





# UNITED STATES PATENT OFFICE.

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## WATER-CLOSET VALVE.

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*To all whom it may concern:*

Be it known that I, ALEXANDER G. ALEXANDER, a citizen of the United States, residing at Detroit, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Water-Closet Valves; and I 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, reference being had to the accompanying drawings, which form a part of this specification.

My invention has for its object a new and improved water-closet valve; and it consists of the structure, combination, and arrangement of devices hereinafter described and claimed, and illustrated in the accompanying drawings, in which—

Figure 1 is a view in vertical section illustrating my invention. Fig. 2 is a view in side elevation. Fig. 3 is a view in cross-section on the line 3 3, Fig. 1. Fig. 4 is a detail view of the stirrup or yoke. Fig. 5 is a detail view, partly in vertical section, showing the engagement of the regulating-valve with the piston-rod of the dash-pot. Fig. 6 is a detail view, also in vertical section, showing features illustrated in Fig. 5, the section being taken at right angles to that shown in Fig. 5. Fig. 7 is a detail view, in vertical section, showing the valve-rod 1, projecting into the drain-pipe Q.

My invention aims to provide a valve of this description of simple and economical construction and of superior utility.

I carry out my invention as follows: I prefer to construct the valve-case in three parts, A representing the upper portion of the valve-case, A' the lower portion of the case, and A<sup>2</sup> an intermediate portion having a threaded engagement with the adjacent ends of the upper and lower portions of said case. Within the intermediate portion of the case is a working chamber A<sup>3</sup> for the working parts of the valve, into which any leakage from the packing-gland may collect and from which the leakage may be discharged, as hereinafter set forth.

A<sup>4</sup> is the cap.

B denotes the main valve, and C the valve-seat, carried at the downward extremity of the lower portion A' of the valve-case. Within

the upper portion of the case is a dash-pot cylinder D, which may be filled with oil or water by removing the cap A<sup>4</sup> to govern the operation of the valve B. Within the dash-pot cylinder is a piston E, provided with a hollow stem or rod E', having a threaded engagement, as shown at e, with the piston, said rod being also threaded toward its upper end, as shown at e'.

F is a stirrup or yoke, with the upper end of which the piston-rod E is engaged, as shown at f, said yoke being provided with downwardly-projecting arms f', engaged with the upper end of the shell of the valve B, said shell being shown formed with laterally-projecting arms b b to engage said arms of the yoke, as shown. The yoke is also provided with a downwardly-projecting arm f<sup>2</sup> to be engaged by an operating-lever G, fulcrumed to the portion A<sup>2</sup> of the valve-case, as shown at g. To this end the lower extremity of the arm f<sup>2</sup> is preferably forked, as shown at f<sup>3</sup>, to rest astride the inner end of the operating-lever. The piston-rod may have an adjustable engagement with the upper end of the yoke by means of nuts e<sup>2</sup> upon the threaded portion e' of said rod. The yoke F being engaged with the valve B, as above specified, it is evident that when the lever G is operated to lift said yoke said valve will also be lifted off said seat.

A<sup>5</sup> is the water-inlet opening or nozzle, communicating into a water-inlet chamber A<sup>6</sup> within the lower portion of the casing. The stroke of the operating-lever may be regulated by a screw H in the adjacent portion of the casing. By adjusting the position of said screw the stroke of the lever, and consequently the stroke of the valve B, may be regulated accordingly.

I denotes a stuffing-box about the shell of the valve B, and J is a packing-nut to hold the packing in place.

K is a nut engaged with the lower end of the dash-pot cylinder. The two nuts J and K are connected by arms k. It will thus be seen that the dash-pot cylinder is supported upon said nuts within the valve-casing.

L is a hollow tube for carrying the upper end of the rod or plunger E', said tube having a threaded engagement into the cap A<sup>4</sup>.

M denotes a spring exerting its tension upon



the valve, the upper end of the spring contacting with the lower portion of the cylinder D, the lower portion of the spring extended within the shell of the valve. By making the valve hollow, as shown, provision is made for a corresponding extension of said spring to give the desired amount of spring tension. It will be perceived that when the plunger and valve are lifted by the operation of the lever G said spring is compressed, and when the lever is released the tension of the spring is exerted to restore the valve to its seat, carrying downward therewith the plunger.

N is a discharge tube or pipe holding the seat C in place and also limiting the area of the discharge-opening of the valve-casing, thereby preventing any noise of the water in its discharge as well as limiting the amount of water flowing into the closet. The upper end of the tube N is shown flanged outwardly to engage upon the valve-seat, as shown at n. The discharge-pipe N is carried within a surrounding tube A<sup>8</sup>, connected with the lower portion of the valve-case and upon the upper end of which rests the leather or other similar valve-seat C.

The lower portion of the case is provided with an inwardly-projecting shoulder, as at a, engaging upon the upper face of the valve-seat. With the lower end of the valve B is connected a drain-tube Q, passing through the discharge-pipe N, as shown, and opening into the shell of said valve. The upper end of the shell of the valve is provided with small openings b' below the line of the opening A<sup>7</sup>, through which the lever G works when the valve is unseated, through which openings b' water in the chamber A<sup>3</sup> will pass into the shell of the valve, and thence be discharged through the drain-tube Q. Thus any leakage passing the packing-glands I will be carried away, as above described. The tube Q is carried downward a sufficient distance in the discharge-pipe to allow the creation of a suction when the valve is open and water is passed downward through the discharge-pipe; otherwise the water in the chamber A<sup>3</sup> might back up and overflow through the opening A<sup>7</sup> of the case.

To regulate the descent of the piston E in the dash-pot cylinder, I provide the piston-rod or plunger with an interior rod S, having a threaded engagement with the plunger at its lower end, the lower end of the rod S being provided with a V-shaped or other suitable opening T, so constructed and arranged that by adjusting the rod S said opening may be adjusted to allow more or less of the liquid in the dash-pot cylinder to pass there-through, so as to regulate the descent of the piston in said cylinder.

The plunger may be provided with one or more orifices S', through which the liquid may pass into the upper portion of the cylinder when the opening T is adjusted into open position. By reference to Fig. 5 it will be seen that when the opening t is adjusted

into open position liquid beneath the piston may pass upward through the opening t into the interior of the hollow stem E' and thence out through the orifices S' into the dash-pot cylinder above the piston. Obviously the size of the opening T, or, in other words, the adjustment of the rod S to unclosethe opening T, will govern the descent of the piston. It will readily be understood that the stroke of the piston into the dash-pot cylinder may thus be governed as desired. The lower end of the rod S, it will be seen, is enlarged to permit its having a threaded engagement with the lower end of the plunger.

The piston E is constructed with a cup-shaped leather, made thin and flexible, so that when the piston ascends the leather will be loose. The orifices S' in the hollow rod are always of greater dimensions than the dimensions of the opening T, permitting the interior of the rod E' at its lower end to be constantly filled with water, excluding the passage of air through the opening T underneath the piston. A constant vacuum is thus caused under the piston, in consequence of which when the piston ascends atmospheric pressure will force the water down about the sides of the piston to the space within the dash-pot cylinder therebelow. It will be clear, therefore, that oil or water will thus be prevented from being lifted over the edge of the dash-pot cylinder. When the tension of the spring M comes upon the piston, the leather of the piston will be tightened against the inner walls of the cylinder.

The operation of the valve will now be understood. The closet-bowl is flushed by pushing down the operating-lever G until it strikes the set-screw H or until the adjacent nut e<sup>2</sup> strikes the lower end of the tube L. It will be evident that by adjusting the tube L in the cap A<sup>4</sup> the stroke of the plunger will be regulated accordingly, giving more or less travel to the plunger, as may be desired, before the adjacent nut e<sup>2</sup> will strike the lower end of said tube. When the valve is unseated, the water entering the inlet-orifice A<sup>5</sup> is then permitted to pass through the discharge-pipe N into the bowl until the valve is seated, the seating of the valve being governed by the descent of the piston in the dash-pot cylinder. When the operating-lever G is thus actuated, the yoke F is lifted, carrying with it the valve B and compressing the spring M. When the lever is released, the spring is allowed to expand, thereby forcing the plunger of the piston downward in the cylinder D and allowing the valve to close gradually, the time taken for the closing of the valve depending upon the time taken for the water or oil in the cylinder D to be transferred from below the piston in the cylinder to the top of the cylinder, the passage of the liquid in the cylinder being regulated by means of the opening or slot in the lower end of the rod S, the degree of the unclosing of said opening governing the pas-



sage of the liquid from beneath the piston into position thereabove, thereby governing the descent of the piston. As soon as the lever G is depressed the valve is thus opened, permitting a full flow of water, the flow continuing until the valve approaches closely to the seat, the supply of water being then diminished, but continuing until the valve is closed, thus allowing the bowl to refill, as required, the amount of water allowed for the refilling of the bowl being regulated, as above observed, by the speed with which the valve is allowed to close. The valve is first regulated through the opening in the lower end of the rod S to provide for the proper speed for refilling of the bowl, and the duration of the flushing of the bowl is regulated by the set-screw H or the adjustment of the tube L, which governs the stroke of the lever and of the valve, as described.

The shell of the valve B is cylindrical and is of equal diameter throughout and forming an equalized cylindrical valve. It will be observed also that all the direct working parts of the valve within the case work upon a straight line. The shoulder *a* not only serves to hold the washer in place, but also assists in regulating the afterflush of the closet-bowl in connection with the adjustment of the rod S with its opening T. The amount of afterflush will be governed by the speed of the valve after it passes the upper edge of said shoulder or while the valve is traveling past the inner face of said shoulder to its seat.

To prevent any liability of water backing up through the tube Q on account of the water-pressure, I prefer to employ a valve-rod, (indicated by the numeral 1,) said valve-rod connected with the lower end of the dash-pot cylinder and extending downward through the spring M, the lower end of said valve-rod arranged to close off communication through the lower end of the valve B when said valve is unseated.

As shown in Fig. 7, the lower end of said valve-rod is beveled on one face thereof, as indicated by the numeral 2, the upper end of the bevel extending slightly above the inner face of the valve when the valve is seated; but it will be evident that since the valve-rod is connected with the dash-pot when the valve is lifted communication through the lower end of the valve will be cut off. The lower end of the valve-rod may extend into the upper end of the drain-tube Q or said drain-tube might be dispensed with.

One of the main objects of the present invention is to so construct the device that the water in the lower chamber will never rise above the packing—preferably a soft packing—into contact with the working parts of the valve. It is important that the inlet-pipe should lead into the side of the lower chamber. It will be seen that the stroke of the lever regulated by the screw H controls the lift of the valve.

What I claim as my invention is—

1. The combination with a case provided with a valve-seat and with an inlet-opening, of an equalized cylindrical valve above said seat, packing about said valve above said opening, a dash-pot cylinder provided with a piston and its plunger to govern the seating of the valve, a yoke engaging said valve and said plunger, and a lever to lift said yoke.

2. The combination with a case provided with a valve-seat and with an inlet-opening, of an equalized cylindrical valve above said seat, a packing about said valve above said opening, a dash-pot cylinder provided with a piston and its plunger, and a packing-nut to hold the packing in place, said cylinder supported upon said packing-nut.

3. The combination with a case provided with a valve-seat and with an inlet-opening above the seat, of a cylindrical valve above said seat provided with an opening through its base, means to lift the valve off its seat, means to govern the seating of the valve, and means to close said opening in the valve when the valve is lifted off its seat.

4. The combination with a case provided with a valve-seat and with an inlet-opening, of a valve above said seat provided with an opening therethrough, a dash-pot cylinder provided with a piston and its plunger, and a valve-rod connected with said cylinder to close the opening through the valve when the valve is lifted, and means to lift the valve off its seat, said dash-pot cylinder constructed to govern the descent of the valve.

5. A water-closet valve having a case forming a water-inlet chamber, a working chamber thereabove, an inlet-opening into the side of the inlet-chamber, and an outlet-opening at the base of said chamber, of a valve-seat at the base of the inlet-chamber below the inlet-opening, valve-operating mechanism in said working chamber, an equalized cylindrical valve above said seat reciprocatory in both said chambers, packing about said valve above said inlet-opening between the inlet-chamber and the working chamber, a dash-pot cylinder provided with a piston and its plunger above said valve, means to simultaneously lift said valve and piston, and means to regulate the flow of liquid in said cylinder from one side of the piston to the other, said inlet-chamber discharging beneath the valve when the valve is open.

6. A water-closet valve having a case constructed with a water-inlet chamber, with a working chamber thereabove, with an inlet-pipe arranged to communicate directly with the city water-main leading into the side of the inlet-chamber, and an outlet-opening at the base of said chamber, of a valve-seat at the base of the inlet-chamber, an equalized cylindrical valve reciprocatory within said chambers above the valve-seat, packing about said valve between said chambers and above the inlet-pipe, valve-operating mechanism in said working chamber, and means to govern



the seating of the valve, whereby the water from a city water-main would be admitted only into the inlet-chamber above the valve-seat and be discharged therefrom below the valve by the opening of said valve, the water in the inlet-chamber being prevented by said packing from rising into said working chamber.

7. A water-closet valve having a case constructed with a water-inlet chamber, with a working chamber thereabove, with an inlet-pipe arranged to communicate directly with the city water-main leading into the side of the inlet-chamber, and an outlet-opening at the base of said chamber, of a valve-seat at the base of the inlet-chamber, an equalized cylindrical valve reciprocatory within said chambers above the valve-seat, packing about said valve between said chambers and above the inlet-pipe, valve-operating mechanism in said working chamber, means to govern the seating of the valve, and means to regulate the stroke of the valve, whereby the water from a city water-main would be admitted only into the inlet-chamber above the valve-seat and be discharged therefrom below the valve by the opening of said valve, the water in the inlet-chamber being prevented by said packing from rising thereabove into the working chamber and into contact with the working parts of the valve.

8. A water-closet valve having a case constructed with a water-inlet chamber, with a working chamber thereabove, with an inlet-pipe arranged to communicate directly with the city water-main leading into the side of the inlet-chamber, and an outlet-opening at the base of said chamber, of a valve-seat at the base of the inlet-chamber, an equalized cylindrical valve reciprocatory within said chambers above the valve-seat, packing about said valve between said chambers and above the inlet-pipe, valve-operating mechanism in said working chamber, a lever projecting into the working chamber to actuate said mechanism, means to govern the seating of the valve, and means to regulate the stroke of said lever, whereby the water from a city water-main would be admitted only into the inlet-chamber above the valve-seat and be discharged therefrom below the valve by the opening of said valve, the water in the inlet-chamber being prevented by said packing from rising thereabove into the working chamber and into contact with the working parts of the valve.

9. A water-closet valve having a case constructed with a water-inlet chamber, with a working chamber thereabove, with an inlet-pipe arranged to communicate directly with the city water-main leading into the side of the inlet-chamber, and an outlet-opening at the base of said chamber, of a valve-seat at the base of the inlet-chamber, an equalized cylindrical valve reciprocatory within said chambers above the valve-seat, packing about said valve between said chambers and above

the inlet-pipe, a yoke within the working chamber engaging said valve, a lever to lift said yoke, and means to govern the seating of the valve, whereby the water from a city water-main would be admitted only into the inlet-chamber above the valve-seat and be discharged therefrom below the valve by the opening of said valve, the water in the inlet-chamber being prevented by said packing from rising thereabove into the working chamber and into contact with the working parts of the valve.

10. A water-closet valve having a case constructed with a water-inlet chamber, with a working chamber, with an inlet-pipe arranged to communicate directly with the city water-main leading into the side of the inlet-chamber, and an outlet-opening at the base of said chamber, of a valve-seat at the base of the inlet-chamber, an equalized cylindrical valve reciprocatory within said chambers above the valve-seat, packing about said valve between said chambers and above the inlet-pipe, a discharge-pipe communicating with the inlet-chamber when the valve is opened, valve-operating mechanism in the working chamber, and means to govern the seating of the valve, said valve opening at its upper end into the working chamber, and at its lower end opening into the discharge-pipe, whereby the water from a city water-main would be admitted only into the inlet-chamber above the valve-seat and be discharged therefrom below the valve by the opening of said valve, the water in the inlet-chamber being prevented by said packing from rising thereabove into the working chamber and into contact with the working parts of the valve.

11. A water-closet valve having a case constructed with a water-inlet chamber, with a working chamber thereabove, and with an inlet-pipe arranged to communicate directly with the city water-main leading into the side of the inlet-chamber, of a valve-seat at the base of the inlet-chamber, an equalized cylindrical valve reciprocatory within said chambers above the valve-seat, packing about said valve between said chambers and above the inlet-pipe, a discharge-pipe communicating with the base of the inlet-chamber, a tube surrounding the discharge-pipe and carrying the valve-seat, means to lift the valve off its seat, and means to govern the seating of the valve, whereby the water from a city water-main would be admitted only into the inlet-chamber and be discharged therefrom by the opening of said valve, the water in the inlet-chamber being prevented by said packing from rising thereabove into the working chamber and into contact with the working parts of the valve.

12. A water-closet valve having a case constructed with a water-inlet chamber, with a working chamber thereabove, with an inlet-pipe arranged to communicate directly with the city water-main leading into the side of the inlet-chamber, and an outlet-opening at



the base of said chamber, of a valve-seat at the base of the inlet-chamber, an equalized cylindrical valve reciprocatory within said chambers above the valve-seat, packing about said valve between said chambers and above the inlet-pipe, valve-operating mechanism in the working chamber, and means to govern the seating of the valve, whereby the water from a city water-main would be admitted only into the inlet-chamber above the valve-seat and be discharged therefrom below the valve by the opening of said valve, the water in the inlet-chamber being prevented by said packing from rising thereabove into the working chamber and into contact with the working parts of the valve, said valve provided with a drain-pipe communicating there-through.

13. A water-closet valve having a case constructed with a water-inlet chamber, with a working chamber thereabove, with an inlet-pipe arranged to communicate directly with the city water-main leading into the side of the inlet-chamber, and an outlet-opening at the base of said chamber, of a valve-seat at the base of the inlet-chamber, an equalized cylindrical valve reciprocatory within said chambers above the valve-seat, packing about said valve between said chambers and above the inlet-pipe, a dash-pot cylinder within the working chamber provided with a piston and its plunger, means within the working chamber connecting said plunger with said valve, means to raise said piston and valve, whereby the water from a city water-main would be admitted only into the inlet-chamber above the valve-seat and be discharged therefrom below the valve by the opening of said valve, the water in the inlet-chamber being prevented by said packing from rising thereabove into the working chamber and into contact with the working parts of the valve, said cylinder and piston constructed to govern the descent of the valve.

14. A water-closet valve having a case constructed with a water-inlet chamber, with a working chamber thereabove, with an inlet-pipe arranged to communicate directly with the city water-main leading into the side of the inlet-chamber, and an outlet-opening at the base of said chamber, of a valve-seat at the base of the inlet-chamber, an equalized cylindrical valve reciprocatory within said chambers above the valve-seat, packing about said valve between said chambers and above the inlet-pipe, a dash-pot cylinder within the working chamber provided with a piston and its plunger, a spring engaging the valve with said cylinder, means connecting said piston and valve, means to lift the piston and valve and compress said spring, and means to govern the descent of the valve, whereby the water from a city water-main would be admitted only into the inlet-chamber above the valve-seat and be discharged therefrom below the valve by the opening of said valve, the water in the inlet-chamber being prevented

by said packing from rising thereabove into the working chamber and into contact with the working parts of the valve.

15. A water-closet valve having a case constructed with a water-inlet chamber, with a working chamber thereabove, with an inlet-pipe arranged to communicate directly with the city water-main leading into the side of the inlet-chamber, and an outlet-opening at the base of said chamber, of a valve-seat at the base of the inlet-chamber, an equalized cylindrical valve reciprocatory within said chambers above the valve-seat, packing about said valve between said chambers and above the inlet-pipe, a dash-pot cylinder within the working chamber provided with a piston and its plunger, means connecting said valve and piston, means to simultaneously lift the valve with said piston and its plunger, and a spring extending into the valve and exerting its tension thereupon to restore the valve and piston to normal position, whereby the water from a city water-main would be admitted only into the inlet-chamber above the valve-seat and be discharged therefrom below the valve by the opening of said valve, the water in the inlet-chamber being prevented by said packing from rising thereabove into the working chamber into contact with the working parts of the valve.

16. A water-closet valve having a case constructed with a water-inlet chamber, with a working chamber thereabove, with an inlet-pipe leading into the side of the inlet-chamber, and with an outlet-opening at the base of said chamber, of a valve-seat at the base of the inlet-chamber, an equalized cylindrical valve reciprocatory within said chambers above the valve-seat, packing about said valve between said chambers and above the inlet-pipe, operative devices for actuating the valve located in the working chamber, a lever to actuate said operative devices to lift the valve off its seat, means to regulate the stroke of the lever, said operative devices provided with means to regulate the seating of the valve, said valve-case provided with a shoulder projecting inwardly at the base of the inlet-chamber above the valve-seat, whereby the water would be admitted only into the inlet-chamber above the valve-seat and be discharged therefrom below the valve by the opening of said valve, the water in the inlet-chamber being prevented by said packing from rising thereabove into the working chamber and into contact with the working parts of the valve, and whereby the after-flush of the closet-bowl will be determined by the speed of the travel of the valve past said shoulder, the means to regulate the stroke of the valve, and the means to regulate the speed of the seating of the valve being independent.

17. A water-closet valve having a case constructed with a water-inlet chamber, with a working chamber thereabove, with an inlet-pipe leading into the side of the inlet-cham-



ber, and an outlet-opening at the base of said chamber, of a valve-seat at the base of the inlet-chamber, operative devices for actuating the valve located in the working chamber, an equalized cylindrical valve reciprocatory within said chambers above the valve-seat, packing about said valve between said chambers and above the inlet-pipe, whereby the water from the inlet-pipe would be admitted only into the inlet-chamber above the valve-seat and be discharged therefrom below the valve by the opening of said valve,

the water in the inlet-chamber being prevented by said packing from rising thereabove into the working chamber and into contact with the working parts of the valve, and two independent means to control the operation of the valve. 15

In testimony whereof I sign this specification in the presence of two witnesses.

ALEXANDER G. ALEXANDER.

Witnesses:

N. S. WRIGHT,  
M. HICKEY.