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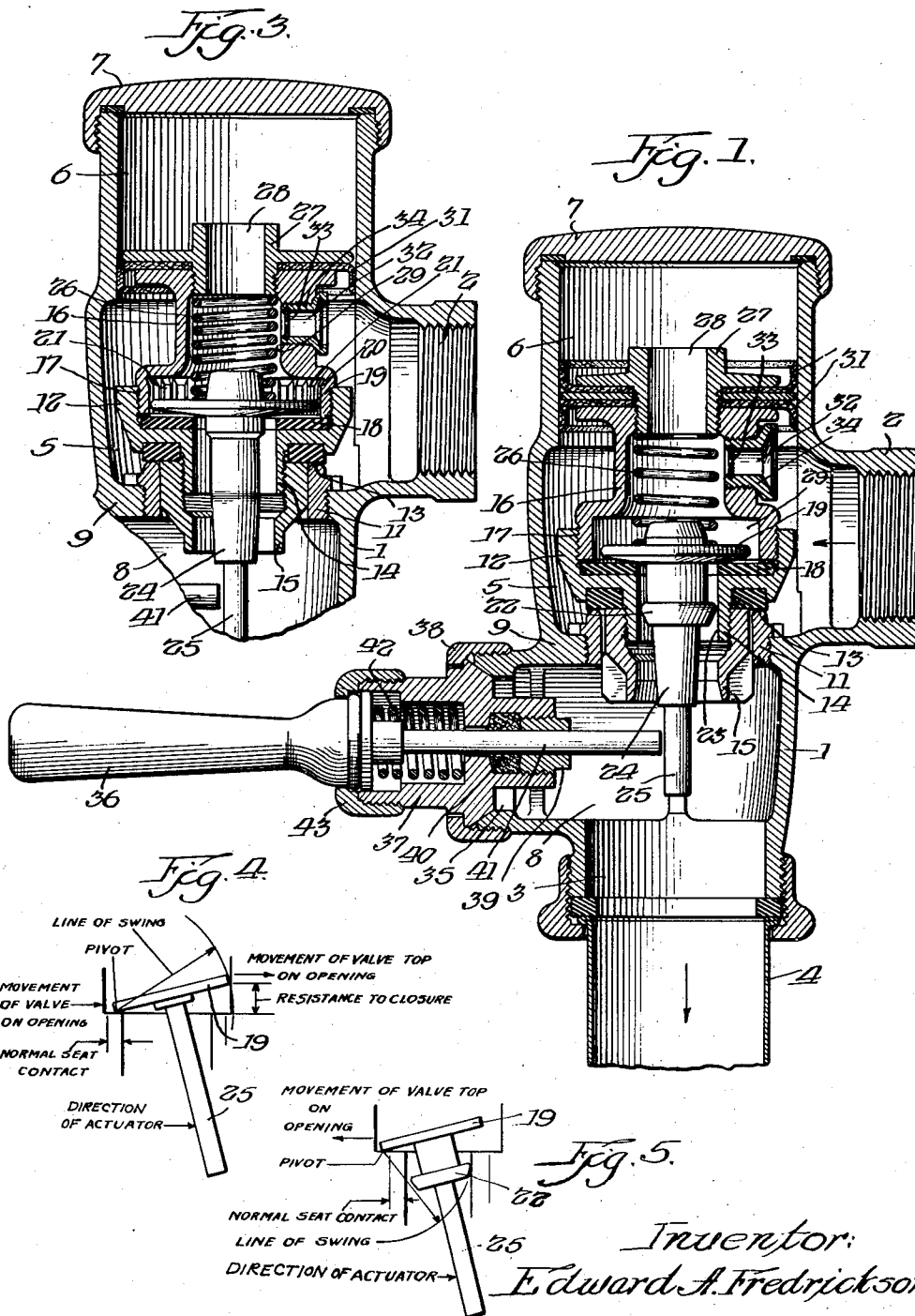
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2,369,104

FLUSH VALVE

Filed Feb. 5, 1943

2 Sheets-Sheet 1



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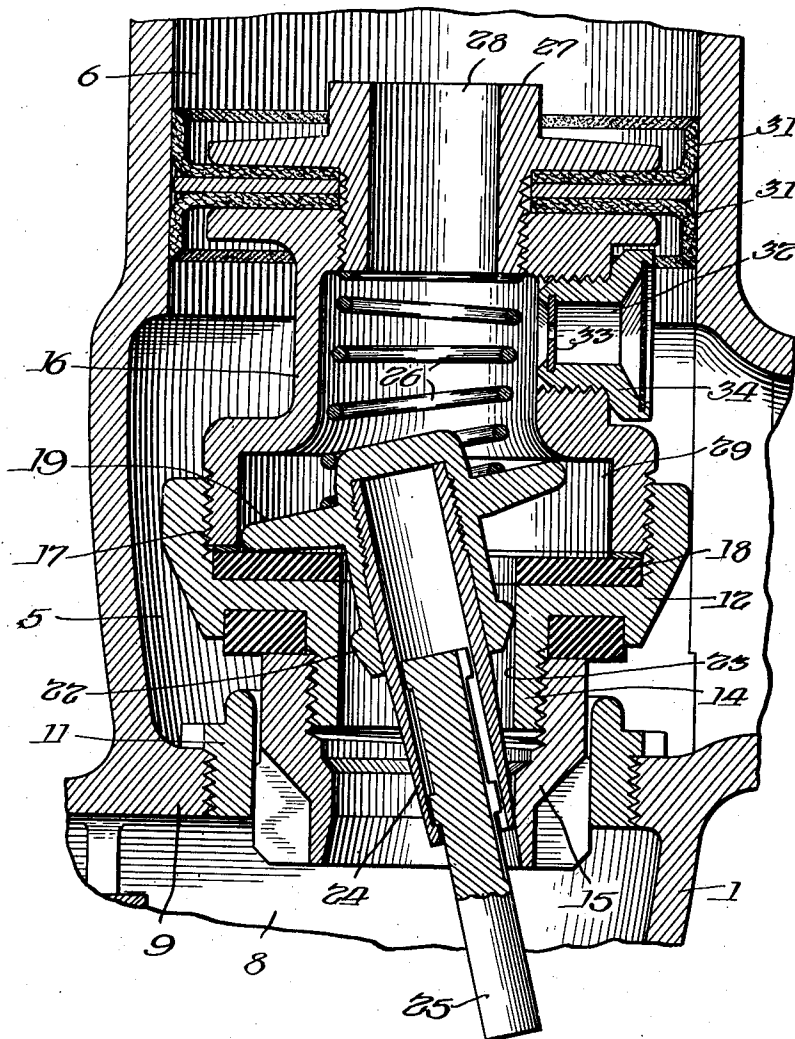
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Fig. 2.



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UNITED STATES PATENT OFFICE

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FLUSH VALVE

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4 Claims. (Cl. 251-125)

This invention relates generally to valves and more particularly is applicable to an improvement in flush valves of the type normally used to control the flow of water to a closet bowl or similar type of plumbing fixture.

One of the more serious complaints arising in connection with faulty operation of flush valves is traceable to the fact that the inherently bad water supply or the objectionable foreign matter within the water, including subsequently deposited calcium carbonate, iron and the like, seriously interfere with the consistently satisfactory operation of this type of valve. It should be appreciated in the latter connection that the operation of the valve itself is relatively critical, since its successful performance depends upon unusually close adjustments and tolerances made to conform with the requirements of the particular installation, considering the volume of water necessary for a satisfactory flush in light of line pressures available, the type of fixture being flushed and the like.

Thus in obtaining a further understanding of the background of this invention it should be realized that the main valve of the currently improved structure is initially set in motion by the actuation of a pilot valve or auxiliary valve as it is more generally known. Thus it has been definitely determined that if such auxiliary valve does not open and close with relative freedom of motion or fails to respond uniformly to its initial actuation, the main valve will similarly fail to operate properly, resulting in the passage of too much flushing water to the fixture or else finding that the valve did not close, in either event resulting in an objectionable waste of water. More specifically, it has been found that the prior auxiliary valves used in the actuation of the main valve in this type of device have been provided with guide means that either rubbed or dragged during the course of closing the auxiliary valve because of the friction encountered adjacent the seat and guide. The ultimate result has been that the auxiliary valve did not operate consistently satisfactorily and this was especially true when the moving parts had become worn or had, during the course of service, become coated with sedimentary deposits. Frequently under such conditions serious complaints have resulted reflecting in general the unsatisfactory performance of the valve as above referred to.

Accordingly, an important object of the present invention is to provide guide means for an auxiliary valve in which such critical guide

means are not subject to sticking or binding during the normal course of valve operations.

In addition, it has for an important object the elimination or a substantial reduction in wear of the usual valve seat employed which may be made of rubber or other composition or of metal, depending upon the service.

A further purpose of the device is to minimize or to eliminate the erosive action on the main valve seat and to reduce substantially the prior objectionable lagging action of the auxiliary valve when closing whereby a more positive, dependable flush termination occurs and a more uniform, well controlled flushing through the valve at all times is accomplished.

A further and more specific purpose of the current contribution to the art resides in the provision of a novel guide arrangement for an auxiliary valve closure member having a stem depending therefrom in which the latter is provided with an annularly positioned guide means to effect a combined arcuate and transverse movement of the auxiliary valve closure member.

Other and more important objects of the present invention will become apparent upon proceeding with the description read in light of the drawings, in which

Fig. 1 is a sectional assembly view of a conventional water-controlled flush valve embodying the improved feature constituting my invention.

Fig. 2 is a fragmentary sectional magnified view of the auxiliary valve and its related parts employing my invention in which the valve is shown in the canted or open position.

Fig. 3 is a fragmentary sectional view of the ordinary auxiliary valve formerly used in this type of structure illustrated for purpose of comparison.

Fig. 4 is a diagrammatic view of the movement of the conventional valve referred to in Fig. 3.

Fig. 5 is a diagrammatic view of the movement of the novel valve embodying my invention.

Similar reference numerals refer to similar parts throughout the several views.

Directing attention now to Fig. 1, the main valve casing 1 is provided with the usual inlet and outlet passages, as designated at 2 and 3 respectively, and further providing for flow therethrough as indicated by the arrows, the inlet 2 being connected generally to the usual stop valve (not shown). The discharge passage or outlet 3 leads through the conduit 4 to a

plumbing fixture, such as a closet bowl or the like, to be flushed upon such actuation of the flushing valve, as hereinafter described in greater detail. The valve body or casing 1 is provided with the usual valve chamber 5 having direct communication with the inlet passage 2 as indicated. The upper part of the valve chamber 5 is provided with the extended interior portion 6 having the usual cap 7 threadedly or otherwise attached in sealing relation thereto. The lower portion of the casing 1 is provided with the discharge chamber 8 normally separated from the chamber 5 by the annularly extending diaphragm or bridge wall 9 supporting the valve seat 11 which of course may be made integral with the body 1 by merely extending the annular part 9 inwardly as desired.

Occupying a substantial portion of the valve chamber 5, it will be apparent that the plunger assembly comprising both the main valve 12 as well as the auxiliary valve as hereinafter referred to, is arranged so that the main valve is normally in closed position, seating on the body seat ring 11, as indicated at 13. Here similarly, while a composition disc is indicated for use as the seating contact for the main valve disc member 12, it is obvious that an integral metal-to-metal seat bearing contact may be effected, if desired. The lower portion of the main valve closure 12 is provided with the threaded shank 14 to which is attached the guide member 15 slidably fitting for reciprocal movement within the bore of the body seat ring 11 as indicated, during the respective opening and closing of the valve. As shown, the main valve closure member is preferably made hollow in its upper portion so as to provide a chamber within which the centerpiece 16 is threadedly positioned as at 17. Clamped below the centerpiece 16 and supported on the lower surface portion of the chamber of the main valve closure member 12, the auxiliary valve seat 18 is positioned, and while a composition seat or the like is shown, it is obvious that under certain conditions an integral seat may be used without departing from the inventive concept. Normally seated upon the valve seat 18 the mushroom shaped auxiliary valve 19 is provided.

Heretofore as shown in the prior valve construction of Fig. 3, it was previously thought desirable to provide for the auxiliary valve to fit within the bore 20 of the centerpiece 16, and having the cored or broached water passages 21 so that the auxiliary valve at its upper head portion served as the guide for the auxiliary valve in the course of leaving and returning to its seat. I have determined, however, that such arrangement as shown and just described is not satisfactory, in that during normal valve operation, the disc 19 after being tilted or canted would not return to its seat, the objection being that the valve either stuck or bound in the canted position. I discovered that the latter objectionable condition was aggravated by the failure to provide the lower stem portion of the auxiliary valve member with suitable guide means.

Therefore as the background for my invention I have found that such prior provision for relatively close clearance in guiding the auxiliary valve to its seat in the valve chamber resulted in both peripheral binding and sticking at the seat so that erratic and objectionably unrestrainable flushing occurred. Therefore, as indicated in Figs. 1 and 2, at the outset, I found it preferable to provide the tiltable auxiliary closure member

19 with a relatively large clearance on its periphery, the advantages of which provision will be apparent shortly.

In cooperation with the desirable effect produced by the use of such relatively large clearance arrangement between the head portion of the tiltable auxiliary valve and the walls of the chamber within which it is movable, a close fitting annular guide 22 is arranged in spaced apart relation to the valve seat 18. The guide 22 is preferably, although not necessarily, made integral with the closure member 19, and is slidably movable in a novel manner within the bore 23 provided by the main valve closure member 12. As shown more clearly in the magnified view of Fig. 2, the auxiliary disc 19 and the stem 24 are hollow in order to accommodate the telescoping member 25 longitudinally movable therewithin for reasons hereinafter explained in detail, but not constituting a part of the instant invention. The guide 22 may be annularly discontinuous.

Continuing with the description of the upper portion of the valve, the auxiliary member 19 is normally maintained on its seat by means of the coil spring 26, the latter member shouldering at the upper portion of the centerpiece 16 by means of the threaded nut 27 having the central passage 28 in communication with the lower chamber 29 of the centerpiece 16. The nut 27 functions with the centerpiece 16, as indicated, to clamp the cup leathers 31 therebetween for snugly fitting within the bore of the upper chamber 6 of the main valve casing 1. The upper part of the chamber 29 at a side portion is provided with the bypass passage 32 having the bypass plate 33 and the indicated strainer which are positioned as desired within the threaded nut 34.

Now directing attention to the lower portion of the valve as shown in Fig. 1, for purpose of actuation the casing 1 is provided with the aperture 35 machined to provide the necessary means for journaling the tiltable actuating handle 36, the latter member being maintained in operating position by virtue of its journaling within the supporting member 37 which is gripped in fluid-tight relation to the casing 1 by means of the threaded union ring 38. The member 37 is provided with the threaded bushing 39 to compress the stuffing box packing 40 which also serves to journal the handle at its separable, reciprocally movable rod portion 41. The spring 42 holds the handle 36 in abutting relation to the complementary end of the handle 36, the complete assembly with the desired compression of the spring being obtained by the second union ring 43.

Proceeding now with a description of the operation of my device and referring, at the outset, to Fig. 1, the tiltable actuating handle 36 is depressed and by the latter action urges the independently movable rod portion 41 forward against the compression of the spring 42. The movement of the member 41 continues inwardly or forward until it strikes the telescoping member 25 and with such movement causes the auxiliary valve disc 19 to be canted as shown in Fig. 2. However, before reaching the full canted position of the closure member 19 as shown, it should be understood, as an important element of this invention, that the peripheral surface portion of the annular guide 22 will contact with a portion of the bore 23, maintaining such contact while serving as a pivotal point for effecting movement of the head 19 transversely across its seat 18 while in the act of being canted at a continuing greater angle, from the position of rel-

active large clearances around its entire periphery to one in which the clearance on one side will be substantially reduced and the other side diametrically opposite correspondingly increased, all of which is more clearly apparent from a study of the diagrammatic operation of the improved structure set forth in Fig. 5. It will be apparent that upon canting or tilting of the auxiliary disc from its seat the pressure in the dashpot chamber 6 will be immediately relieved. Since the area of the dashpot chamber 6 is substantially greater than the area through the main valve seat, as determined by the peripheral area of the annular seating portion 13, the water supply pressure within the valve chamber 5 forces the main valve 12 upwardly, leaving its seat 11 and thereby opening the main valve carrying the auxiliary valve and seat upwardly with it. Such movement of the valve 12 causes the water within the dashpot chamber 6 to move downward through the chamber or passage 28, thence into the lower chamber 29 and past the opening provided by the tilted auxiliary valve 19. The upward movement of the main valve closure 12 continues until by its own lift, it has caused the lowest end portion of the telescoping member 25 to reach a position upwardly in which it has cleared the handle rod portion 41 and become disengaged therefrom whereupon the auxiliary valve 19 will immediately return to its seat 18. It is important at this stage of operation of the auxiliary valve to realize that a significant movement of this valve also occurs on closing, for the peripheral surface of the guide member 22 rocks away from its contact with the surface portion of the bore 23, thereby causing the lowermost canted edge of the auxiliary valve 19 to slide laterally to the right (toward the valve axis) in its contact with the surface of the seat 18, enabling the valve stem to assume a substantially vertical position in the return of the valve to its seat. Such sliding to the right during closing movement of the valve is caused by contact of the guide 22 with the left hand wall of the bore 23. Obviously in assuming such position the previous friction with the failure of the valve 19 to close has been positively overcome. Continuing with the procedure of valve closing, with the tight seating of the auxiliary valve, water from the inlet supply at the passage 2 will enter the dashpot chamber 6 through the bypass passage 32 past the orifice plate 33 to thereby again accumulate pressure within the chamber 6 and causing the main valve 12 to return to its seat. Accordingly the flushing valve is now closed and ready for the next cycle of operation as above described.

In recapitulation, and in contradistinction, it will be evident upon directing attention to Figs. 3 and 4 that heretofore the auxiliary valve 19 upon being actuated tilted to such degree and in such manner that it would bind and frequently stick in the canted position, since the friction and sticking of the closure member and guide actually prevented the former from closing. At the same time, the valve seat employed was cut by erosive action so that to a considerable extent its sealing effectiveness was substantially minimized by the throttling effect of water flowing through a reduced orifice under high velocity under the improper seating conditions described.

Obviously, if the auxiliary valve 19 fails to seat properly or does not seat at all, the subsequent functioning of the main valve will likewise be objectionably affected, producing either an incon-

sistent, poorly-timed flush of the plumbing fixture or else failing to close at all and resulting in unsatisfactory water waste. It should be noted that providing as much of a frictionless surface as possible, the peripheral surface of the annular guide 22 may be polished or burnished so as to impart thereto a high degree of frictionless contact with the interior surface of the bore 23 of the main valve closure member.

It will be further apparent that while this device provides for an improved means for guiding the closure member of a valve back to its seat after being opened, and doing so in a manner in which friction is reduced to a minimum, the detailed manner in which this is accomplished may vary, as for example, the relative positions of the inlet and outlet may be other than as above described, and therefore the scope of my protection should be measured by the appended claims.

I claim:

1. In a valve of the character described comprising a centerpiece casing having an inlet and outlet passage, a valve closure member therewithin, actuating means for said valve member, the said valve closure member having depending guide means comprising a lower stem portion positioned substantially within the outlet passage and having an annular raised portion in spaced-apart transverse relation to the said valve closure member, the said raised portion allowing for predetermined canting of the said valve closure member whereby the portion of the cross-sectional area of the outlet passage which is obstructed by the annular raised portion is decreased when the said raised portion is canted from its normal transverse or horizontal position in the outlet passage.

2. In a valve comprising a casing having an inlet, a discharge passage and a valve seat therebetween, a valve closure member therefor, actuating means for the said valve closure member, the said valve closure member having depending guide means within the discharge passage to develop predetermined movement of the said valve closure member which movement consists of tilting with a slight lateral sliding, the said guide means including a transversely extending annular portion spaced-apart from the said valve seat for contact with an annular portion of the discharge passage upon predetermined canting of the said depending guide means and the valve closure member whereby the portion of the discharge passage area which is obstructed by the transversely extending annular portion of the said guide means is decreased when the said guide means is canted from its normal position of substantial axial alignment with the said discharge passage.

3. In an auxiliary valve of the character described having a casing with an inlet and an outlet, comprising in combination a valve closure member, actuating means for the said valve closure member, the said actuating means engaging a depending portion of the said valve closure member whereby the said valve closure member is canted to unseat it from its normal seating contact, the depending portion of the said valve closure member having a single annularly extending spaced-apart guide means within the outlet of the said valve, the said annular guide means having a rounded portion to allow for predetermined canting of the said valve closure member and for a reduction in that portion of the cross-sectional area of the outlet which is obstructed by the annular guide means while pro-

viding for limited sliding contact of the rounded portion of the guide means with an inner surface portion of the said outlet during the return of the said valve closure member to its seat.

4. In a valve of the character described comprising a casing having an inlet and outlet, a valve closure member therefor, actuating means for the said valve closure member, the said valve closure member having guide means comprising a lower stem positioned within the outlet of the said casing, an annular enlarged guide portion cooperating with the said stem and there being

a narrow longitudinally extending neck portion between the said valve closure member and the said guide portion, the guide means allowing for predetermined tilting of the said valve closure member upon initial actuation in opening the valve whereby the enlarged annular portion of the said guide means is pivotally movable to allow for a reduction of that portion of the outlet which is obstructed by the enlarged guide portion when the latter is tilted from its normal position in the outlet.

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