

March 31, 1936.

A. C. DOBRICK

2,035,693

FLUSH VALVE

Filed May 31, 1932

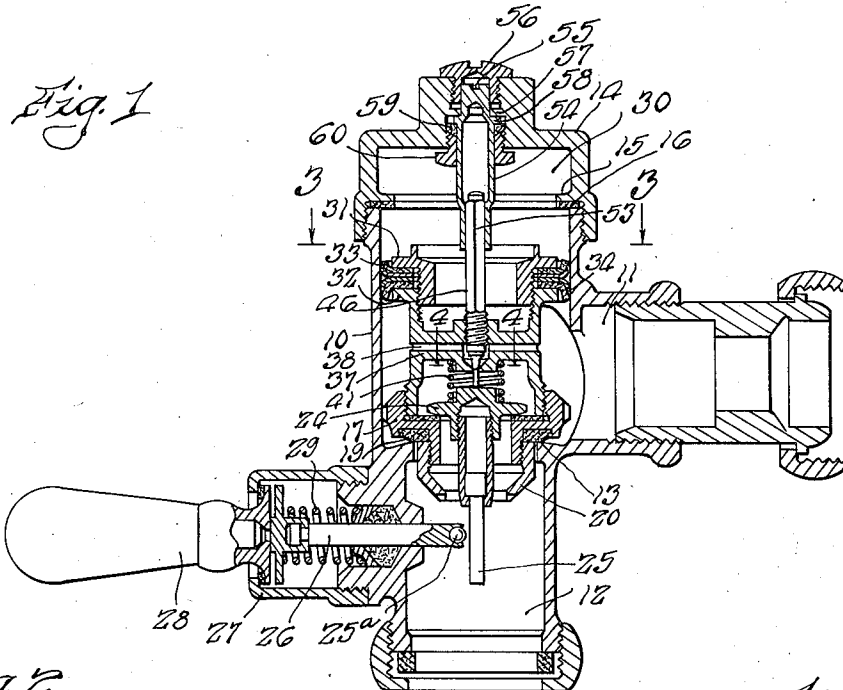


Fig. 2

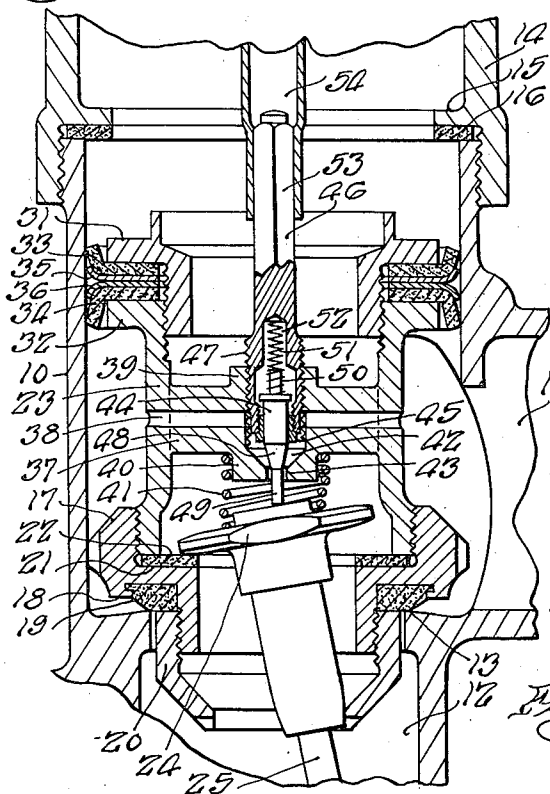


Fig. 3

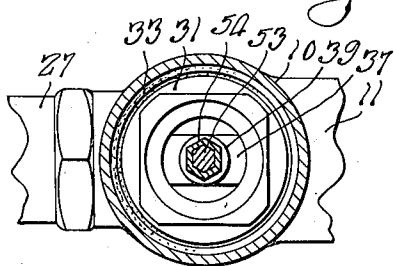
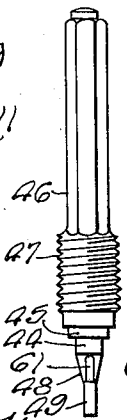


Fig. 4

Inventor:
August C. Dobrick

By John Howard McElroy
ATTORNEY

Fig. 5



UNITED STATES PATENT OFFICE

2,035,693

FLUSH VALVE

August C. Dobrick, Chicago, Ill., assignor to The
Imperial Brass Manufacturing Company, Chi-
cago, Ill., a corporation of Illinois

Application May 31, 1932, Serial No. 614,519

6 Claims. (Cl. 137-93)

My invention is concerned with flush valves of the type in which the valve casing is provided with inlet and outlet ports separated by a valve seat for the main valve, which is lifted when an auxiliary valve is opened manually and permits the water confined in the controlling chamber constituting the upper part of the casing to escape through the auxiliary valve to the outlet port so that the pressure of the water from the inlet port acting against a plunger or equivalent element above the main valve will lift it quickly from its seat and permit the flush water to pass rapidly from the outlet port. The length of the flush is controlled by a small port through which the water passing to the controlling chamber to refill it as the main valve moves to its seat must pass, and one purpose of my invention is to produce a simple structure that can be adjusted from the outside of the casing to regulate the size of this small port and thereby the length of the flush, and also move a cleaning plunger to insure the small port being kept free and open for use.

Another feature of my invention resides in a construction of the length-of-flush controlling mechanism whereby I can regulate it other than by the size of the passage to take care of the different pressures under which the valve must operate.

Another feature of my invention is found in the provision of a hard ball that can rotate in its bearing and contacts with the stem of the auxiliary valve, and thus insures an easier operation and longer life to the operating connection.

Another feature of my invention resides in the construction of the main valve whereby a substantially noiseless action is secured when the valve is seated at the end of the flush.

To illustrate my invention, I annex hereto a sheet of drawings in which the same reference characters are used to designate identical parts in all the figures, of which,—

Fig. 1 is a central vertical section through the complete valve, with the parts at rest;

Fig. 2 is a much enlarged view of a portion of the mechanism shown in Fig. 1, but with the length-of-flush controlling mechanism in additional section;

Fig. 3 is a plan view in section on the line 3-3 of Fig. 1;

Fig. 4 is a very much enlarged view in section on the line 4-4 of Fig. 1; and

Fig. 5 is a side elevation of the length-of-flush controlling member detached and on the same scale as it is seen in Fig. 2.

In carrying out my invention in one form, I

employ a valve casing 10, of a generally cylindrical form, and provided on one side with the inlet port 11 and the customary connections, and at the bottom with an outlet port 12, the two ports being separated by the main valve-seat 13, which will be seen to be formed integral with the casing and to be slightly inclined upward. The top of the casing is closed by the cap 14 threaded on the body of the casing and provided with the internal flange 15 co-operating with the washer 16 employed to make a liquid-tight joint. The main valve is built up of an annular member 17 having its larger upper portion internally threaded, while its reduced lower portion is externally threaded, and the under side of which has the overhanging flange 18 by which the rubber ring 19, which forms the engaging surface of the valve, has its outer edge held in place against any possible displacement, its inner edge being engaged by the internally threaded ring 20 screwed on to the reduced lower portion of the member 17. The valve member 17 has the horizontal flange or surface 21 formed by the horizontal connection between the top and bottom portions, and this surface 21 has the preferably rubber ring 22 seated thereon and held in place by the body of the piston member 23 being screwed into the top and engaging the ring. This ring 22 forms the seat for the tilting auxiliary valve 24, which has its stem 25 extending downwardly through the bottom of the ring 20 in position to be engaged by the steel ball 25^a which is mounted to rotate in the end of the sliding rod 26, which is mounted in the customary manner in the handle casing 27, so that when the handle 28, mounted therein in the customary manner, is tilted in any direction, the rod 26 will be thrust inward against the tension of the spring 29 in the housing, and which returns the rod and handle to their normal position when the pressure on the handle is released. As will be understood by those familiar with these flush valves, when the handle 28 is swung from its normal position, the rod 26 is thrust inward and the ball 25^a engages the stem 25 and tilts it and the valve 24 to the position shown in Fig. 2, which permits, in a manner to be hereinafter described, the water to escape from the controlling chamber 30 constituting the upper part of the casing into the lower part, thus permitting the water in the inlet to engage the under side of the main valve and lift it off of its seat to its upward limit, during which movement the stem 25 is in engagement with the ball 25^a. Prior to my invention, the end of the rod 26 has been simply squared off, and no antifriction device pro-

vided, with the result that the pressure between the members as the stem 25 raised resulted in a speedy cutting of the engaging parts, with the result that it was not long until repairs were needed. With my invention, in which the ball 25^a rolls in its seat as the stem 25 rises, all cutting is avoided, and a much more durable device is secured. This protection is especially needed as the stem 25 is customarily made of non-corrosive bronze, which tends to cut readily, especially when the water pouring over it happens to be gritty, as is often the case.

The casting 23 threaded into the valve member 17 preferably takes the form of a hollow cylinder, and it has its upper end internally threaded to receive the clamping ring 31 threaded therein and provided with an outwardly extending annular flange, between which and the annular flange 32 forming the top of the casting 23 are clamped the pair of leather piston rings 33 and 34 which have their outer edges turned upward and downward, respectively, and held in position by the metal rings 35 and 36 interposed between them and having their outer edges similarly turned upwardly and downwardly.

The casting 23 has extending diametrically through the center thereof the tubular portion 37 having the comparatively small passage 38 extending therethrough and having the projections 39 and 40 at the center of the upper and lower sides thereof. The projection 40 serves as a means for confining the helically-coiled expanding spring 41, which surrounds it, in place to engage the upper side of the auxiliary valve 24. There is a vertical passage extending entirely through the portion 37 and having its upper end internally threaded, while its lower end is provided with the tapered portion 42 leading to the reduced lower portion 43, the angle between the parts 42 and 43 serving as a seat for the plunger 44 mounted to slide in the sleeve 45 threaded in the enlarged lower end of the plunger casing 46, which has its threaded, enlarged lower end 47 screwed into the projection 39. The plunger 44 has the tapered portion 48 co-operating with the seat formed between the parts 42 and 43, and also the small extension 49 projecting down through the reduced portion 43. The upper portion of the plunger 44 is reduced, as seen at 50, and is surrounded by the helically-coiled expanding spring 51, which extends up into the extension 52 of the cavity formed in the lower end of the plunger casing 46, so that the plunger can be pressed upwardly into the plunger casing against an increased spring tension when the casing 46 is screwed farther down into the member 37. In order to turn this plunger casing for adjustment from the outside, I make its upper portion hexagonal in cross section, and this upper portion slides in the reduced lower portion 53 of the tubular adjusting member 54, the lower portion 53 being hexagonal in its internal cross section, so that when the member 54 is turned the plunger casing 46 will also be turned and screwed into or out of the member 37, depending upon which way it is turned. The upper portion of the adjusting tube 54 is solid and is provided with the cut 55 to which a screw-driver can be applied in adjusting the same when the cap screw 56 threaded in the top of the cap 14 has been removed. The top of the cap 14 is provided with an aperture therethrough to receive the member 54, and it has the internally projecting annular flange 57 engaged by the annular flange 58 formed on the upper portion of the

member 54. A packing ring 59 is held against the under side of the flange 58 by the gland nut 60 threaded in the lower end of the passage through the top of the cap.

As seen in Figs. 4 and 5, the tapered portion 48 of the plunger 44 has a portion thereof flattened, as seen at 61, so that when the plunger 45 is resting against the seat, a very fine stream of water is free to pass inwardly from the supply through the channel 38, down past the flattened portion 61 into the central part of the casting 23, and thence up into the controlling chamber, slowly filling the same as the piston descends. If a very quick flush is desired and the water pressure is low, the adjusting member 54 is turned to raise the plunger a trifle off of the seat when the parts are at rest, with the result that an increased flow of water can occur. By this means an adjustment for a quicker flush than is normally used can be made.

However, the main purpose of this adjustment is to take care of possible variations in the pressure of the water, and it will be obvious that where the pressure is very strong, it will tend to unseat the plunger and thus increase the area of the orifice, and shorten the time of the flush. When a very strong pressure is met with, the adjusting member 54 is turned until it is far enough down so that the spring 51 will be put under sufficient tension to resist the pressure of the water, and by turning this member 54, it will be obvious that any desired degree of pressure within the limits of the construction may be placed on the plunger to compensate for any degree of pressure that may exist in the water.

It will be noted from Fig. 2 that when the handle 28 is operated to tilt the auxiliary valve 24, the central portion of the top of said valve engages the extension 49 of the plunger so as to lift it off of its seat, with the result that any impurities that might tend to collect there will be washed out by the increased flow of water due to the lifting of the plunger.

Referring to the construction of the main valve and its valve seat, as heretofore explained, I have found that where the customary construction is employed, with the seat corresponding to 13 flat and with a flat rubber ring corresponding to 19 loose on its outer edge that the ring soon loosens enough so that it can flap at said edge, and that the loose edge co-operating with the water in movement makes a noisy action that is undesirable. By securing said outer edge this objection is remedied. I have also found by extended tests that the slight upward slant of the valve seat therein is most efficient in producing a noiseless operation. If this slant is made substantially greater, i. e., if the angle between the vertical wall and the seat is made more acute, the noise is very materially increased, and furthermore an annular channel of some depth is formed in which dirt accumulates, while with the slight slant shown, substantially no channel is formed and any dirt which might settle about or on the valve seat is swept away clean at each flush. With this construction, the rubber ring 19 must have the under surface beveled off as shown, as otherwise the metal of the flange 18 would necessarily contact with the metal of the seat and destroy the utility of the combination. By beveling the ring 19 off as shown, the outer edge can be securely held without the metals contacting. I have also found that the bevel assists in making the flow of the water through the main valve less noisy than where the ring is

flat on its under side, and there is a more abrupt deflection of the water in passing it.

While I have shown and described my invention as embodied in the form which I at present consider best adapted to carry out its purposes, it will be understood that it is capable of modification, and that I do not desire to be limited in the interpretation of the following claims except as may be necessitated by the state of the prior art.

What I claim as new, and desire to secure by Letters Patent of the United States, is:

1. In a device of the class described, the combination with a valve casing having inlet and outlet ports and a main valve seat between said ports, of a main valve co-operating with said seat, a movable element to which said valve is attached which separates the casing into a controlling chamber and an operating chamber inversely varying in size as the element rises and falls, a valve seat in said element, an auxiliary valve co-operating therewith, a passage having a seat therein through which only a fine stream of water can pass from the operating to the controlling chamber, a spring-pressed plunger in said passage co-operating with the seat, a supporting member in which the plunger is housed carried by said element, means for adjusting the position of the supporting member to and from the seat in the passage to vary the size of the fine stream of water, and means for moving the auxiliary valve, which valve contacts with the plunger when it is moved, for the purpose described.

2. A flush valve constructed as described in claim 1 in which the supporting member is screw-threaded into the movable element so that by turning it the plunger is moved toward and from its seat.

3. In a device of the class described, the combination with a valve casing having inlet and outlet ports and a main valve seat between said ports, of a main valve co-operating with said seat, a movable element to which said valve is attached, which element separates the casing into a controlling chamber and an operating chamber inversely varying in size as the element rises and falls, a valve seat in said element, an auxiliary valve co-operating therewith, a passage through the element having a seat therein through which only a fine stream of water can pass from the operating to the controlling chamber, a spring-pressed plunger in said passage co-operating with the seat, a supporting member in which the plunger is housed screw-threaded into said element, a tube in which the supporting member is telescoped and splined mounted to be rotated in the valve casing from the exterior thereof, and means for moving the auxiliary valve, which valve contacts with the plunger when it is moved, for the purpose described.

4. In a device of the class described, the com-

bination with a valve casing having inlet and outlet ports and a main valve seat between said ports, of a main valve co-operating with said seat, a movable element to which said valve is attached which separates the casing into a controlling chamber and an operating chamber inversely varying in size as the element rises and falls, a passage having a seat therein through which only a fine stream of water can pass from the operating to the controlling chamber, a spring-pressed plunger co-operating with said seat, means operable from the exterior of the casing for adjusting the pressure of the spring on the plunger, and operating means allowing the water to escape from the controlling chamber to permit the main valve to open.

5. In a device of the class described, the combination with a valve casing having inlet and outlet ports and a main valve seat between said ports, of a main valve co-operating with said seat, a movable element to which said valve is attached which separates the casing into a controlling chamber and an operating chamber inversely varying in size as the element rises and falls, a passage through said element having a seat therein through which only a fine stream of water can pass from the operating to the controlling chamber, a spring-pressed plunger co-operating with said seat, a housing for the plunger threaded in said element so that by turning it the spring engaging the plunger may be put under increased tension or vice versa, and operating means for allowing the water to escape from the controlling chamber to permit the main valve to open.

6. In a device of the class described, the combination with a valve casing having inlet and outlet ports and a main valve seat between said ports, of a main valve co-operating with said seat, a movable element to which said valve is attached which separates the casing into a controlling chamber and an operating chamber inversely varying in size as the element rises and falls, a passage through said element having a seat therein through which only a fine stream of water can pass from the operating to the controlling chamber, a spring-pressed plunger co-operating with said seat, a housing for the plunger threaded in said element so that by turning it the spring engaging the plunger may be put under increased tension or vice versa, the upper part of said housing having an angular cross section, a tubular member journaled in the top of the casing having its internal cross section complementary to the cross section of the housing which it partly surrounds, means for turning the tubular member, and operating means for allowing the water to escape from the controlling chamber to permit the main valve to open.

AUGUST C. DOBRICK.