No. 700,486. Patented May 20, 1902.

J. J. FINNEY.

FLUSH VALVE.

(Application filed Aug. 20, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 2.

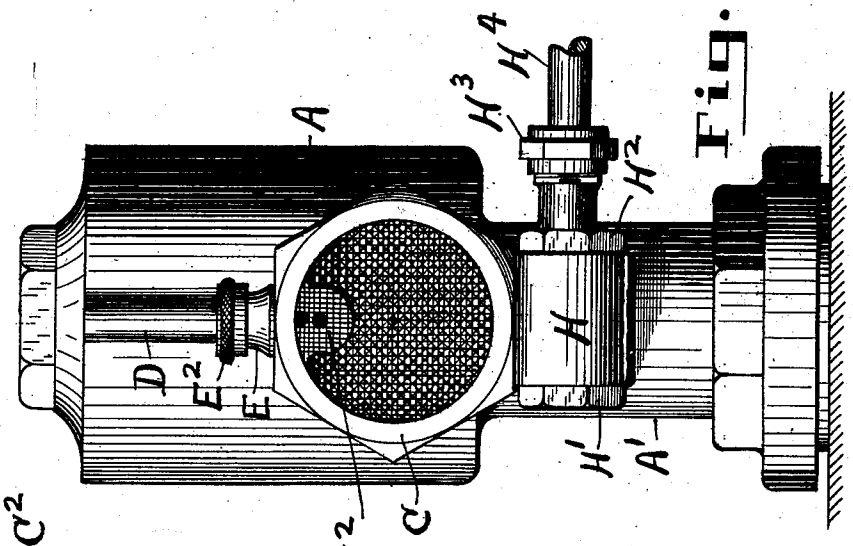
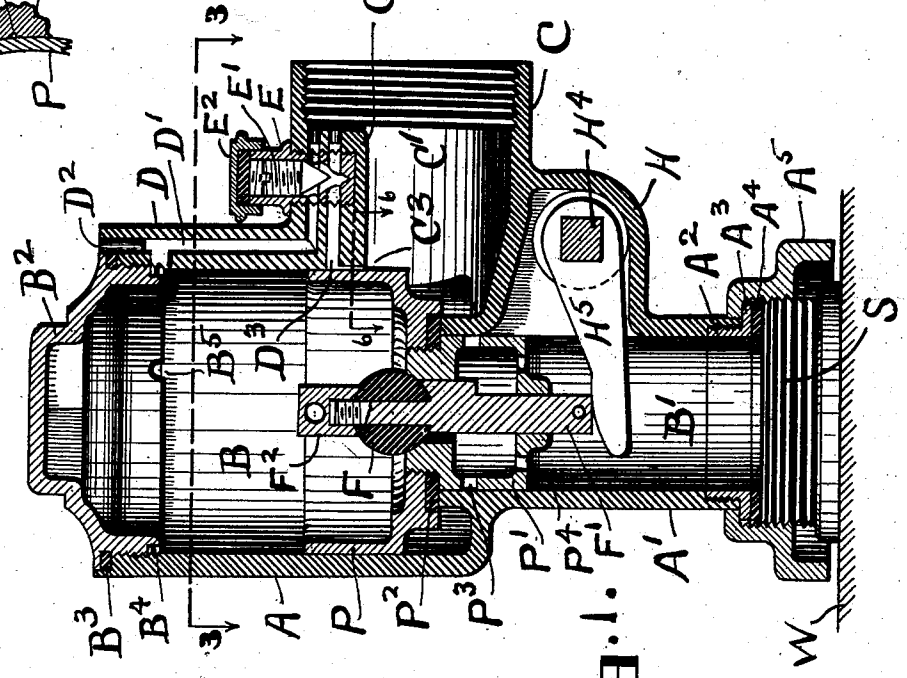


Fig. 6.

Fig. 1.



WITNESSES.

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INVENTOR

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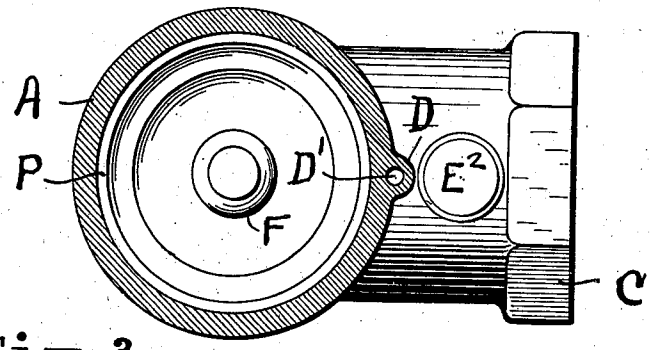

Fig. 3.

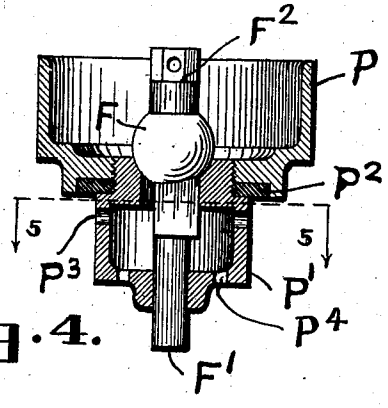

Fig. 4.

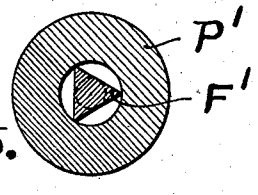

Fig. 5.

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UNITED STATES PATENT OFFICE.

JAMES J. FINNEY, OF CHICAGO, ILLINOIS.

FLUSH-VALVE.

SPECIFICATION forming part of Letters Patent No. 700,486, dated May 20, 1902.

Application filed August 20, 1900. Serial No. 27,359. (No model.)

To all whom it may concern:

Be it known that I, JAMES J. FINNEY, a citizen of the United States of America, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Flush-Valves, of which the following is a specification.

My invention relates to flush-valves for water-closets, and has for its object improvements in the device shown and described by me in an application, Serial No. 714,781, filed April 28, 1899. In that application the flush-valve serves to admit water directly from a service-pipe to a closet-bowl without the intervention of a tank and float, as is ordinarily used.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a central section. Fig. 2 is a rear elevation. Fig. 3 is a section on line 3 3 of Fig. 1. Fig. 4 is a section of the piston and its interior valve. Fig. 5 is a section on line 5 5 of Fig. 4, and Fig. 6 is a section on line 6 6 of Fig. 1.

The valve-body consists of an upper cylinder A and a lower cylinder A′, which are formed in a single piece and which are bored out with their axes coinciding with each other. The interior space or cylinder above is marked B, and a smaller cylinder below is marked B′. Into the lower end of the smaller cylinder is screwed a bushing A^2, having a flange A^3.

Surrounding the body A′ and retained by the flange A^3 is a nut A^5, arranged to be screwed onto the spud S of a closet-bowl, between which spud and the flange A^3 is a gasket A^4. The nut A^5 is arranged so as to cover up the spud S and also so as to securely hold the flush-valve to the said spud. The upper end of the larger cylinder A B is tapped out, and into this is screwed a cap B^2, which is packed by a gasket B^3. The lower portion of the thread on the cap B^2 is cut away, as shown at B^4 in Fig. 1, and at one or more places in the flange of the cap are notches B^5.

Projecting laterally from the body of the valve-casing is an inlet C′, which communicates with the interiors B and B′.

Within the cylinder B is a piston P, to the lower face of which is secured a removable projection or extension P′, adapted to fit into the cylinder B′. The projection P′ may be made solid with the piston P; but I prefer to make it a separate piece, securing the two together and holding between them the yielding valve-face P^2, which engages upon and closes the upper opening of the cylinder A′ B′. The upper face of the piston P is hollowed out, so as to make it as light as practicable, and the interior of the projection or extension P′ is hollowed out for the same reason. Through the sides of the projection P′ are a series of openings P^3, communicating with the interior. On the lower face of the same projection there are also a series of openings P^4, communicating with the interior. Through the piston and its projection or through one of them there is an axial opening which is closed by a valve F, that consists of a rubber ball mounted upon the upper end of a valve-stem F′. A nut F^2 holds the valve F securely in position. The part of the stem F′ which is adjacent to the valve F and in the upper aperture is cut away, as shown in Fig. 5, so that when the said valve is opened water may freely flow from the upper face of the piston P through the said aperture and through the holes P^4 into the lower cylinder B′.

Adjacent to the inlet projection C is a boss H, the interior of which is hollow and opens into the cylinder B′. The projection H is bored out transversely and has one face closed by a plug H′ and the other face by a plug H^2, which terminates in a stuffing-box H^3 for permitting the handle H^4 to project through into the interior of the boss H. The handle or rod H^4 in the interior of the boss is square, and on this is secured a lever H^5, which is adapted to engage the lower end of the valve-stem F′. The rod H^4 is shown broken off in Fig. 2, but extends out and is provided with a handle in any convenient manner, so that by turning the said rod H^4 the lever H^5 will raise the valve-stem F′, and consequently the valve F, so as to permit water to flow from the chamber B to the chamber B′.

On the side of the upper cylinder A is a bead D, and through this bead is a small channel D′, which communicates with a lateral branch in a boss C^3, that is located within the inlet-opening C′. There is also a second opening

D^3 through the boss C^2, that connects the outer portion of the inlet-opening with the interior chamber B. In making the channels through the boss C^2 they are drilled from the inlet-opening and afterward the ends next to the inlet-opening are filled by plugs driven into them, as shown in Fig. 1. In the upper portion of the extension C is inserted a hollow plug E, which is threaded on the inside and into which is inserted a screw E', the whole being covered by a cap E^2. The plug E is inserted in position before the small channels are drilled, as previously described, so that when the said channels or holes are drilled they pass through the interior of the hollow plug E. The hollow plug therefore serves as a means of connecting the two branches of the channel D' D^3, one end of which enters the chamber B near the center of its length and the other end of which enters the chamber at the place where the flange on the nut B^2 is cut away at B^4. The lug C^2 has a small by-pass or channel C^3 grooved in its surface, as shown in Figs. 1 and 6. When the piston is at its upper position in contact with the flange on the cap B^2, the inlet passage-way C' is in free communication with the channel D^3, which communicates through the hollow plug E with the channel D'; but when the piston is at its lowest position or nearly there the piston covers the opening of D^3, so that the communication between the passage-way C' and the channel D^3 is by the small groove C^3. Assuming the device to be in the position shown in Fig. 1 and with a service-pipe connecting to the passage-way C' and having a sufficient pressure of water therein, then such pressure will be conveyed through C^3 D^3 E D' to the chamber B over the piston P, thus holding the piston securely down, with the valve-face P^2 on the upward projection of the cylinder A' within the chamber B. It will therefore be evident that in this condition there is no communication between the service-pipe and the closet-bowl. If, however, the handle be moved by hand, so as to raise the lever H^5, and consequently the valve F, then as the opening from the chamber B into the chamber B' is greater than the opening through D' it will be evident that the pressure on the annular part of the piston surrounding the projection upward of A' will cause the piston P to rise and force the water from the chamber B down to the chamber B' and into the closet-bowl. When the piston reaches its upper extremity, the projection P' is far enough removed above the opening to B' so that there is a full and free flow of water from the service-pipe through the passage-way C' into and through the cylinder B'. The passage-way C' is made with a slightly-larger area than the passage-way B', so that there will be more inlet-pressure than outlet-pressure. Upon the release of the lever H^5, permitting the valve F to close, then this surplus pressure will cause water to feed through the channel D^3 and D' into the chamber B above the piston P. As the pressure on the upper face of the piston is equal to the pressure in the passage-way C' and as that portion of the lower face of the piston opposite the opening B' is only equal to the pressure in the discharge-opening, it will therefore be apparent that there is a slightly-greater pressure on the upper face of the piston than on the lower face. This will cause the piston to move downward at the rate of speed which is controlled by whatever adjustment the screw E' may be placed at. As soon, however, as the edge of the piston closes the opening to the channel D^3 the flow to the upper face of the piston will be reduced to the amount of water that can pass through the small channel C^3. It will therefore be evident that the latter part of the closing movement is slower than the first part. At about the time when the edge of the piston closes the opening to the channel D^3 the projection P' will begin to enter the cylinder B', shutting off the full flow from the inlet passage-way and leaving only an amount of flow that is able to pass through the openings P^3 and P^4. The flow through these small openings in the projection P' continues until the openings P^3 are closed just before the valve-face P^2 settles to its seat. The result of this operation is that upon opening the valve F the piston P immediately rises to its upper extremity, permitting a full flow of water from the inlet to the outlet openings of the valve-body, which full flow will be maintained until the projection P enters or is nearly entering the opening B', after which time there will be a reduced flow from the inlet to the outlet openings, which reduced flow produces what is technically known as an "afterflow"—that is, a flow of water that will seal the trap to the closet-bowl.

In the previous application hereinbefore referred to I depended partly for my closing action upon the weight of the piston which closed the connection between the inlet and outlet openings. In the present device, however, I do not depend upon weight to accomplish this result, but accomplish it entirely by means of variations or differences in areas of the upper and lower faces of the piston and of the areas of the passage-ways connecting the various parts together. When a flush-valve is made as shown in the accompanying drawings, it will work horizontally or upside down equally well as when right side up, which fact demonstrates that the operation is not at all dependent upon weight for its movements.

Matters herein shown and described relating to regulating and to retarding the closing movement of the piston, to the maintenance of a uniform afterflow during a portion of the closing movement, and to the arrangement of passage-ways for water are not

herein claimed, as they form the subject-matter of my copending application, Serial No. 714,781, filed April 28, 1899.

What I claim is—

In a flush-valve provided with a piston for opening and closing said valve, the combination with means for moving said piston so as to maintain during a portion of its closing movement a reduced and uniform flow of water, of means for shutting off such flow of water prior to the final closing action of said piston, substantially as described.

Signed at Chicago, Illinois, this 18th day of August, 1900.

JAMES J. FINNEY.

Witnesses:

ROBT. J. REED,

CASPER L. REDFIELD.