may at all times be adjusted to regulate the inflow of the water so that under high pressure the flow may be throttled to secure the desired result. When the inflow is thus throttled and regulated, the low dynamic flow with the aid of the controller will still be sufficient to firmly and effectively bring the main valve to its seat. The closing operation of the valve is therefore uniform under all water pressures.

During the operation of my improved valve, the water passing with greater velocity through the openings 19ª and through the channel 30, will, as it passes the opening

34, produce a suction at said opening which will act in the nature of an exhaust ejector. By this means any water which owing to the loose fit of the septum has passed beneath the same will thus be quickly withdrawn therefrom so that said septum is readily and quickly lowered by the pressure above it and easily closes the relief valve which is of smaller area and consequently is dominated by said septum. The material advantage of this construction is that the efficiency of the septum is greatly increased by applying the pressure directly upon the same. This is accomplished by locating the septum within the controller, with pressure ports above it so that when the main valve is closing and the controller enters the discharge chamber as before stated, the pressure entering the pressure chamber through the openings 19ª acts directly on said septum to hold the relief valve of less area firmly and securely upon its seat until the main valve is closed. This improved construction does away with the necessity for weights or springs and permits of the use of a very short handle, a wheel, or even a cross handle. In my structure I rely on the septum to close the valve under pressure varying from three pounds static to over one hundred pounds, the device operating with equal regularity and reliability under all conditions. Furthermore by means of the ejector feature in this form of my invention the septum can be made to fit loosely within the controller so as to allow a free passage between the septum and controller for the water. If the water is thus heavily charged with sediment, this sediment will be washed through said space and will not settle on the septum and clog the valve.

Referring now more particularly to Fig. 2, the construction of the valve piston, main valve, controller and connected parts is identical with that shown in Fig. 1. The difference in this form of my device lies entirely in the construction of the casing which, in this case, is made integral with the discharge chamber 14ª instead of separate therefrom as in Fig. 1. In this last form of construction the valve seat 20ª, which corresponds to the seat 20 thus also forms an integral part of the valve body or casing. The valve body 5ª in this latter instance is formed with a counter bored chamber 5ᵇ surrounding the main valve seat 20ª. The utility of this counter bored chamber is the same as in my prior Patent No. 947,183 hereinbefore referred to. That is as the piston and valve gradually move downward toward the valve seat the controller 19 will enter the discharge chamber 14 and throttle the flow of water which thus enters faster than it can leave and collects in said counter bored chamber and forms a water cushion beneath the valve 17 and valve disk 18. The pressure of this water cushion is exerted against the closing of the valve and is maintained to the instant of closing owing to the fact that it is impossible for the water in said counter bored chamber to leak out through the small annular space between the walls of the discharge chamber and the controller as fast as it enters through the annular space between the main valve and the wall of the said counter bored chamber. The result is that the water cushion formed in this manner permits the valve to settle gradually and noiselessly to its seat and assists to prevent water hammering thereof. The life of the valve is thus greatly increased and the necessity for continuous repairs is obviated.

If it is desired for any reason to disconnect the valve operating parts that is the handle 45 and its connected parts which may be the same in all of my structures herein shown and described, the cap 48 is first removed to expose the sleeve 46, which may then be removed from the screw-threaded end 43 of the shaft 42. On loosening the cap 50 the bearing portion 44 with the handle 45 and shaft 42 may be withdrawn from hub 39 and the collar 47. After this has been accomplished the hub 39 of the arm 38 will drop into and be held by the retaining guards 41 against dropping into the closet.

The cap 50 may sometimes be screwed up so tightly as to cause the packing to engage the bearing portion 44 with such pressure that the friction would ordinarily be sufficient to maintain the handle, particularly a short light handle, in its upper position with the valve open or if not sufficiently great to accomplish this would delay the closing of said valve. In my improved structure this friction is easily overcome by the direct heavy pressure of the water on the septum in either of the forms of my device and the valve is readily and quickly closed as intended.

It will be seen that the loop 37 is, or rather the walls forming said loop are relatively broad so as to engage the operating arm 38 throughout a considerable portion of the length. This construction overcomes any tendency of the stem 26 to rotate due to the action of the rushing water while the valve is in operation. In other words, the flat walls of the loop 37 will engage and be held against rotation by contact with the arm 38.

My invention thus provides a simple and easily operated flush valve structure which is effective and noiseless in operation and does not readily get out of order.

Various changes in the specific construction shown and described may be made within the scope of the claims without departing from the spirit of my invention.

I claim:

1. The combination of a valve casing

provided with an inlet and an outlet, a main valve controlling said outlet, means for opening said main valve, an apertured chamber connected with said main valve, a septum in said chamber on which the water pressure is exerted to close said main valve, a movable tubular stem extending lengthwise of and beyond said chamber and carrying said septum, and provided with a channel below said septum for automatically withdrawing water from beneath the septum and a relief valve carried by said stem and arranged to be opened before the main valve is opened and to be closed and maintained closed during the closing operation of the main valve by the water pressure on the septum.

2. The combination of a valve casing provided with an inlet and an outlet, a main valve controlling said outlet, an apertured chamber connected with said main valve and extending below the same, a channeled stem extending loosely through said chamber, the exit end of the channel terminating outside of said chamber, a relief valve carried by said stem, means for successively opening said relief valve and said main valve, and a septum on said stem within said chamber on which the water pressure is exerted to close the relief valve and to keep it closed during the closing operation of the main valve and to close the main valve, said stem being provided with a channel below the septum through which the water is automatically withdrawn from beneath said septum.

3. The combination of a flushing valve provided with an inlet, an outlet, and a main valve arranged to open and close said outlet, a controller located below and connected with said main valve and of substantially the same cross-sectional area as said outlet, said controller comprising an apertured chamber provided with a relief passage, a valve stem having a limited longitudinal movement relatively to said chamber, a relief valve carried by said stem and controlling said relief passage and a septum connected with said stem and having a loose piston fit in said chamber on which the pressure of the water acts to close the relief valve, said aperture of the said chambeir being located entirely above said septum.

4. The combination of a casing having an inlet, an outlet, and a chamber disposed above said outlet, a main valve mounted to reciprocate in said chamber to control said outlet, a hollow controller depending from the underside of said valve and adapted to throttle and substantially close said outlet in the closing movement of said main valve, said controller being apertured near its top, the combined length of the valve and controller being less than the length of said chamber above the outlet, a relief passage through said valve and controller, a relief valve governing said passage, a stem carrying said relief valve, and a septum also carried by said stem below said aperture, said septum being of greater area than the relief passage and having substantially a loose piston fit within said controller and adapted to aid in seating the relief and the main valve.

5. The combination of a casing having an inlet, an outlet, and a chamber disposed above said outlet, a main valve mounted to reciprocate in said chamber and to control said outlet, a hollow controller depending from the underside of said valve and adapted to throttle and substantially close said outlet in the closing movement of the valve, said controller being apertured near its top and provided at its bottom with a closure having a single opening therethrough, the combined length of the valve and controller being less than the length of said chamber, a relief passage through said valve and controller, an auxiliary valve governing said passage, a stem carrying said auxiliary valve and passing through and substantially filling the opening in the bottom closure of said controller and a member carried by said stem and housed within said hollow controller and adapted to aid in seating the auxiliary and the main valve.

6. The combination of a flushing valve provided with an inlet, an outlet, an adjustable valve cylinder arranged to graduate the volume of flow through said outlet, a main valve operative within said cylinder to open and close the outlet, and a controller disposed below and connected with said main valve, and of substantially the same cross sectional area as said outlet, said controller comprising an apertured chamber having a relief passage through it, a relief valve controlling said relief passage, a valve stem attached to said relief valve and a septum on said stem having a loose piston fit within said chamber on which the pressure of the water acts to close the relief valve, said septum being of greater diameter than said relief passage, and said aperture of the said chamber being located entirely above said septum.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

SAMUEL W. LEWIS.

Witnesses:

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