April 28, 1925. 1,535,562

C. H. ATKINS

FLUSHOMETER

Filed Jan. 27, 1923

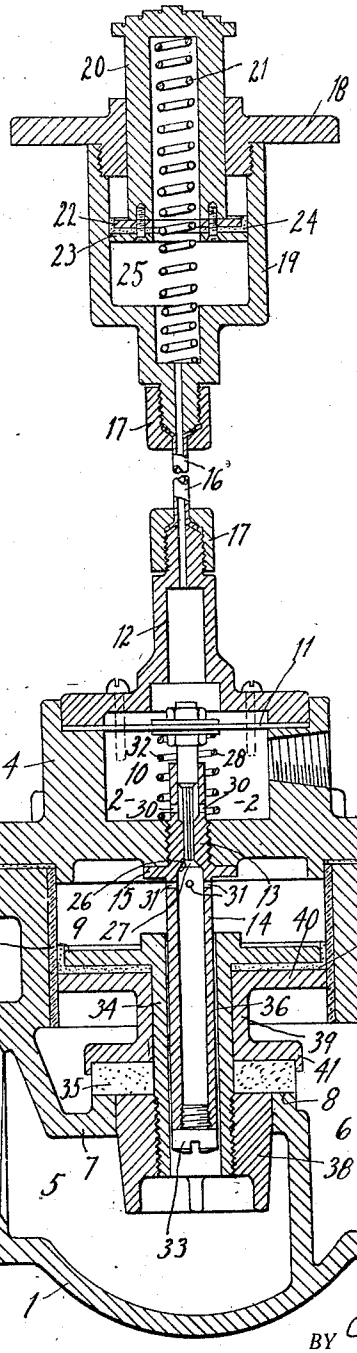


FIG. 1.

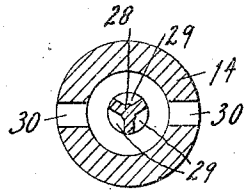


FIG. 2.

INVENTOR.

BY Charles H. Atkins,

Frank A. Cutter, ATTORNEY.

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UNITED STATES PATENT OFFICE.

CHARLES H. ATKINS, OF PALMER, MASSACHUSETTS.

FLUSHOMETER.

Application filed January 27, 1923. Serial No. 615,204.

To all whom it may concern:

Be it known that I, CHARLES H. ATKINS, a citizen of the United States of America, and a resident of Palmer, in the county of Hampden and State of Massachusetts, have invented a new and useful Flushometer, of which the following is a specification.

My invention relates to improvements in flush valves or flushometers especially designed for use in lavatories, and consists generally and broadly of a casing having therein communicating inlet and outlet chambers, compression, and a waste or relief chamber, said inlet and pressure chambers being in communication, a valve between said inlet and outlet chambers, and said pressure and relief chambers also being in communication, a diaphragm- and spring-operated, relief valve between said pressure and relief chambers, and air-compression means for operating said diaphragm and relief valve, against the resiliency of the associated spring, from a remote point, together with such other parts and members as may be necessary or desirable in order to render the flushometer complete and serviceable, all as hereinafter set forth.

The primary object of my invention is to produce a flushometer and means for operating and controlling the same from a remote point by pneumatic pressure, which are simple in construction, and positive in action, and wherewith are obtained a quick discharge, and a slow closing action, involving a predetermined time interval.

This flushometer is practically noiseless, does not leak, and is withal practicable and efficient.

Other objects and advantages will appear in the course of the following description.

I attain the objects and secure the advantages of my invention by the means illustrated in the accompanying drawings, in which—

Figure 1 is a central, vertical section through a flushometer which embodies a practical form of my invention, the intermediate portion of the tube between the casing members and the compressed-air-cylinder being broken out, and the movable parts being disposed in closed and otherwise normal or initial position, and, Fig. 2, an enlarged, cross section through certain of the parts, taken on lines 2—2, looking down, in Fig. 1.

Similar reference characters designate similar parts throughout the several views.

As illustrated in the drawings, a valve casing is represented at 1, and secured to this casing, with a packing ring 3 between, is a head 4. The casing 1 is designed to be connected with the usual supply and discharge pipes of an ordinary water-supply system, and said casing has therein an inlet chamber 5 and an outlet chamber 6. The chambers 5 and 6 are separated by means of a partition 7 which is provided with a horizontal valve-seat 8. There is a brass-lined pressure chamber 9 in the casing 1 below the head 4, and a waste, exhaust, or relief chamber 10 in said head. The top of the chamber 10 is formed by a diaphragm 11 which is held in place by means of the flanged base of a nipple 12, said base being secured to the cap 4 above said diaphragm. The passage in the nipple 12 at the upper terminal is constricted. The axis of the passage through the nipple 12 is in the same line with the axis of the valve-seat 8, and also in this line is an opening through the bottom of the cap 4. Tapped into the aforesaid opening is a tube 14 which is provided with a flange 15 to seat against the bottom of the cap 4. The lower end of a tube 16 is securely attached, by means of a coupling 17, to the upper terminal of the nipple 12, and said tube opens into the constricted passage, of which mention has been made, in said nipple.

An annular support 18, which is adapted to be set in the floor, has depending therefrom a hollow, cylindrical casing 19 in the lower terminal of which is a constricted passage similar to that in the upper terminal of the nipple 12. The upper end of the tube 16 is secured to the bottom of the cylinder 19 by means of a second coupling 17, said tube opening into the constricted passage in said cylinder.

A vertical plunger 20 is slidingly arranged in the center of the support 18. The plunger 20 has a central passage therein which opens through the bottom thereof, and a spring 21 is arranged in said passage between the top thereof and a shouldered part of the cylinder 19 through which opens at the top the constricted passage in said

casing. Normally the spring 21 retains the plunger 20 in an elevated position, so that the head of said plunger extends some distance above the support 18. Upon applying the foot to the head of the plunger 20 said plunger can be forced downwardly against the resiliency of the spring 21. Secured to the bottom of the plunger 20 is a piston-head comprising upper and under rings 22 and 23, respectively, and an interposed leather washer or cup-packing 24. An air chamber 25 is thus formed in the cylinder 19, such chamber being below the aforesaid piston-head.

A valve-seat 26 is provided in the tube 14 approximately on the same level with that of the under side of the bottom of the cap 4. A relief valve 27 is provided for the valve-seat 26, the construction of said seat and valve being such that the latter opens downwardly. The valve 27 is supported from a stem 28 that is secured to the center of the diaphragm 11, and extends into and is guided by the upper-terminal portion of the tube 14. The lower portion of the stem 28 is channeled, as best shown at 29 in Fig. 2. The tube 14 opens at 30 into the chamber 10, and at 31 into the chamber 9. The openings 30 are adjacent to the channels 29 in the valve-stem 28, and the openings 31 are below the valve 27. A spring 32 is interposed between the diaphragm 11 and the bottom of the cap 4. The lower end of the tube 14 is closed by means of a plug 33.

Slidingly arranged on the lower-terminal portion of the tube 14 is a hollow member 34 which serves as a valve-stem for a valve 35 for the valve-seat 8. This is the main valve. There is an annular clearance or a narrow annular space 36 between the tube 14 and the valve-stem 34. The valve-stem 34 below the valve 35 is tapped into a valve member 38. A sleeve 39, having a top flange 40 and a bottom flange 41, is mounted on the valve-stem 34. The valve-stem 34 has a top flange 42 between which and the flange 40 is a leather washer or cup-packing 43 that tightly fits the walls of the chamber 9 in which latter these members move up and down. The flanges 40 and 42 and the cup-packing form a piston-head. The valve 35 is clamped between the flange 41 and the valve member 38. The valve 35 when in closed position bears on the top of the valve-seat 8, while the upper portion of the valve member 38 at such time fills the opening through said seat. The lower portion of the member 38 is frusto-conical in shape, and, when the valve 35 and said member are elevated so that such frustro-conical part of said member is in the valve-seat 8, water is permitted to flow from the chamber 5 around the frustro-conical part through said seat into the chamber 6. The frustro-conical valve member also prevents water-hammer.

The operation of this flushometer, assuming that the parts and members are disposed as in Fig. 1, as follows:

The plunger 20 is forced downwardly, against the resiliency of the spring 21, and carries with it the piston-head which includes the cup-packing 24, with the result that the air between said piston-head and the diaphragm 11 is compressed and forces said diaphragm downwardly in the center, against the resiliency of the spring 32. The diaphragm 11 carries with it the valve-stem 28 and the valve 27 and opens the way through the valve-seat 26. The chamber 9 is full of water which has entered the same from the chamber 5 through the narrow passage 36, and the tube 14 between the valve 27 and the plug 33 is also full of water which has entered through said tube through the openings 31 in the tube, and the water from said tube and said first-named chamber immediately passes through the valve-seat 26, up through the channels 29, and out through the openings 30 in the tube, into the chamber 10, from which latter the water escapes to the sewer. As soon as the plunger 20 is released, and it should be released directly after being depressed, the spring 21 raises said plunger and with it the attached piston-head, with the result that the spring 28 is permitted to act on the diaphragm 11 and restore the same to its former or initial position, thus closing the valve-seat 26 with the valve 27, through the medium of the valve-spring 28. While the water is escaping from the chamber 9 through the openings 31, the tube 14, the valve-seat 26, the channels 29, and the openings 30, the pressure of the water below the valve member 38 causes said member, the valve 35, and the valve-stem 34 with the other parts and members carried thereby to be raised a sufficient distance to open the way through the valve-seat 8, and permit the water to pass from the chamber 5 through said valve-seat into the chamber 6. The flow of water from the inlet chamber to the outlet chamber continues until the pressure of water in the chamber 9 is sufficient to force downwardly the piston-head in said chamber 9 and cause the valve 35 to close the valve-seat 8, when the flow of water from said inlet chamber to said outlet chamber is cut off, and further flow ceases. The water pressure accumulates in the chamber 9, to bring about the closing of the valve 35, because the valve 27 is closed, and water enters said chamber through the passage 36 and continues to enter until the balance of pressure changes from the chamber 5 to the chamber 9.

Water enters the chamber 5 under pressure as usual, and the results described above

are due to the fact that a certain amount of the water entering said chamber rises through the passages 36 into the chamber 9 until the latter is filled and has a pressure therein equal to the pressure in the chamber 5; and to the further fact that the chamber 9 is much larger in diameter than the opening through the valve-seat 8, or the area of the piston-head in the chamber 9 is greater than that of said valve-seat, so that the valve 35 is seated with a force proportionate to this difference in area when the pressure in the chambers 5 and 9 is equal. It naturally follows that the opening of the relief valve 27 enables the pressure in the chamber 9 to be reduced, with the result that the greater pressure of the water in the chamber 5 causes the valve 35 to be opened. As soon as the relief valve is closed, however, the water pressure in the chamber 9 begins to increase, by reason of the entrance into said chamber of the water through the passage 36, and continues to increase until the pressure above the piston-head in said chamber is greater than that below the valve 35, when the latter is forced onto its seat, as previously observed.

More or less change in the shape, size, construction, and arrangement of some or all of the parts of this flushometer may be made, without departing from the spirit of my invention or exceeding the scope of what is claimed.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a flushometer, a casing having therein inlet and outlet chambers, and a pressure chamber with which said inlet chamber is at all times in communication, a valve-seat between said inlet and outlet chambers, a downwardly-closing valve for said valve-seat, said inlet chamber opening through said valve-seat below said valve, a tightly-fitting piston-head in said pressure chamber, the area of said piston-head being greater than that of said valve, a stem connection between said valve and piston-head, the construction and arrangement of parts being such that said valve is normally retained in closed position by pressure on said piston-head from the water which enters said pressure chamber from said inlet chamber, means, comprising a diaphragm-controlled valve, to permit the water to escape from said pressure chamber in sufficient quantity to enable said valve to be opened by the pressure from the water in the inlet chamber, and air-compression means capable of being located at a remote point, and of forcing air against the diaphragm of said diaphragm-controlled valve to open the latter.

2. In a flushometer, a casing having therein communicating inlet and outlet chambers, and a pressure chamber, a valve between said inlet and outlet chambers, a piston-head in said pressure chamber, the area of said piston-head being greater than that of said valve, a stem connecting said valve and piston-head, a fixed tubular member upon which said stem is slidingly arranged with a clearance between, said tubular member depending from the top of said pressure chamber and extending through said chamber and said outlet chamber into said inlet chamber, said tubular member opening into said pressure chamber, having a valve-seat which opens above said pressure chamber, and being otherwise closed, means, comprising a diaphragm-controlled valve, to relieve the pressure in said pressure chamber, and air-compression means to force air against the diaphragm of said diaphragm-controlled valve to open the latter.

3. In a flushometer, a casing having therein communicating inlet and outlet chambers, a valve between said chambers, means, comprising a diaphragm-controlled valve, normally to cause said first-named valve to be held in closed position, a remotely-located casing, a plunger provided with a piston-head in said second-named casing, whereby the air in said second-named casing is compressed when said plunger is forced inwardly, an air-tight conduit between said casings to direct the compressed air against the diaphragm of said diaphragm-controlled valve to open the latter, and means to enable said first-named valve to be opened when said diaphragm-controlled valve is opened.

4. In a flushometer, a casing having therein inlet and outlet chambers, and a pressure chamber, a valve-seat between said inlet and outlet chambers, a downwardly-closing valve for said valve-seat, said inlet chamber opening through said valve-seat below said valve, means in said pressure chamber normally to retain said valve in closed position, a second valve adapted when open to permit water to escape from said pressure chamber, yielding means normally retaining said second valve in closed position, a remotely-located casing, an air-tight conduit between said casings, and an outwardly spring-pressed air-compression plunger in said second-named casing, the construction and arrangement of parts being such that the air when compressed in said second chamber overcomes the resistance of said yielding means and causes said second valve to be opened.

5. In a flushometer, casing members having therein inlet and outlet chambers, a pressure chamber, and a relief chamber, a fixed tubular member extending downwardly from the member which separates said relief chamber from said pressure chamber, having therein a valve-seat for communication between said pressure and

relief chambers, opening into said pressure chamber, and being otherwise closed, a main valve-seat between said inlet and outlet chambers, a downwardly-closing main valve for said main valve-seat, said inlet chamber opening through said main valve-seat below said main valve, a piston-head in said pressure chamber, connections outside of said tubular member and between said main valve and piston-head, said pressure chamber being in constant communication with said inlet chamber through said connections, a diaphragm in said relief chamber, a valve for said first-named valve-seat, a stem carried by said diaphragm and carrying said second-named valve, and means to force air against said diaphragm and thereby open said second-named valve.

6. In a flushometer, casing members having therein inlet and outlet chambers, a pressure chamber, and a relief chamber, a valve-seat between said inlet and outlet chambers, a downwardly-closing valve for said valve-seat, said inlet chamber opening through said valve-seat below said valve, a piston-head in said pressure chamber, connections between said valve and piston-head, a spring-pressed diaphragm in said relief chamber, a fixed tubular member extending through the member which separates said relief chamber from said pressure chamber, and extending downwardly into said valve and piston-head connections, the arrangement being such that said relief chamber is in constant communication with said pressure chamber outside of said tubular member, and the latter opening laterally into said pressure chamber, having a valve-seat in the upper part thereof, and being otherwise closed, a valve for said second-named valve-seat, a stem carried by said diaphragm and carrying said second-named valve, and means to force air against said diaphragm and thereby overcome the resistance of the diaphragm spring and open said second-named valve.

7. In a flushometer, casing members having therein inlet and outlet chambers, a pressure chamber, and a relief chamber, a fixed tubular member extending downwardly from the member which separates said relief chamber from said pressure chamber, having therein a valve-seat for communication between said pressure and relief chambers, opening into said pressure chamber, and being otherwise closed, a main valve-seat between said inlet and outlet chambers, a downwardly-closing main valve for said main valve-seat, said inlet chamber opening through said main valve-seat below said main valve, a piston-head in said pressure chamber, connections outside of said tubular member and between said main valve and piston-head, said pressure chamber being in constant communication with said inlet chamber through said connections, a diaphragm in said relief chamber, a valve for said first-named valve-seat, a stem carried by said diaphragm and carrying said second-named valve, a cylinder, an air-tight conduit between said cylinder and the side of said diaphragm which is opposite to that whereon said second-named valve is located, and an air-compression plunger in said cylinder, the construction and arrangement of parts being such that air compressed by said plunger in said cylinder operates said diaphragm to open said second-named valve.

8. In a flushometer, casing members having therein inlet and outlet chambers, a pressure chamber, and a relief chamber, a valve-seat between said inlet and outlet chambers, a downwardly-closing valve for said valve-seat, said inlet chamber opening through said valve-seat below said valve, a piston-head in said pressure chamber, connections between said valve and piston-head, a spring-pressed diaphragm in said relief chamber, a fixed tubular member extending through the member which separates said relief chamber from said pressure chamber, and extending downwardly into said valve and piston-head connections, the arrangement being such that said relief chamber is in constant communication with said pressure chamber outside of said tubular member, and the latter opening laterally into said pressure chamber, having a valve-seat in the upper part thereof, and being otherwise closed, a valve for said second-named valve-seat, a stem carried by said diaphragm and carrying said second-named valve, a cylinder, an air-tight conduit between said cylinder and the side of said diaphragm which is opposite to that whereon the spring for said diaphragm and said second-named valve are located, and an air-compression plunger in said cylinder, whereby, when said plunger is actuated to compress the air in said cylinder, the compressed air operates said diaphragm to open said second-named valve.

CHARLES H. ATKINS.

Witnesses:
F. A. CUTTER.
GEORGE W. FAIRFIELD.