April 15, 1924. 1,490,106

P. HAAS

AUTOMATIC FLUSHING VALVE

Filed Nov. 14, 1921

Fig. 1.

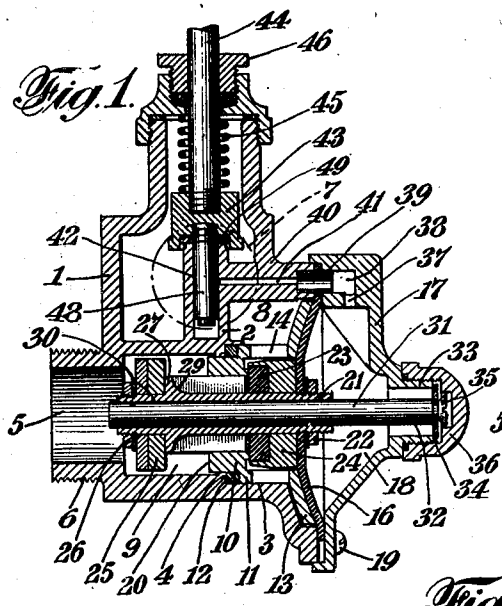


Fig. 2.

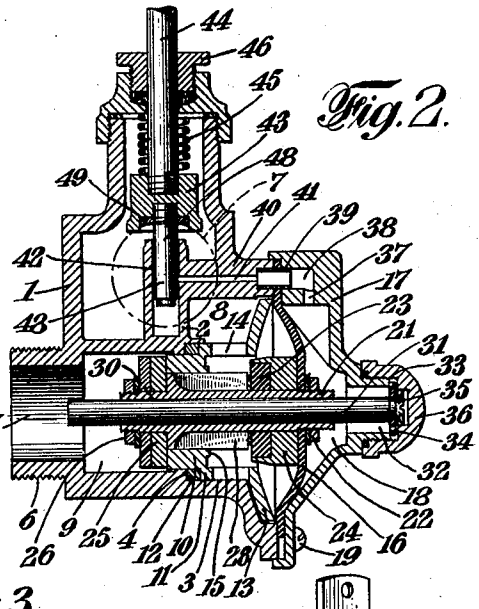


Fig. 3.

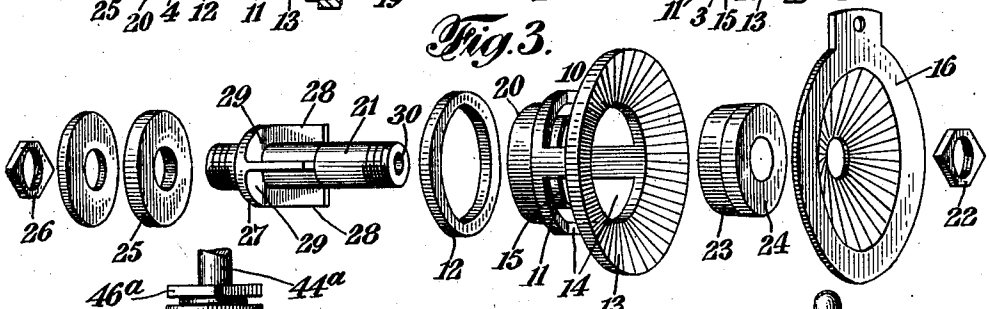


Fig. 4.

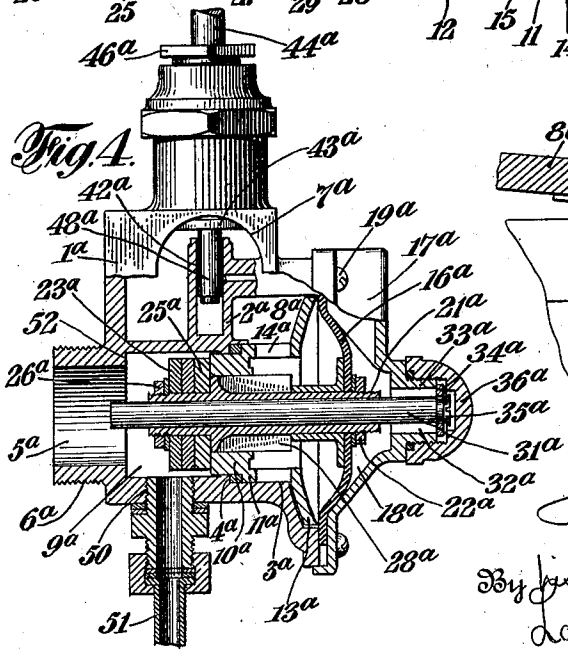
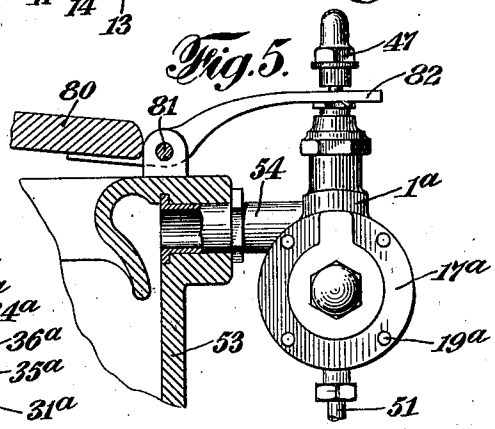


Fig. 5.



Inventor

Philip Haas

By his Attorney

Louis Prevost Blaker

Patented Apr. 15, 1924. 1,490,106

UNITED STATES PATENT OFFICE.

PHILIP HAAS, OF DAYTON, OHIO.

AUTOMATIC FLUSHING VALVE.

Application filed November 14, 1921. Serial No. 514,953.

To all whom it may concern:

Be it known that I, PHILIP HAAS, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Automatic Flushing Valves; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention consists in the novel features hereinafter described, reference being had to the accompanying drawing which illustrates one embodiment of the invention, selected by me for purposes of illustration, and a slight modification thereof, and the said invention is fully disclosed in the following description and claims.

My present invention relates to water closet valves of the kind disclosed in my former Patent #1,142,092, granted June 8, 1915, and consists in certain improvements therein. These valves are ordinarily controlled by the weight of the operator through a lever operatively connected with the closet seat, and acting when the seat is depressed to open the relief valve against the action of the spring which normally holds the relief valve closed and the seat in elevated position. The valve itself comprises a body or casing having a vertically disposed partition therein provided with a communicating aperture, an inlet opening for water on one side of the partition, and an outlet on the other side, and a removable cover forming a back pressure chamber, the edges of the cover clamping the marginal portions of the diaphragm which forms the other wall of the back pressure chamber, the diaphragm carrying a valve stem provided with two valves for closing communication between the inlet and outlet apertures at each end of the movement of the valve stem, suitable means being provided for establishing communication between the inlet aperture and the back pressure chamber, and a relief passage controlled by the relief valve being provided for the back pressure chamber. In this type of valve it has been customary heretofore to form the valve seats in or upon the valve casing, and in case of wear or corrosion of the valve seats, it is necessary to remove and replace the entire valve body. It has been found in practice that the sudden opening of the relief passage, especially where the water pressure is high, results in such a sudden actuation of the valves, as to cause a hammering or a severe knock which is objectionable on account of the noise and also tends to injure the parts of the apparatus.

One of the objects of my present invention is to provide a removable sleeve which is inserted in the aperture in the partition of the valve casing and which carries preferably both valve seats and also the supporting flange for the diaphragm, so that in case of injury to the valve seats, this part can be removed in a few minutes and replaced with another similar part at small expense without disturbing the connections to the valve casing, and of course without the necessity of replacing the entire casing, so that it is not necessary to put the apparatus out of operative condition more than a few minutes to make the necessary repairs.

Another feature of my present invention consists in a throttling device for the relief passage whereby the discharge of water from the pressure chamber is retarded and compelled to take place gradually, thereby insuring a relatively slow movement of the valve stem and avoid hammering and shock in the operation of the apparatus. I also prefer to provide the valve stem itself with means, hereinafter described, whereby on the opening movement of the normally closed valve and the closing of the normally open valve the passage of water from the inlet aperture to the outlet aperture is gradually retarded instead of being shut off abruptly to additionally contribute to the quiet and gradual operative movement of the valve stem and valve. My invention also contemplates the provision of a universally mounted pin secured preferably to the cover of the valve casing by means permitting universal movement and extending loosely through a central passage in the valve stem, the annular passage so formed around said pin constituting the communication between the inlet aperture and the back pressure chamber. This universally mounted pin is especially desirable in connection with the detachable sleeve before referred to as it prevents binding of the valve stem and permits the pin to accommodate any inaccuracies in the positioning of the sleeve which may be due to inequalities in the packing or inaccuracies in the formation of the parts, and which otherwise

would produce binding between the pin and the valve stem if the pin were rigidly mounted as heretofore, and would interfere with the proper operation of the valve mechanism. My invention also contemplates other details of construction all of which are hereinafter described and particularly pointed out in the claims.

Referring to the accompanying drawings, Fig. 1 represents a vertical sectional view of my improved valve mechanism embodied in an automatic closet valve in which the stem of the relief valve is adapted to be raised by the depression of the seat, the parts being shown in normal position with the relief valve closed.

Fig. 2 is a similar view showing the relief valve open and the valve stem and valves in the position to which they are moved by the automatic operation of the valve mechanism, and in which they remain so long as the seat is depressed.

Fig. 3 represents a detail perspective view of the detachable valve sleeve, valve stem and valves removed from the apparatus and in separated relation.

Fig. 4 is a view similar to Fig. 1 showing a slight modification in which a jet attachment, or auxiliary jet discharge, is provided in addition to the main flushing discharge from the valve casing.

Fig. 5 is a detail view showing the associated relation of the valve mechanism with the closet bowl and seat, parts of which are broken away.

Referring to the form of the invention illustrated in Figs. 1, 2 and 3, 1 represents the main body of the valve casing which is provided internally with a central vertical partition 2, having a cylindrical aperture 3 formed with an annular shoulder 4. The rear portion of the casing is provided with an inlet aperture 5 in axial alignment with the aperture 3 in the casing, the casing being provided with a threaded portion 6, surrounding the inlet aperture, for the purpose of connecting the water inlet pipe thereto. The water inlet pipe will be connected ordinarily with the service pipe from the street water main or other source of supply, and it is not necessary to use a tank in connection with the water supply pipe where the supply is adequate, although a tank may be employed if desired and the inlet aperture 5 may be connected with the tank or connected both to the tank and the main, as preferred. 7 represents an outlet aperture, preferably located at one side of the casing, and in communication with a chamber 8 on the opposite side of the partition from the inlet aperture. I conveniently term this chamber 8 the outlet chamber and designate the portion of the valve casing on the opposite side of the partition, indicated at 9, as the inlet chamber. 10 represents a detachable sleeve which is provided with a portion adapted to extend through the aperture 3 in the partition, the said sleeve being provided exteriorly with an annular flange 11 which abuts against the shoulder 4 of the partition, a gasket 12 being provided between the said flange and shoulder to insure a tight joint. At its outer end the sleeve is provided with a laterally extending annular flange 13 for supporting the flexible diaphragm hereinafter referred to. This flange is spaced from the adjacent portions of the valve casing over which it extends so that pressure may be applied to said flange, as hereinafter described, to force the sleeve inward and compress the gasket 12 for making a tight joint between the sleeve and partition. The sleeve 10 is also provided with a plurality of apertures 14 adjacent to the diaphragm supporting flange for establishing communication between the outlet chamber and the interior of the sleeve. In the preferred form of my invention the sleeve is also provided interiorly with an annular valve seat 15 against which the normally closed valve hereinafter referred to seats. The end of the sleeve 10 which extends into the inlet chamber 9 is provided with a valve seat 20 for the normally open valve hereinafter described.

16 represents a flexible diaphragm which extends across the end of the sleeve and the diaphragm supporting flange thereof and forms the inner wall of the back pressure chamber, and 17 represents a detachable cover having an interior concave portion forming the outer wall of the back pressure chamber 18, this cover plate being secured in position upon the casing by means of screws 19 and having annular portions which clamp the marginal portions of the diaphragm against the face of the casing and also against the diaphragm supporting flange 13, thereby forcing the sleeve 10 into place in the partition aperture and clamping the gasket 12 between the flange 11 and the shoulder 4.

21 represents a reciprocating valve stem secured at its inner end to the diahragm by means of the nut 22 and carrying the normally closed valve. In this instance in the form of my invention illustrated in Figs. 1 to 3 inclusive, in which the apparatus is not provided with a jet attachment, I prefer to provide the valve stem with a normally closed valve 23 adjacent to the diaphragm and preferably enclosed within a metallic casing 24, the valve being adapted to seat upon the valve seat 15 before described when the apparatus is in normal position and the seat is raised. The opposite end of the valve stem which extends into the inlet chamber 9 is provided with a normally open valve 25 held in place by a nut 26 against a flange or shoulder 27 on the valve stem, the valve 25

being adapted to seat against the valve seat 20 at the inner end of the sleeve 10 when the reciprocating valve stem is at the opposite end of its movement, as illustrated in Fig. 2. The valve stem is provided with longitudinal guiding webs 28 having a guiding engagement with the interior of the sleeve 10, the spaces between said webs forming passages for the water from the inlet chamber to the outlet chamber when both of the valves are unseated. The valve stem is also provided between said webs, at the inner end of the valve stem adjacent to the flange or shoulder 27 with curved or inclined shoulders 29 for the purpose of gradually shutting off the flow of water as the normally open valve seats itself on the valve seat 20, to prevent hammering and insuring the gradual closing of the valve. The valve stem 21 is provided with a longitudinal central passage, indicated at 30, extending entirely through the stem and through this passage extends the pin 31 which loosely engages the passage so as to provide an annular communicating passage at all times between the inlet aperture and the back pressure chamber 18. The cover plate 17 is provided with an aperture 32 in axial alignment with the passage 30 in the valve stem, of slightly greater diameter than the pin 31 and the exterior of the cover is provided with a threaded boss 33 surrounding said aperture. The pin 31 extends through the aperture 32 and is provided with a washer or collar 34 to which it is loosely connected by means permitting of universal movement between the pin and the washer, as for example, by the screw 35 loosely engaging an aperture in the collar or washer 34, and threaded into the end of the pin. A closing cap 36 engages the boss and is provided with shoulders for clamping the washer or collar 34 against the end of the boss. This construction permits of universal movement of the pin with respect to the cover so that it can accommodate itself to the valve stem at all times, thus compensating for any inaccuracies in the making or assembling of the parts due to variations of thickness of material or careless workmanship, thus preventing any binding between the valve stem and the pin 31.

The back pressure chamber is provided with a suitable relief passage communicating with the discharge aperture of the valve casing. In this instance the cover plate is provided with a passage 37 communicating with a recess 38 which fits over a tube 39 passing through an aperture in an extension of the diaphragm and itself forming an extension of an interior lug 40 within the casing, a passage 41 extending through said lugs and connecting with a cylindrical vertically disposed passage 42, the upper end of which discharges into a recessed portion of the casing when the relief valve, hereinafter described, is opened, this recessed portion communicating with the outlet passage, as clearly shown in Figs. 1 and 2. 43 represents the relief valve body mounted on the lower end of the stem 44 surrounded by a retracting spring 45, said stem extending vertically through a suitable gland 46 and provided at its upper end with a suitable device, as a nut 47, adapted to engage an arm 82 secured to the seat 80 which is pivoted at 81 in the manner indicated in Fig. 5 of the drawing, so that the depression of the seat will raise the valve stem. The lower part of the valve body 43 is provided with a depending throttling stem 48 which extends into the cylindrical guiding passage 42 of the relief passage and around the throttling stem is a washer 49 of rubber, fibre or other suitable material constituting the valve proper, which is normally held seated on the end of the tubular guiding passage by the spring 45.

The operation of the valve mechanism thus far described will be as follows. The inlet aperture 5 being connected with the water supply, the water will pass through the annular communicating passage between the interior of the valve stem 21 and pin 31, filling the back pressure chamber and the back pressure exerted on the diaphragm will hold the normally closed valve 23 seated as shown in Fig. 1. When the closet seat 80 is depressed the relief valve is opened, as indicated in Fig 2, thus relieving the pressure in the back pressure chamber permitting the water therein to pass out through the relief passage and between the cylindrical portion thereof and the throttling stem 48. This permits the valve stem to move outwardly, opening the valve 23 and allowing a certain amount of water to pass through the sleeve to the outlet until the normally open valve 25 seats against the valve seat 20 on the end of the sleeve, when the communication between the inlet and outlet apertures is again closed. As the valve 25 closes, the curved shoulders 29 of the valve stem will throttle the water and permit the valve 25 to close quietly and without shock, cooperating in this respect with the action of the throttling pin 48 in throttling the flow of water from the back pressure chamber. The parts remain in this position, indicated in Fig. 2, until the closet seat is permitted to rise under the influence of the retracting spring 45 of the relief valve, or other retracting means, thus permitting the relief valve to close. Water immediately begins to accumulate in the back pressure chamber, after the closing of the relief valve, and acting upon the diaphragm, forces the reciprocating valve stem in the inward direction, opening the valve 25 and permitting a continuous flushing action, until the normally closed valve 23 is seated.

This is the true flushing action and is entirely automatic.

It will be readily seen that in the movements of the valves and valve stems, the loosely mounted pin 31 will conform to any slight variations from the concentric position on the part of the valve stem and will compensate for any slight variations or inaccuracies in the assembling of the parts or the workmanship thereon, or variations in the thickness of the gasket, etc. It will also be seen that in case the valve seats 20 or 15 become eaten away or worn, or otherwise injured the water can be shut off, and by removing the cap or cover, the sleeve 10 can be removed and replaced without disconnecting the valve casing from the pipe connections, and without putting the apparatus out of operation more than a few minutes.

In Fig. 4 I have shown a slight modification, in which the parts corresponding with those illustrated in Figs. 1, 2 and 3, and hereinbefore described, are given the same numeral with the addition of the letter "a". The parts are shown in this figure with the normally closed valve in the open position, and the normally open valve in closed position, corresponding with Fig 2. The form of valve illustrated in Fig. 4 is adapted for use in connection with bowls provided with a ventilating jet, in which case the valve casing is provided with an aperture, indicated at 50, communicating with the inlet chamber 9^a, to which is connected a suitable pipe or fitting, indicated at 51, which leads to the jet (not shown) in a manner well understood, and as illustrated in my former patent before referred to. The operation of this jet is well understood and need not be further described herein. In order, however, to prevent the water from flowing continuously through this jet pipe 51, it is necessary that the normally closed valve shall be located between the water inlet aperture 5^a and the jet aperture 50. To this end I conveniently form a valve seat, indicated at 52 on the interior of the casing adjacent to the inlet aperture 5^a and I provide the valve stem with a normally closed valve 23^a located in rear of the valve 25^a, for engaging the seat 52 when the parts are in normal position. The valve stem in this case will not be provided with a valve adjacent to the diaphragm, as in Figs. 2 and 3. Otherwise the construction and operation are the same as previously described, except that when the normally closed valve is open, there is a continuous discharge of water through the jet pipe 51 which operates to ventilate the bowl and also to assist in the flushing operation.

In Fig. 5 I have illustrated, in a fragmentary manner, the portion of the bowl, indicated at 53, provided with the usual flushing pipe 54, which is connected to the outlet aperture of the valve casing, indicated in full lines at 7^a in Fig. 4, and in dotted lines in Figs. 1 and 2. Fig. 5 also illustrates a convenient arrangement of the pivoted closet seat 80, pivoted at 81, provided with an actuating arm 82, and engaging the stem of the relief valve, as previously described. Where the jet pipe 51 is employed, it will extend downwardly from the valve casing, as indicated in Fig. 5, but as previously intimated, it may be omitted if desired.

What I claim and desire to secure by Letters Patent is:—

1. A water closet valve, comprising among its members a valve casing provided with a central partition having an aperture therein provided with an annular shoulder, said casing having an inlet aperture on one side of the partition and an outlet aperture on the other side thereof, and a detachable concave cover forming a back pressure chamber, a removable valve sleeve having a portion fitting said partition aperture and engaging said shoulder, and provided with an annular diaphragm supporting flange, adjacent to said cover, a flexible diaphragm located between said flange and cover and having its edges clamped between the cover and said flange and the body of the casing, a reciprocating valve stem secured to said diaphragm and extending through said sleeve, valves carried by said stem for shutting off the flow of water from the inlet to the outlet aperture, when the valve stem is at each end of its reciprocating movement, means for establishing communication at all times between the inlet aperture and the back pressure chamber, a relief valve passage for the back pressure chamber, and a relief valve controlling said relief passage.

2. A water closet valve, comprising among its members a valve casing provided with a central partition having an aperture therein provided with an annular shoulder, said casing having an inlet aperture on one side of the partition, an outlet aperture on the other side thereof, and a detachable concave cover forming a back pressure chamber, a removable valve sleeve having a portion extending through said partition aperture and provided with a portion engaging said shoulder, and a laterally extending annular diaphragm supporting flange, a flexible diaphragm extending across said flange and having its edges clamped between the cover and said flange and the body of the casing, said cover holding the removable valve sleeve in position, a reciprocating valve stem secured to said diaphragm and extending through said sleeve, a normally open valve carried by said stem for engaging a valve

seat at the inner end of said sleeve, a normally closed valve carried by said stem for normally closing the communication between the inlet and outlet apertures, means for establishing communication at all times between the inlet aperture and the back pressure chamber, a relief passage for the back pressure chamber, and a relief valve controlling said passage.

3. A water closet valve comprising among its members a valve casing provided with a central partition having an aperture therein, provided with an annular shoulder, said casing having an inlet aperture on one side of the partition and an outlet aperture on the other side, and a detachable concave cover forming a back pressure chamber, a removable valve sleeve extending through said partition aperture and provided with a part to engage said shoulder, and an outwardly extending annular diaphragm supporting flange, said sleeve being also provided interiorly with an additional valve seat, a flexible diaphragm located between said flange and the cover, a reciprocating valve stem secured to said diaphragm and extending through said sleeve, a normally closed valve carried by said stem for engaging said interior seat, a normally open valve carried by said stem for engaging the valve seat at the inner end of said sleeve, means for establishing communication at all times between the inlet aperture and the back pressure chamber, a relief passage for the back chamber, and a relief valve for controlling said relief passage.

4. A water closet valve comprising among its members a valve casing provided with a central partition having an aperture therein provided with an annular shoulder, said casing having an inlet aperture on one side of the partition, and an outlet aperture on the other side thereof, and a detachable concave cover forming a back pressure chamber, a removable valve sleeve having a portion fitting said partition aperture and engaging said shoulder and provided with an annular diaphragm supporting flange adjacent to said cover, a flexible diaphragm located between said flange and cover, a reciprocating valve stem secured to said diaphragm and extending through said sleeve, a normally open and a normally closed valve carried by said stem for closing the communication between the inlet and outlet apertures, at opposite ends of the reciprocating movement of said valve stem, longitudinal guiding webs on said stem engaging said sleeve and providing passages therethrough for water when both valves are in open position during the movement of the valve stem, said stem being provided with curved shoulders between said webs adjacent to one end of the sleeve, to gradually throttle the flow of water through the sleeve and prevent hammering, means for establishing communication at all times between the inlet aperture and back pressure chamber, a relief passage for the back pressure chamber, and a relief valve for controlling said passage.

5. A water closet valve comprising among its members a valve casing provided with a central partition having an aperture therein, provided with an annular shoulder, said casing having an inlet aperture on one side of the partition and an outlet aperture on the other side, and a detachable concave cover forming a back pressure chamber, a removable valve sleeve extending through said partition aperture and provided with a part to engage said shoulder, and an outwardly extending annular diaphragm supporting flange, said sleeve being also provided interiorly with an additional valve seat, a flexible diaphragm located between said flange and the cover, a reciprocating valve stem secured to said diaphragm and extending through said sleeve, a normally closed valve carried by said stem for engaging said interior seat, a normally open valve carried by said stem for engaging the valve seat at the inner end of said sleeve, said valve stem being provided with longitudinal guiding webs engaging the sleeve and forming water passages between them, and curved shoulders on said stem between the said webs adjacent to the normally open valve for throttling the flow of water through the sleeve to prevent hammering, means for establishing communication at all times between the inlet aperture and the back pressure chamber, a relief passage for the back pressure chamber, and a relief valve controlling said passage.

6. A watercloset valve comprising among its members a valve casing provided with a central partition having an aperture therein, provided with an annular shoulder, said casing having an inlet aperture on one side of the partition and an outlet aperture on the other side, and a detachable concave cover forming a back pressure chamber, a removable valve sleeve extending through said partition aperture and provided with a part to engage said shoulder, and an outwardly extending annular diaphragm supporting flange, said sleeve being also provided interiorly with an additional valve seat, a flexible diaphragm located between said flange and the cover, a reciprocating valve stem secured to said diaphragm and extending through said sleeve, a normally closed valve carried by said stem for engaging said interior seat, a normally open valve carried by said stem for engaging the valve seat at the inner end of said sleeve, said valve stem being provided with a longitudinal passage therethrough, a pin loosely engaging said passage and having one end con-

nected with the said cover by a loose connection permitting universal movement of the pin, an annular space between said pin and passage providing a communication from the inlet aperture to the back pressure chamber, a relief passage for the back pressure chamber, and a relief valve for said passage.

7. A water closet valve, comprising among its members a valve casing provided with a central partition having an aperture therein provided with an annular shoulder, said casing having an inlet aperture on one side of said partition, and an outlet aperture on the other side thereof, and a detachable concave cover forming a back pressure chamber, a removable valve sleeve having a portion fitting said partition aperture, and engaging said shoulder, and provided with annular diaphragm supporting flange, adjacent to said cover, a flexible diaphragm located between said flange and cover and having its edges clamped between the cover and said flange and the body of the casing, a reciprcoating valve stem secured to said diaphragm, and extending through said sleeve, valves carried by said stem for shutting off the flow of water from the inlet to the outlet apertures, when the valve stem is at each end of its reciprocating movement, said stem having a longitudinal passage therethrough, and said cover having an aperture therein in axial alignment with said passage, a pin extending loosely through the aperture in the cover and loosely engaging said passage in the stem, a collar loosely engaging said pin, a closing cap for the cover aperture for holding the collar in position, a relief passage for the back pressure chamber, and a relief valve for said passage.

8. A water closet valve comprising among its members a valve casing provided with a central partition having an aperture therein, inlet and outlet apertures on opposite sides of the partition, and a cover forming a back pressure chamber, a diaphragm interposed between said cover and the casing and forming one wall of the back pressure chamber, a valve stem secured to said diaphragm and extending through said partition, a normally open and a normally closed valve carried by said valve stem for closing the communication between the inlet and outlet apertures, said valve stem having a longitudinal passage therethrough, a pin extending through said passage and having one end connected with the cover by means providing universal movement of the pin with respect thereto, the annular space between said pin and said passage forming a communication between the inlet aperture and the back pressure chamber, a relief passage for the back pressure chamber, and a relief valve controlling said relief passage.

9. A water closet valve comprising among its members a valve casing provided with a central partition having an aperture therein, inlet and outlet apertures on opposite sides of the partition, and a cover plate forming a back pressure chamber, a diaphragm interposed between said cover and the casing and forming one wall of the back pressure chamber, a valve stem secured to said diaphragm and extending through said partition, a normally open and a normally closed valve carried by said valve stem for closing the communication between the inlet and outlet apertures, said valve stem having a longitudinal passage therethrough, said cover being provided with an externally threaded boss having an aperture therein in axial alignment with said passage, a pin extending loosely through the aperture in said boss and the longitudinal passage of the valve stem, a collar loosely connected to the pin at its outer end and engaging the outer end of said boss, a closure having threaded portions for engaging said boss, and an annular shoulder for engaging said collar, the annular space between the pin and passage in the valve stem forming a communication between the inlet aperture and the back pressure chamber, a relief passage for the back pressure chamber, and a relief valve controlling said relief passage.

10. A water closet valve comprising among its members a valve casing provided with a central partition having an aperture therein provided with an annular shoulder, inlet and outlet apertures at opposite sides of the partition, and a detachable concave cover forming a back pressure chamber, a removable valve sleeve having a portion extending through said aperture and a portion engaging said shoulder, said sleeve being provided with an annular diaphragm supporting flange adjacent to said cover, a flexible diaphragm located between said flange and cover, a reciprocating valve stem secured to said diaphragm and extending through said sleeve, a normally open and a normally closed valve carried by said stem, said sleeve being provided with seats for engaging said valves, and said stem being provided with a central longitudinal passage, a pin loosely connected with the cover by means providing for universal movement, and extending through said passage, a relief passage for the back pressure chamber provided with a tubular guiding portion, a relief valve for closing the relief passage, and a stem connected with said relief valve and extending into said tubular guiding passage, means actuated by the weight of the operator for moving said relief valve longitudinally in a direction to open the valve, and a spring normally holding the relief valve in closed position.

In testimony whereof I affix my signature.

PHILIP HAAS.