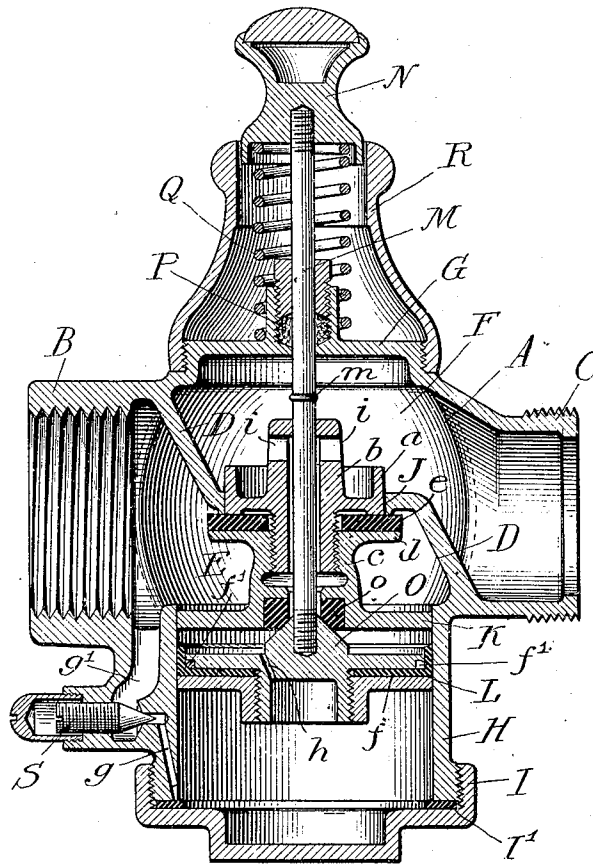


E. G. WATROUS.
 FLUSHING VALVE.
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1,254,869.

Patented Jan. 29, 1918.



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UNITED STATES PATENT OFFICE.

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FLUSHING-VALVE.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, EARL G. WATROUS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Flushing-Valves, of which the following is a specification, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to that class of flushing valves known as slow-closing valves, adapted to be quickly opened by or upon the movement of a manually operated part, to produce a maximum flow of water for a brief period, and then to close slowly in order to produce a prolonged and gradually decreasing flow of water.

My present invention is, in certain respects, an improvement upon the valve heretofore patented to me by Letters Patent No. 1,066,350, dated July 1, 1913, and consists in a simplification and cheapening of the construction of that valve, and in a modification which permits the valve to be used with equal efficiency in any position—horizontal, vertical or angular. In this latter respect my new valve is particularly adapted for use in horizontal position in vertical pipes, and its construction is further such as to especially adapt it for use in what is commercially called "concealed work," the pipes and valve being entirely hidden within walls or partitions, with the exception of the manually operated part of the valve, which is projected through the same into position to be operated.

The novelty of my invention will be hereinafter set forth and particularly pointed out in my claims.

The main casing or body portion of the valve consists of a central approximately-spherical portion A, having a supply pipe connection B at one side and a discharge pipe connection C at its opposite side, and having an internal diaphragm or partition D separating its interior into an inlet chamber E and an outlet chamber F, communication between which chambers is controlled by the valves hereinafter described.

The top of the outlet chamber F is closed by a wall G formed integral with the valve body, while depending from the under side of the latter and formed integral with it is a cylinder or piston chamber H whose lower end is closed by a cap I screwed upon it

and confining a packing ring I' between itself and the bottom of the cylinder.

The diaphragm D within the valve body is provided with a central circular opening, with which, and with a seat formed around it upon the under side of the partition coöperates the main valve J. This valve is composed, in the present instance, of a cylindrical portion *a* fitting within and adapted to coöperate with the circular aperture in the partition D, and carried by and formed integral with a central tubular portion or stem *b* upon whose exteriorly-threaded lower end is screwed a casting *c* whose upper end has formed upon it a flange or disk *d* upon which rests a leather disk *e* which is clamped between the disk *d* and the cylinder *a* above it and coöperates with the valve seat upon the under side of the partition D.

Formed upon the lower end of the tubular casting *c* is a piston in the form of a disk K, which loosely fits and travels within the cylinder or piston-chamber H, normally occupying a position in the upper or inner end of the latter, as shown in the drawing, when the main valve is closed. Located within the cylinder H, beneath or at the outer side of the piston K, is a second piston L, in the present instance of familiar composite construction, including a cup leather *f*, a split ring *f'* confined within the latter, in an annular recess provided in the metal disk of the piston, serving to press the leather outward against the cylinder wall. This piston L is carried by a valve stem M extending axially through the valve structure and provided upon its upper end with a pressure-piece or push-button N. Formed upon the upper side of the piston L, at its center, is a supplemental valve O adapted to coöperate with a leather seat *o* provided for it in the under side of the piston K and casting *c* which carries said piston, said valve O controlling the passage around the valve stem M from the under side of the piston K to a pair of lateral ports *i* by which the upper end of said passage communicates with the interior of the outlet chamber F.

The valve stem M is provided with an annular shoulder or ring *m* and surrounded by a stuffing box P at the point where it passes through the wall G of the valve body and above said wall is surrounded by a coiled spring Q which is confined between said wall and the push-button N upon the upper

end of the valve stem. The parts above the wall G are inclosed with a cap or bonnet R within the outer end of which fits the lower or inner end of the push-button N upon the

5 end of the valve stem.

A by-pass gg' , formed in one side of the wall of the cylinder H, and controlled by a regulating screw S, connects the water supply and inlet chamber E with the interior

10 of the piston chamber beneath the piston L, while a small port h , through the piston L, connects the space beneath said piston with that above it and between the piston L and the piston K.

15 Under the foregoing construction and arrangement of the parts, the operation is as follows:

Owing to the provision of the by-pass gg' and the port h , as well as the leakage way

20 around the piston K, the interior of the piston chamber beneath the piston L, and also the space between the pistons L and K, are normally filled with water under the full pressure of that within the pipe connection

25 B and inlet chamber E, so that the pressures upon the upper and lower sides of the piston L and disk K will be equalized and the main valve will be held to its seat by the upward pressure against its under side. Upon

30 slightly depressing the valve stem M, by means of the push button N, the relief valve O will be unseated, and the portion of the piston chamber beneath the piston L, and the space between the pistons L and K,

35 will be placed in communication, through the tubular passage around the valve stem and the ports i, i , with the outlet chamber F of the valve. This will serve to relieve the pressure upon the under sides of the

40 pistons L and K, whereupon the preponderating pressure upon the upper side of the piston K will force the latter downward and unseat the main valve. If the latter should stick in its seat it can be manually

45 unseated by sufficient depression of the valve stem M whose ring m will contact with the top of the valve casting. The pressure on the push button being continued, so as to hold the valve O unseated, the piston K and

50 main valve will move on downward until the central aperture or passageway through the diaphragm D is fully opened and a maximum flow of water through the valve permitted. During such downward move-

55 ment of the parts the water in the cylinder H escapes freely past the piston L and offers little resistance to its downward movement.

Upon relieving the push-button N of pressure the spring Q will lift it and the valve

60 stem M, relatively to the main valve and the piston K, and reseat the relief valve O, thereby closing the escape passage from the lower end of the piston chamber and the space between the pistons L and K to the

65 outlet side of the valve, whereupon the

pressure of the water supply will be gradually restored in the lower portion of the piston chamber, and in the space between the pistons L and K, through the by-pass gg' , port h , and leakage way around the piston

70 K, and such pressure, exerted against the under sides of the pistons L and K, supplemented by the pull of the spring Q, and the rush of water upward through the valve seat, will tend to restore the parts to normal position and close the main valve. The

75 piston L can move upward, however, only so fast as the water is admitted to the space beneath it through the regulated by-pass gg' , supplemented by the port h through

80 the piston, and the closing movement of the main valve is regulated by means of such by-pass.

If the main valve, under the pressure exerted against the under side of the piston

85 K, tends to close too rapidly, and is moved upward in advance of the piston L, the relief valve O will become unseated, thereby temporarily relieving the pressure beneath

90 the piston K and arresting the movement of the latter until the piston L catches up with it and reseats the valve O. The closing movement of the main valve is thus regulated and controlled and it is caused to

95 move slowly and quietly to its seat.

While it is desirable that the by-pass gg' and the port h in the piston L be both employed, in combination or coöperation with

100 each other, as well as to enable either to act alone if the other should become clogged up or obstructed, the operation of the valve is not dependent upon the presence of both, and either may be omitted without defeating

it.

In the accompanying drawing I have

105 illustrated my new valve in upright position, and in the description of its various parts have referred to them in that relation, as if the valve were secured in a horizontal

110 pipe, with its operating push-button at the top, and while the valve will operate in that position as well as any other, it is, as heretofore stated, particularly adapted for use

in horizontal position, with its pipe connections arranged in vertical line, and with its

115 operating push-button projecting laterally from the body of the valve and from the vertical line of the pipe connections. The valve is not only so designed and constructed as to operate in such position, which

120 is not the case with many prior valves, but as heretofore stated it is also well-designed for use in "concealed work," since the bonnet or cap R of the valve casting, which

125 houses the outer end of the valve stem and its surrounding spring and the stuffing box, may be readily extended through the partition behind which the valve and piping are located, and the push-button be properly

located for use. If the partition through

130

which such cap has to project is of unusual thickness a cap of corresponding length may be readily provided, together with a longer valve stem and surrounding spring, to accommodate such situation.

Having thus fully described my invention, I claim:

1. In a flushing valve, the combination of a valve body having diametrically-opposed pipe connections and a cylinder projecting from it at right angles to said pipe connections, a piston slidingly engaging said cylinder and permitting restricted leakage of water, a main valve carried by said piston, a second piston also slidingly engaging said cylinder, a spring-pressed supplemental valve carried by the latter piston and coöperating with the first-mentioned piston to open and close relatively free communication between the inlet and outlet sides of the valve through said piston and main valve, and means for manually moving the second piston to unseat the supplemental valve and open communication between the opposite sides of the main valve through said main valve and the first-mentioned piston.

2. In a flushing valve, the combination of a valve body having diametrically-opposed pipe connections and a cylinder projecting from the valve body at right angles to said pipe connections, said cylinder being provided with a regulated by-pass connecting one end of it with the inlet side of the valve, a piston slidingly engaging said cylinder and permitting restricted leakage of water, a main valve carried by said piston, a second piston also slidingly engaging said cylinder, a spring-pressed supplemental valve carried by the second piston and coöperating with the first-mentioned piston to open and close relatively free communication between the opposite sides of the main valve through said main valve and piston, and means for manually moving the second piston to unseat the supplemental valve and open communication between the opposite sides of the main valve through the latter and the first-mentioned piston.

3. In a flushing valve, the combination of a valve body having diametrically-opposed pipe connections and a cylinder projecting from the valve body at right angles to said pipe connections, a piston slidingly engaging said cylinder and permitting restricted leakage of water, a main valve carried by said piston, a second piston also slidingly engaging said cylinder provided with a small port providing restricted communication between the spaces at its opposite sides, a spring-pressed supplemental valve carried by the second piston and coöperating with the first-mentioned piston to open and close relatively free communication between the opposite sides of the main valve through said main valve and piston, and means for

manually moving the second piston to unseat the supplemental valve and open communication between the opposite sides of the main valve through the latter and the first-mentioned piston.

4. In a flushing valve, the combination of a valve body having diametrically-opposed pipe connections and a cylinder projecting from the valve body at right angles to said pipe connections, said cylinder being provided with a regulated by-pass connecting one end of it with the inlet side of the valve, a piston slidingly engaging said cylinder and permitting restricted leakage of water, a main valve carried by said piston, a second piston also slidingly engaging said cylinder having a small port providing restricted communication between the spaces at its opposite sides, a spring-pressed supplemental valve carried by the second piston and coöperating with the first-mentioned piston to open and close relatively free communication between the opposite sides of the main valve through said main valve and piston, and means for manually moving the second piston to unseat the supplemental valve.

5. In a flushing valve, the combination of a valve body having diametrically-opposed pipe connections and a cylinder projecting from the valve body at right angles to said pipe connections, a piston in said cylinder permitting restricted leakage of water, a main valve carried by said piston, said piston and valve being formed with a passage providing relatively free communication between the piston chamber and the outlet side of the valve, a second piston in said cylinder, a supplemental valve carried by the second piston and coöperating with the first-mentioned piston to control the passage through the same and the main valve, a valve-stem extending axially through the main valve and the first-mentioned piston and secured at one end to the second piston, a pressure-piece secured to the opposite end of said valve stem, a spring surrounding the latter end of the valve stem and confined by said pressure-piece, and an inclosing cap or bonnet upon the valve body for said spring, valve stem and pressure-piece.

6. In a flushing valve, the combination of the valve body A having the pipe connections B—C and the internal diaphragm D separating its interior into the inlet chamber E and outlet chamber F, and having the cylinder H projecting from the valve body at right angles to the pipe connections B—C, said cylinder having the by-pass *gg'* controlled by the regulating screw S, the piston K in the cylinder H permitting restricted leakage of water, the main valve J carried by said piston and coöperating with the diaphragm D, said piston K and valve J being formed with a passage providing relatively free communication with the outlet side of

the valve, the piston L in the cylinder H at the outer side of the piston K, the supplemental valve O carried by the piston L and coöperating with the piston K to control the
 5 passage through the same and the main valve, the valve stem M extending axially through the main valve and piston K and secured to the piston L, the pressure-piece N secured upon the opposite end of said valve
 10 stem, the spring Q surrounding said stem and confined by said pressure-piece, and the cap or bonnet R screwed upon the valve body and inclosing said spring, valve stem and pressure-piece.

15 7. In a flushing valve, the combination of the valve body A having the diametrically-opposed pipe connections B—C and the cylinder H projecting from the valve body at right angles to said pipe connections, said cylinder having a regulated by-
 20 pass connecting its outer end with the inlet side of the valve, the piston K in the cylinder H permitting restricted leakage of water, the main valve carried by said piston
 25 and composed of the tubular stem portion *b*, cylindrical portion *a* and disk portions *d* and *e*, the piston K and main valve having an axial passage through them providing relatively free communication between
 30 the outlet side of the valve and the piston chamber, the second piston L located in the cylinder H at the outer side of the piston K and having the small port *h*, the supplemental valve O carried by the piston L and co-
 35 operating with a seat upon the piston K to control the passage through the latter and the main valve, the valve-stem M extending axially through the main valve and piston K and the wall G of the valve body, and se-
 40 cured at one end to the piston L, the stuffing box P surrounding the valve-stem M at its passage through the wall G, the pressure-piece N upon the outer end of the valve stem, the coiled spring Q surrounding the
 45 valve stem between said pressure-piece and the wall G, and the cap R inclosing said spring, stuffing box, valve-stem and pressure piece.

8. In a flushing valve, the combination of
 50 a valve body having pipe connections and an internal diaphragm provided with a main valve seat and separating the interior of the body into an inlet chamber and an outlet chamber and also having a cylinder ar-
 55 ranged in the inlet chamber in axial alinement with the valve seat, the outer end of said cylinder having restricted communication with the inlet side of the main valve, a piston in the inner end of said cylinder
 60 permitting restricted leakage of water, a main valve carried by said piston and co-operating with said main valve seat, said piston being formed with a supplemental valve seat on its outer side and said piston
 65 and main valve being formed with an axial

passage providing relatively free communi-
 cation between such seat and the outlet side
 of the valve, a second piston at the outer
 side of said first-mentioned piston, a sup-
 70 plemental valve carried by said piston co-
 operating with said supplemental valve seat,
 and a spring-pressed operating stem secured to said supplemental valve and extending
 axially through said first-mentioned piston
 and main valve and yieldingly tending to
 75 hold both said valves seated.

9. In a flushing valve, the combination of
 a valve body having pipe connections and
 an internal diaphragm provided with a
 main valve seat and separating the interior
 80 of the body into an inlet chamber and an
 outlet chamber and also having a cylinder
 arranged in the inlet chamber in axial aline-
 ment with the valve seat, the outer end of
 said cylinder having restricted communica-
 85 tion with the inlet side of the main valve,
 a piston in the inner end of said cylinder
 permitting restricted leakage of water, a
 main valve carried by said piston and co-
 operating with said main valve seat, said
 90 piston being formed with a supplemental
 valve seat on its outer side and said piston
 and main valve being formed with an axial
 passage providing relatively free communi-
 cation between such seat and the outlet side
 95 of the valve, a second piston at the outer
 side of said first-mentioned piston, and also
 being formed with a leak port permitting re-
 stricted passage of water from one side
 thereof to the other, a supplemental valve
 100 carried by said piston coöperating with said
 supplemental valve seat, and a spring-
 pressed operating stem secured to said sup-
 plemental valve and extending axially
 through said first-mentioned piston and
 105 main valve and yieldingly tending to hold
 both said valves seated.

10. In a flushing valve, the combination
 of a valve body having pipe connections
 and an internal diaphragm provided with
 110 a main valve seat and separating the in-
 terior of the body into an inlet chamber and
 an outlet chamber and also having a cylin-
 der arranged in the inlet chamber in axial
 alinement with the valve seat, the outer end
 115 of said cylinder having restricted communi-
 cation with the inlet side of the main valve,
 a piston in the inner end of said cylinder
 permitting restricted leakage of water, a
 main valve carried by said piston and co-
 120 operating with said main valve seat, said
 piston being formed with a supplemental
 valve seat on its outer side and said piston
 and main valve being formed with an axial
 passage providing relatively free communi-
 cation between such seat and the outlet side
 125 of the valve, a second piston at the outer
 side of said first-mentioned piston, a sup-
 plemental valve carried by said piston co-
 operating with said supplemental valve seat,
 130

and a spring-pressed operating stem secured to said supplemental valve and extending axially through said first-mentioned piston and main valve and yieldingly tending to hold both said valves seated, said operating stem having a limited lost-motion engagement with said main valve.

11. In a flushing valve, the combination of a cylinder having an open end constantly exposed to pressure adjacent the inner side of the main valve, a piston in said cylinder permitting restricted leakage of water, a main valve carried by said piston, said piston and valve being formed with a valve seat and passage providing communication between the piston chamber and the outlet

side of the valve, a second piston in said cylinder, said second piston also permitting restricted flow of water past it, a supplemental valve carried by said second piston and cooperating with said valve seat, and a spring-pressed operating stem passing through the passage in the main valve and first-mentioned piston and connected with said supplemental valve, said stem being provided with an abutment permitting a short relative movement with respect to the main valve.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."