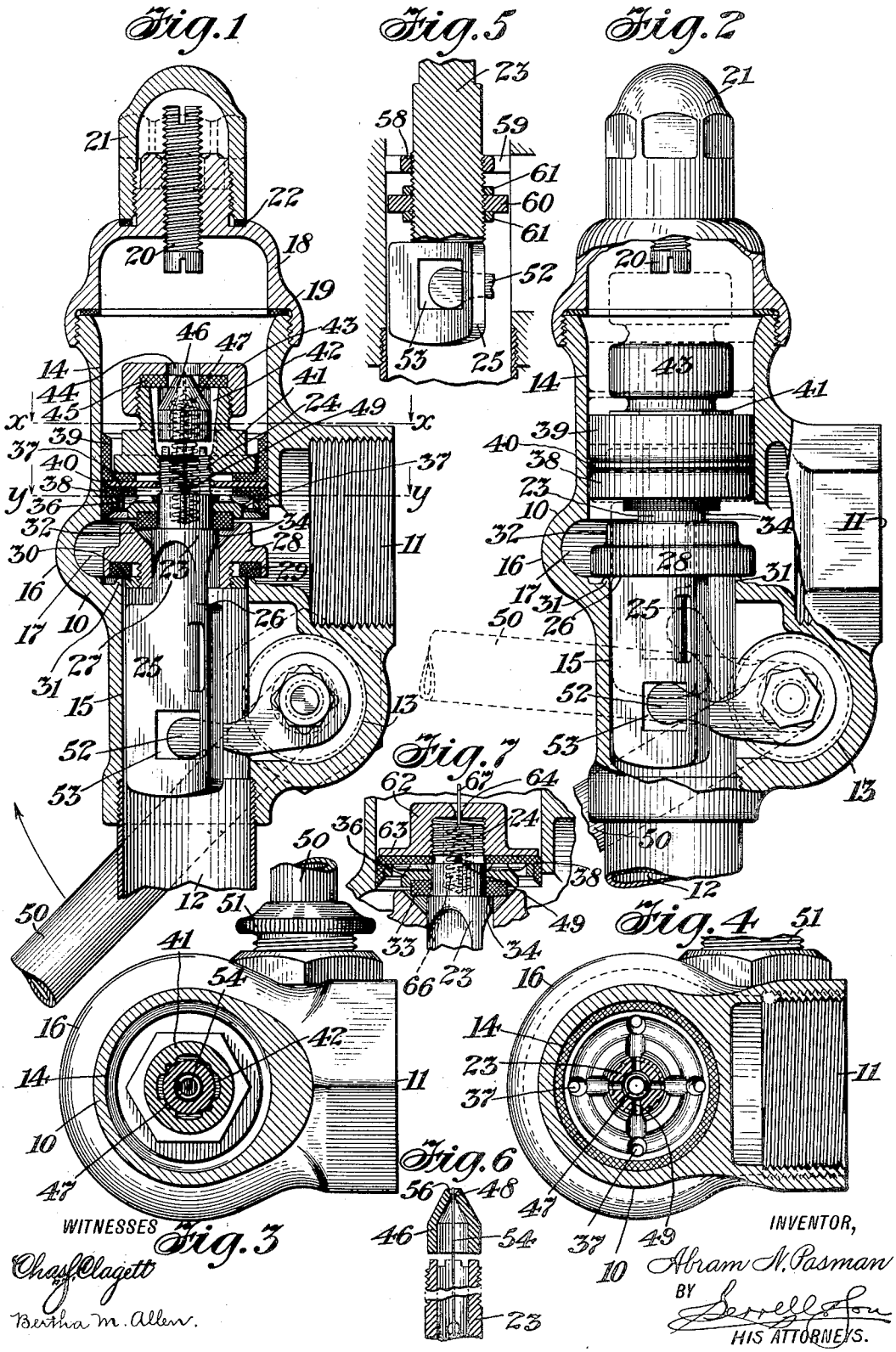
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FLUSH VALVE.

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UNITED STATES PATENT OFFICE.

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FLUSH-VALVE.

1,126,070. Specification of Letters Patent. Patented Jan. 26, 1915.

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To all whom it may concern:

Be it known that I, ABRAM N. PASMAN, a citizen of the United States, residing at Jersey City, in the county of Hudson and State of New Jersey, have invented an Improvement in Flush-Valves, of which the following is a specification.

My present invention relates to an automatically closing flush valve, such as are used in connection with closets and other devices where it is desirable or necessary to produce a predetermined flow of water or other liquid, and the object of my invention is the provision of a manually operated self-closing flush valve of simple, inexpensive construction in which the operating parts are all associated and movable with the piston, by which the valves are closed by utilizing the pressure in the system in which the valve is employed.

The valve made in accordance with my present invention, and as hereinbefore stated, is manually operated, and in operating the valve the construction is such that an initial movement is imparted to an auxiliary valve and the piston to open a relief valve before the main inlet valve is raised, the object of this, manifestly, being to make the operation of the valve easier by reducing the pressure under which the initial movement is imparted to the piston, as is customary in valves of the type to which my invention relates. The piston operates in a cylinder in which, and above the piston, there is normally entrapped a quantity of water under pressure of the service main, which maintains the valves in their normally closed positions.

When the initial or starting movement has been imparted to the piston of my improved valve, the water or other liquid entrapped in the piston cylinder is permitted to flow to the intake by passing through the piston stem after the control valve has been opened, this water passing through apertures in the stem placed below the piston for this purpose, whereas in the closing of the valves the water under pressure from the mains flows in the reverse direction through these passages, maintains the control valve against its seat, and passes to the cylinder through a small aperture provided for this purpose, gradually forcing the piston to its initial position and consequently seating the valves. I may also provide an adjustable device associated with the piston for regulating the afterflow or refill for closet bowls, as will hereinafter be more particularly described.

Referring to the drawing, Figure 1 is a central longitudinal section of a flush valve made in accordance with my present invention. Fig. 2 is a similar view showing the piston in elevation, and in dotted lines, in its raised position. Fig. 3 is a transverse section on line x x, Fig. 1. Fig. 4 is a transverse section on line y y, Fig. 1. Fig. 5 is a partial longitudinal section illustrating a modified form of the invention, Fig. 6 is a partial longitudinal section illustrating the control valve without a spring, and Fig. 7 is a partial central section in elevation illustrating a modified form of the invention.

Referring to the drawing, the flush valve preferably comprises a casing indicated at 10, which at the side is provided with an inlet connection 11, and at one end with an outlet connection 12. Preferably between the inlet and outlet connections, the casing is provided with a handle connection indicated at 13, and at the opposite side of the inlet connection the casing is provided with a cylindrical portion 14. In the outlet end of the casing there is a discharge chamber 15, and intermediate of this and the cylindrical portion, the casing has a circular rib 16, making provision for an inlet chamber 17.

To the end of the cylinder 14 a cap 18 is connected, with an intervening gasket 19, and secured to the cap 18 is a cover member 21, there being a gasket 22 intervening between the same and the cap 18, in which latter, and preferably centrally, there is mounted an adjusting screw 20 for determining the travel of the piston, as will be hereinafter described.

23 designates the piston stem, which at one end is screw threaded, as indicated at 24, and provided with a central bore, this screw threaded end of the stem being of less diameter than the central portion. At the opposite end the stem 23 is provided with ribs 25, which fit within the discharge chamber 15 and act as guides for maintaining the movable parts in proper alinement. The inner ends of these ribs 25 are indicated at 26, these ends forming shoulders, the functions of which will also be hereinafter described, and between the ends 26 of these ribs and the reduced opposite end

of the stem, the stem is preferably provided with recesses, indicated at 27.

On the stem 23 is a collar 28, and in the collar 28 is a main inlet valve 29, secured in position within the recess provided therefor by means of the nut 30, or otherwise. This main valve 29 is adapted normally to bear against the valve seat 31, provided at the inner end of the inlet chamber 15, it being understood that the main valve and the collar in which the same is carried are movable freely on the stem 23. An auxiliary inlet valve is carried by the reduced end of the stem 23 and bears against the shoulder 34 formed between the stem and this reduced end thereof, the adjacent portion of the collar 28 being recessed, as indicated at 32, so that the inclined surface forms a seat for this auxiliary inlet valve. Also on the reduced portion of the stem 23, and immediately next the auxiliary inlet valve, is a plate 36.

The piston in this flush valve preferably comprises a pair of cup leather washers, indicated at 38 and 39, between which is a thin plate, indicated at 40, these cup leather washers being oppositely disposed, as indicated in the drawing.

Turned down on the screw threaded end of the stem 23, I employ a head indicated at 41, and by which the cup leather washers with the intervening plate, the plate 36, and the auxiliary inlet valve 33, are all maintained in position on the stem. Within the head 41 is a chamber 42, and covering the end of the head 41 I employ a cap 43, which latter is centrally provided with a port 44. Within the cap 43, I provide a valve seat 45, in which there is also centrally provided an aperture registering, or approximately registering, with the port 44 in the cap 43, and within the chamber 42, I employ a control valve 46, which, as shown in Fig. 1, may be provided with a tapered end adapted to extend partially into the port provided in the valve seat 45 and to seat against the edges of the wall defining this port. This control valve may be normally maintained in position against its seat by the use of a spring 47, which extends at one end into a bore provided therefor in the control valve, and at its opposite end into the bore of the reduced end of the stem 23. Such a spring, however, is only necessary when the valve is to be used in systems in which the pressure is extremely low. In systems in which the pressure is relatively high, this spring 47 may be entirely dispensed with, as shown in Fig. 6.

In the valve 46, I provide an aperture or port 48, making communication between the valve chamber in the head and the interior of the cylindrical portion 14 of the casing, and in the plate 36, between the auxiliary inlet valve and the cup leather washer 38, I provide a series of apertures, indicated at 37, which, together with the apertures 49 in the reduced end of the stem, provide for communication between the inlet chamber, on one side of the cup leather washers or piston, and the valve chamber 42 and the interior of the cylinder 14 at the opposite side of the cup leather washers. As hereinbefore stated, this is a manually operated valve, and 50 designates a handle rod passed through a suitable packing gland 51, and provided within the handle connection 13 with a suitable bearing and an arm 52, the free end of which passes within a recess 53 provided at the end of the stem 23 for communicating the movement of the handle rod 50 to the stem and parts associated therewith.

As shown in Fig. 6, the outer portion of the port 48 in the valve 46 is tapered, as indicated at 56, to direct the liquid into the port. As is also shown in this figure, the spring 47 is dispensed with. I may also employ a wire rod 54, extending from the base of the bore in the reduced end of the stem 23, through this port 48 in the end of the control valve, not only to guide the same when moved, but also to prevent the port therein from becoming clogged or stopped up.

Referring to Fig. 5, it will be seen that I may employ a ring 58 having projections 59, which perform the same functions as the ends 26 of the ribs 25 of the construction as shown in Fig. 1, and that I may also employ a washer or similar device, indicated at 60, adjustable of the stem 23, and secured in any position between the ring 58 and the ribs 25 by means of lock nuts 61, to determine the afterflow and refilling of a closet bowl, with which the valve may be employed.

The parts of the hereinbefore described valve are in their normal positions, as shown in Fig. 1. In the operation of the valve, the handle rod 50 is raised or turned in the direction of the arrow, which motion is communicated to the arm 52, and imparted thereby to the lower end of the stem 23, raising the stem a short distance, which, as will be understood, will carry with it the auxiliary inlet valve, as well as the cup leather washers, the head 41, and its cap 43. This movement continues until the ends 26 of the ribs 25 contact with the lower surface of the ring 28, by which the main inlet valve is carried, and during this movement, as will be understood, the control valve is opened by being moved against the pressure of the water entrapped in the cylinder 14, permitting this water to pass through the port 44 into the valve chamber within the head 41, thence to the bore within the reduced end of the stem, through the apertures 49 and 37 to the inlet chamber be-

neath the cup leather washers. The continued movement of the stem opens the main inlet valve by the shoulders or ends 26 of the ribs 25 coming into contact with the ring 28 and carrying this ring with the main inlet valve, with the other parts in the continued upward movement thereof, it being understood that the farther that the parts move, the more liquid will be permitted to escape from the cylinder 14 by the passages in the manner hereinbefore described. It will also be apparent that the distance the piston stem, valves, and the cup leather washers can travel will be governed by the position of the adjusting screw 20, which may be so placed as to permit of a relatively small movement of the piston stem and other parts, so that the main inlet valve will barely open or may be so placed as to permit the piston valve and associated parts to move sufficiently far to provide a clear passage between the inlet and the discharge connections. That is to say, one in which the main inlet valve and the ring by which the same is carried, is entirely removed from the inlet chamber.

As is common in valves of this type when placed vertically, gravity and the pressure of the liquid in the supply are utilized to return the parts to their normal positions, and so reseat the valves, and in the valve, as hereinbefore described, the water or other liquid from the service pipe, passes through the apertures 37, 49, into the bore within the reduced end of the stem, and thence into the valve chamber in the head 41, returning and maintaining the control valve against its seat, and finding an escape from this valve chamber through the aperture 48 into the cylinder 14, where the water gradually accumulates and forces the piston in the opposite direction to that to which it is moved by the handle rod 50 until the main and auxiliary valves are closed, thereby shutting off the flow of the water from the inlet and the discharge connections.

In the modified form of the control valve shown in Fig. 6, the spring as shown in Fig. 1 is dispensed with, and as hereinbefore stated, the wire rod 54 is merely employed as a guide, and acting as such tends to keep the port in the end of the valve from becoming clogged.

Referring to Fig. 7, it will be seen that I may dispense with the cup leather washer 39, the disk or washer 40, between the cup leather washers 38 and 39, the head 41, the cap 43, and the auxiliary or control valve 46, together with the spring 47 for normally maintaining the same against its seat, and in lieu of all these parts, simply employ a cap 62 adapted to turn down on the screw threaded end of the piston stem 23, and provided with a flange 63 adapted to engage the outer face of the cup leather washer 38 to maintain the same in position against the plate 36 and to secure these parts, together with the auxiliary valve 33, in place, with the latter against the shoulder 34 on the piston stem. In this construction, the outer or screw threaded end of the piston stem is provided with a bore similar to that in the form illustrated in Fig. 1, and centrally the cap 62 is provided with a port 64, the outer end of which is preferably flared or tapered, as is substantially indicated in Fig. 7. Within the bore in the end of the piston stem in this form of the invention, I prefer to employ a helical spring 66, one end of which bears against the base of the bore and the other terminates in a straight rod 67, which passes through the port 64 in the cap 62 and extends appreciably beyond the same when the parts are in their normal positions, as indicated in this figure.

In the operation of the valve, constructed as shown in Fig. 7, the initial movement upwardly of the piston stem first unseats the auxiliary valve and then the main inlet valve, as in the form of the invention hereinbefore described, and this, as well as in the continued movement of the piston stem, causes the cup leather washer 38, and the cap by which the same is held in place, to move within the cylindrical portion 14 of the casing. In so doing, a portion of the liquid normally entrapped above the cup leather washer, which forms the piston, will naturally escape through the port 64 into the bore in the end of the piston stem, through the apertures 49, and will so pass below the cup leather washer. Much the larger portion of the liquid normally entrapped above the cup leather washer will, however, in opening the valve, escape around the cup leather washer; that is to say, between the cup leather washer and the walls of the cylindrical portion of the casing. This will be obvious because the cup leather washer 39, as shown in Fig. 1, is dispensed with and the water pressure will tend to force the sides of the cup leather washer 38 away from the walls of the cylinder.

When the piston has reached the end of its stroke, the end 67 of the spring 66 will strike against the adjusting screw 20, causing a compression of the spring 66, thereby causing the rod 67 to move within the port 64, the object of this feature being to prevent the port 64 from becoming clogged or stopped by impurities or foreign substances in the water or other liquid with which the valve is employed. The return movement of the piston and associated parts, causing the valves to be reseated, is substantially the same as that hereinbefore described.

I claim as my invention:

1. A flush valve comprising a casing hav-

ing an inlet and outlet connection, a stem which at one end is screw threaded and of reduced cross section and provided with a bore, a ring movable on the said stem, a main inlet valve fixed in the said ring, a seat in the casing for the main inlet valve, an auxiliary inlet valve mounted on the stem, a seat for the auxiliary inlet valve in the said ring, a piston associated with the said stem, a head secured on the reduced screw threaded end of the stem for maintaining the piston and auxiliary inlet valve in position thereon, the said head being provided with a chamber, a cap secured on the head, the reduced portion of the stem being provided with ports making communication between the said bore therein and the interior of the casing below the said piston, manually operated means for moving the stem in one direction so that the auxiliary inlet valve and piston are first moved a relatively short distance and then these parts, together with the said ring and main inlet valve, are moved in unison, and means within the said chamber in the head permitting the liquid above the piston to be discharged when the piston and parts connected therewith are moved in one direction, and also permitting the liquid from the source of supply to flow in the opposite direction to the said chamber above the piston to cause the piston and parts connected therewith to return the said valves to their seats.

2. A flush valve comprising a casing having an inlet and an outlet connection, a stem, which at one end is screw threaded, of reduced cross section and provided with a bore, a ring movable on the stem, a main inlet valve fixed in the ring, a seat in the casing for the main inlet valve, an auxiliary inlet valve mounted on the stem, a seat for the auxiliary inlet valve in the said ring, cup leather washers forming a piston, a head secured on the reduced screw threaded end of the stem for maintaining the cup leather washers and auxiliary inlet valve in position thereon, the said head being provided with a chamber, a cap secured to the said head, the reduced portion of the stem being provided with ports making communication between the said bore therein and the interior of the casing below the cup leather washers, manually operated means for moving the stem in one direction so that in the operation of the flush valve the auxiliary inlet valve and cup leather washers are first moved a relatively short distance and then these parts, together with the said ring and main inlet valve, are moved in unison, and means within the said chamber in the said head permitting the liquid above the piston to be discharged when the piston and parts connected therewith are moved in one direction, and also permitting the liquid from the source of supply to flow in the opposite direction to the said chamber above the piston, to cause the return movement of the piston and parts connected therewith to return the said valves to their seats.

3. A flush valve comprising a casing having an inlet and an outlet connection, a stem, which at one end is screw threaded, of reduced cross section and provided with a bore, a ring movable on the stem, a main inlet valve fixed in the ring, a seat in the casing for the main inlet valve, an auxiliary inlet valve mounted on the stem, a seat for the auxiliary inlet valve in the said ring, cup leather washers forming a piston, a head secured on the reduced screw threaded end of the stem for maintaining the cup leather washers and auxiliary inlet valve in position thereon, the said head being provided with a chamber, a cap secured to the said head, the reduced portion of the stem being provided with ports making communication between the said bore therein and the interior of the casing below the cup leather washers, manually operated means for moving the stem in one direction so that in the operation of the flush valve the auxiliary inlet valve and cup leather washers are first moved a relatively short distance and then these parts, together with the said ring and main inlet valve, are moved in unison, a valve seat secured in the said cap having a port therein, there being a corresponding port provided in the said cap, and a control valve in the chamber in the said head adapted normally to bear against the last aforesaid valve seat.

4. A flush valve comprising a casing having an inlet and an outlet connection, a stem, which at one end is screw threaded, of reduced cross section and provided with a bore, a ring movable on the stem, a main inlet valve fixed in the ring, a seat in the casing for the main inlet valve, an auxiliary inlet valve mounted on the stem, a seat for the auxiliary inlet valve in the said ring, cup leather washers forming a piston, a head secured on the reduced screw threaded end of the stem for maintaining the cup leather washers and auxiliary inlet valve in position thereon, the said head being provided with a chamber, a cap secured to the said head, the reduced portion of the stem being provided with ports making communication between the said bore therein and the interior of the casing below the cup leather washers, manually operated means for moving the stem in one direction so that in the operation of the flush valve the auxiliary inlet valve and cup leather washers are first moved a relatively short distance and then these parts, together with the said ring and main inlet valve, are moved in unison, a valve seat secured in the said cap having a port therein, there being a corresponding port provided in the said

cap, a control valve in the chamber of the said head, and means for normally maintaining the control valve against the last aforesaid valve seat.

5. A flush valve comprising a casing having an inlet and an outlet connection, a stem, which at one end is screw threaded, of reduced cross section and provided with a bore, a ring movable on the stem, a main inlet valve fixed in the ring, a seat in the casing for the main inlet valve, an auxiliary inlet valve mounted on the stem, a seat for the auxiliary inlet valve in the said ring, cup leather washers forming a piston, a head secured on the reduced screw threaded end of the stem for maintaining the cup leather washers and auxiliary inlet valve in position thereon, the said head being provided with a chamber, a cap secured to the said head, the reduced portion of the stem being provided with ports making communication between the said bore therein and the interior of the casing below the cup leather washers, manually operated means for moving the stem in one direction so that in the operation of the flush valve the auxiliary inlet valve and cup leather washers are first moved a relatively short distance and then these parts, together with the said ring and main inlet valve, are moved in unison, a valve seat secured in the said cap having a port therein, there being a corresponding port provided in the said cap, a control valve in the chamber of the said head, the said control valve having a small port provided in the end thereof, and means for guiding and directing the travel of the said control valve and the movements thereof.

6. A flush valve comprising a casing having an inlet and an outlet connection, a stem, which at one end is screw threaded, of reduced cross section and provided with a bore, a ring movable on the stem, a main inlet valve fixed in the ring, a seat in the casing for the main inlet valve, an auxiliary inlet valve mounted on the stem, a seat for the auxiliary inlet valve in the said ring, cup leather washers forming a piston, a head secured on the reduced screw threaded end of the stem for maintaining the cup leather washers and auxiliary inlet valve in position thereon, the said head being provided with a chamber, a cap secured to the said head, the reduced portion of the stem being provided with ports making communication between the said bore therein and the interior of the casing below the cup leather washers, manually operated means for moving the stem in one direction so that in the operation of the flush valve the auxiliary inlet valve and cup leather washers are first moved a relatively short distance and then these parts, together with the said ring and main inlet valve, are moved in unison, a valve seat secured in the said cap having a port therein, there being a corresponding port provided in the said cap, a control valve in the chamber of the said head, the said control valve having a small port provided in the end thereof, and a small wire rod within the bore in the said stem and passing through the port in the said control valve to guide the same in the movements thereof and to prevent the said port from becoming clogged.

Signed by me this 17th day of January, 1913.

ABRAM N. PASMAN.

Witnesses:
BERTHA M. ALLEN,
J. B. LE BLANC.