S. C. LAIDLEY.

AUTOMATIC FLUSHING VALVE.

APPLICATION FILED MAY 9, 1910.

990,751.

Patented Apr. 25, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

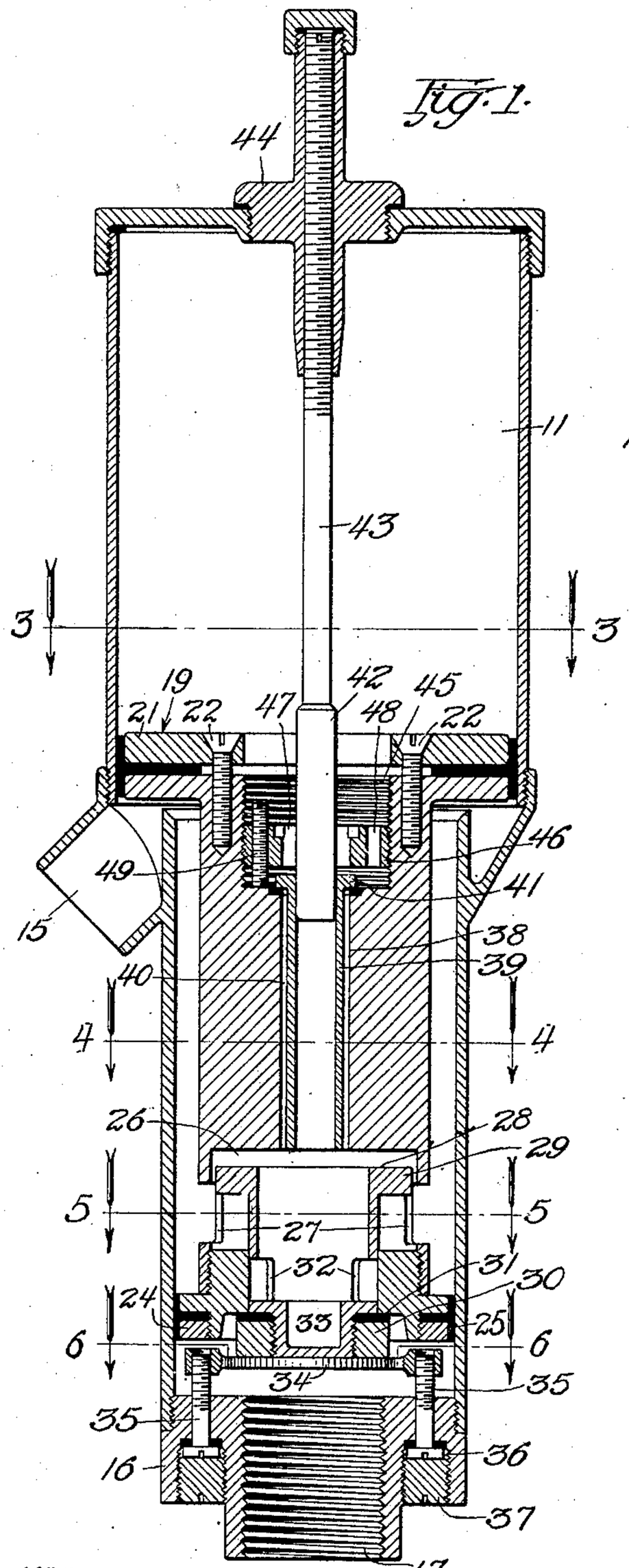


Fig. 3.

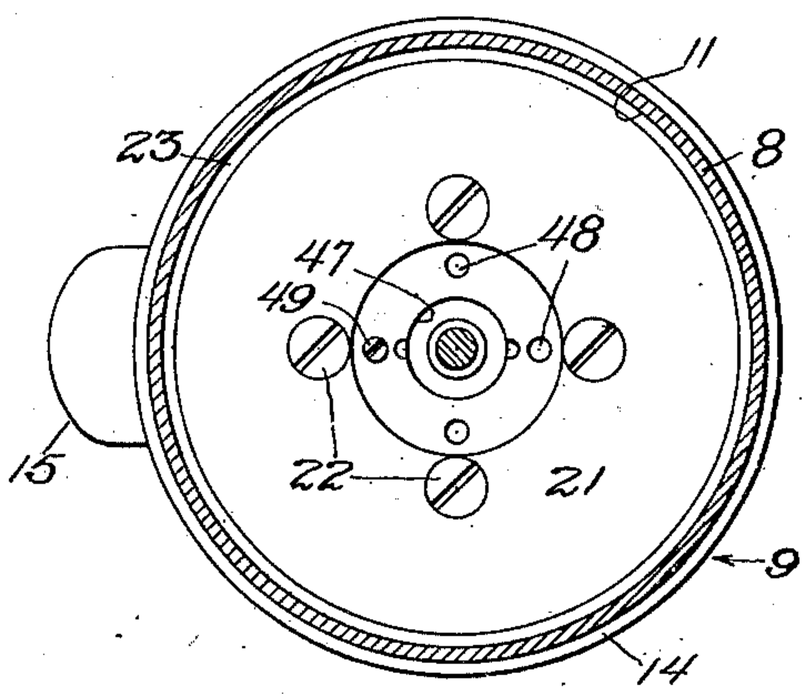


Fig. 4.

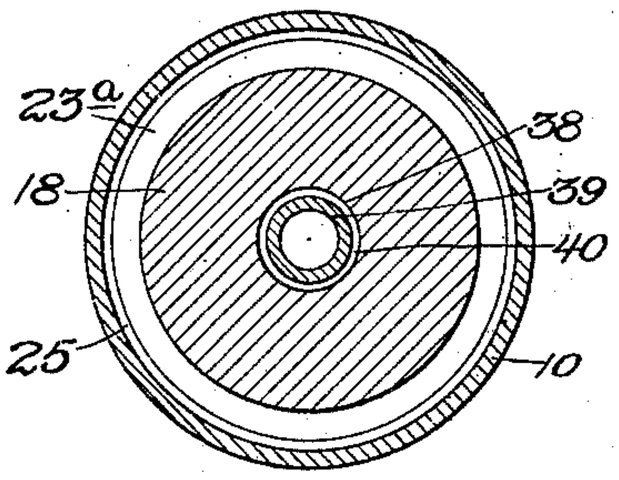
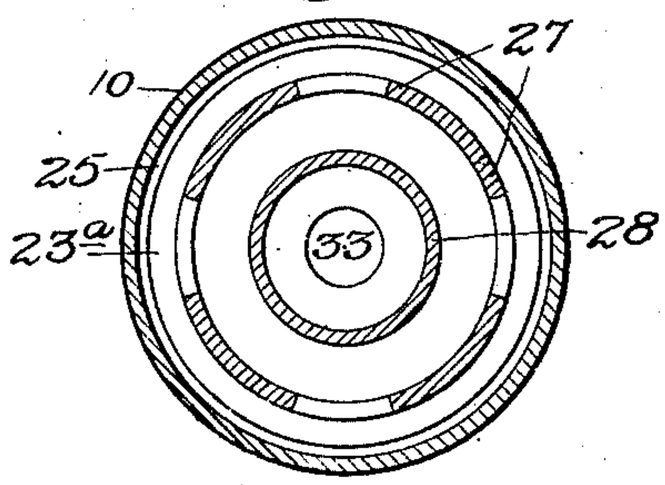


Fig. 5.



Witnesses:

J. N. Daggett.

Wm. F. Bond

Inventor:

Samuel C. Laidley.

by Banning & Banning

Attys.

S. C. LAIDLEY.

AUTOMATIC FLUSHING VALVE.

APPLICATION FILED MAY 9, 1910.

990,751.

Patented Apr. 25, 1911.

2 SHEETS—SHEET 2.

Fig. 2.

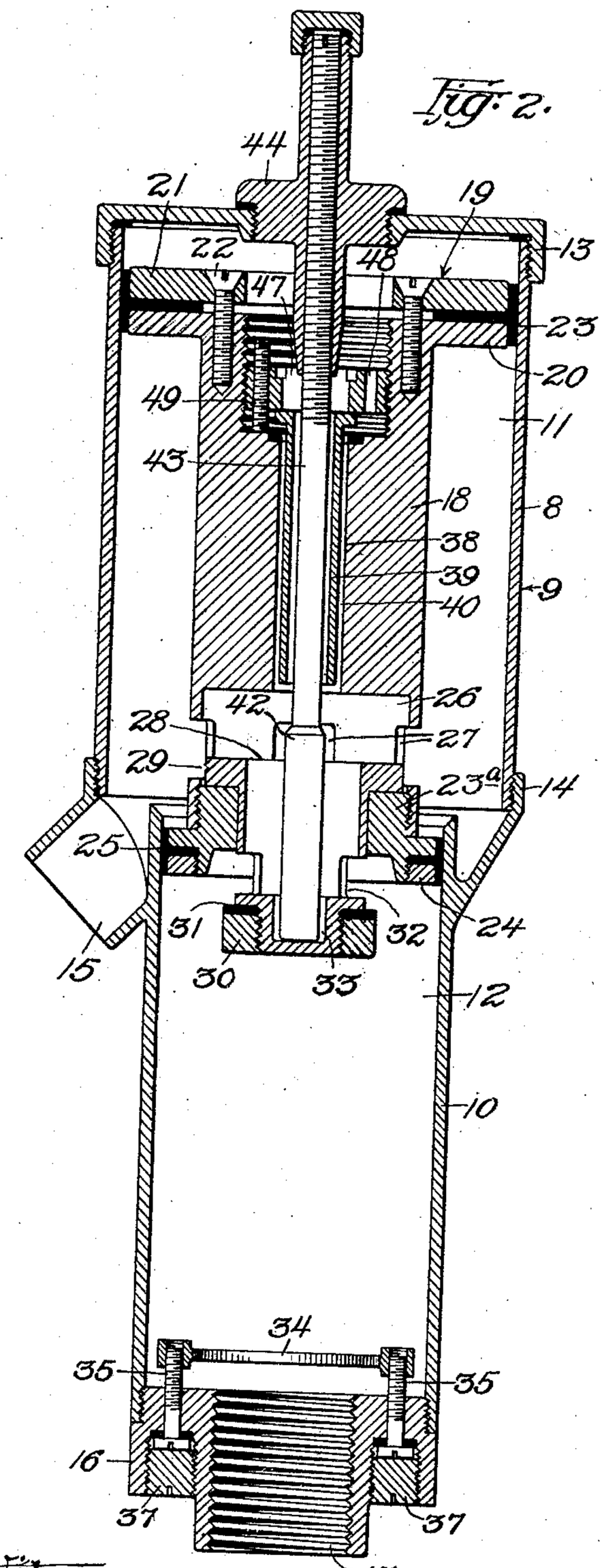


Fig. 6.

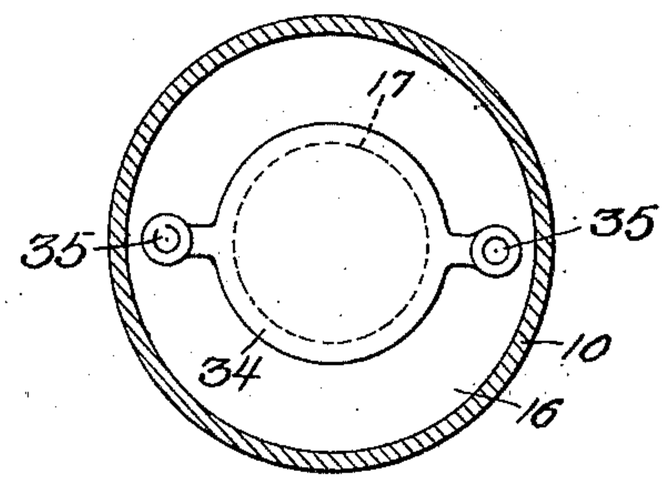
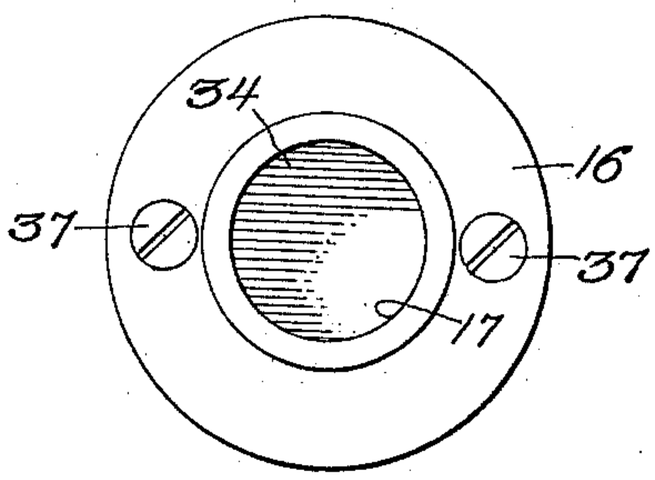


Fig. 7.



Witnesses:

J. N. Dagget.

W. T. Bond

Inventor:

Samuel C. Laidley.

by Banning & Banning

Attys.

UNITED STATES PATENT OFFICE.

SAMUEL C. LAIDLEY, OF CHICAGO, ILLINOIS.

AUTOMATIC FLUSHING-VALVE.

990,751. Specification of Letters Patent. **Patented Apr. 25, 1911.**

Application filed May 9, 1910. Serial No. 560,243.

To all whom it may concern:

Be it known that I, SAMUEL C. LAIDLEY, 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 Automatic Flushing-Valves, of which the following is a specification.

The valve of the present invention relates to that type ordinarily employed in lavatory fixtures; and has for its objects, to produce a mechanism in which the valve regulating the control between the fluid inlet and the fluid outlet will be held in closed position by fluid pressure; to means for positively actuating the valve to open communication between the fluid inlet and outlet and thus relieve the pressure on the valve member, so that it may remain in open position for a predetermined length of time; to means for positively moving the valve to closed position; to the formation of an upper and a lower chamber in the valve casing; to means for admitting fluid to the upper chamber; and to means for permitting the outflow of the fluid from said chamber through a restricted passageway, thus producing a relatively slow movement in one direction of a slidable member carrying the valve.

The invention further consists in the features of construction and combination of parts hereinafter described and claimed.

In the drawings, Figure 1 is a sectional elevation showing the slidable member in lowered position and the valve member closed; Fig. 2, a sectional elevation showing the slidable member in raised position and the valve member open; Fig. 3, a section on line 3—3 of Fig. 1, looking in the direction of the arrow; Fig. 4, a section on line 4—4 of Fig. 1, looking in the direction of the arrow; Fig. 5, a section on line 5—5 of Fig. 1, looking in the direction of the arrow; Fig. 6, a section on line 6—6 of Fig. 1, looking in the direction of the arrow; and Fig. 7, a detail showing the lower end of the lower chamber.

The mechanism of the present invention is inclosed within a casing 8, comprising an upper section 9 and a lower section 10. The upper section is preferably larger in diameter than the lower section and has therein a chamber 11, which will be termed the upper chamber. The lower section 10 has therein a chamber 12, which will be termed the lower chamber. The upper chamber is closed by means of a cap or cover 13, and, as shown, the upper section 9 is joined to the lower section 10 by means of a screw-threaded collar 14 formed on the lower section; and adjacent to the upper end of the lower section is an outlet passage 15, which, as shown, is formed so as to lie at the juncture of the upper section with the lower section. The lower end of the lower section is closed by means of a plug 16, having therein an inlet passage 17, screw-threaded for the reception of a main supply pipe.

Mounted within the casing is a slidable member 18, provided at its upper end with a head 19, which moves within the upper chamber 11; and the head, as shown, is formed of two sections, the lower section 20 being in the nature of a flange formed integral with the body portion of the slidable member, the upper section 21 being in the form of a plate secured to the body portion of the slidable member by screws 22, or other suitable fastening devices. The head is further provided with a packing ring 23 contacting the inner wall of the chamber 11. The slidable member has secured to its lower end a plug 23^a, and lying within the plug is a screw-threaded ring 24, serving to retain in position a packing ring 25. The lower end of the slidable member is recessed to provide a chamber 26, into the lower end of which is entered the plug 23^a; and the walls of said chamber have formed therein a plurality of relatively contracted openings 27, which form eduction openings for fluid, as will be more fully hereinafter set forth.

Mounted within the plug 23^a is a slidable valve member 28, provided at its upper end with a flange 29, forming a head; and the valve member is reduced at its lower end to receive a screw-threaded ring 30, which forms a head upon the lower end of the valve member and serves to retain in position a packing ring 31. The valve is provided with a plurality of openings 32, relatively enlarged with respect to the openings 27 located adjacent to the lower end thereof, and is also provided with a recess or pocket 33 formed in the reduced end of the valve member. Thus, when the valve is in assembled position, the head 29 and the ring 30 will form abutments which will contact the upper and lower surfaces respectively

of the plug 23ª and limit the movement of the valve in either direction.

Located adjacent to the lower portion of the lower chamber 12 is a plate 34, held in position by a plurality of screw-threaded stems 35, the heads of which lie within recesses 36 formed in the plug 16, and each of the heads is concealed by a plug 37 entered into the recess 36. The plate 34 serves as a means for returning the valve to its closed position when the slidable member shall have reached its limit of movement downward. This plate is adjustable in height, so that it may be adjusted so as to regulate the space between it and the fluid inlet, whereby a greater or less restriction will be placed on the fluid entering through the inlet, thus regulating the amount of fluid entering therethrough; or, by lowering the plate to seal the inlet, communication between said inlet and the interior of the casing may be entirely cut off.

The slidable member is provided centrally thereof with a bore or passage 38, into which is entered a sleeve 39, the sleeve, however, being somewhat smaller in diameter than the bore, thereby providing a space 40 between the wall of the bore and the sleeve. The sleeve is formed at its upper end with an outwardly extending flange 41, and entered into the sleeve is a head 42 of a stem 43, which stem is secured within a plug 44 carried by the cap 13. The stem 43 is screw-threaded for a portion of its length, thus permitting of its adjustment; and the head 42 of the stem 43 is entered into the sleeve 39 with a sliding fit, so that it is possible for fluid to pass between the head 42 and the interior face of the sleeve 39, although the head will form a restriction so that such passage of fluid must necessarily be slow. In the upper end of the slidable member is formed a recess 45, which is screw-threaded, and into which is entered a collar 46, provided with a central opening 47 and an opening 48 located at one side of the center; and entered through the collar is a screw-threaded pin 49 to permit of its adjustment.

The operation is as follows: With the parts as shown in Fig. 1, fluid enters through the fluid inlet 17 and passes into the chamber 12. The flange will act upon the surface presented by the lower end of the plug 23ª and initially, force the slidable member 18 upward. After the member has risen so that the valve 28 is clear of the plate 34, then the pressure will act against both the valve and plug to raise the member 18. This upward movement will continue until the point has been reached where the lower end of the head 42 will strike the lower end of the valve member 28 and force the valve member into the position shown in Fig. 2, at which time the ports 32 will be brought into communication with the lower chamber 12 and fluid will enter said ports and pass through the valve member and out through the ports 27 in the lower end of the slidable member, and thence into the outlet passage 15. It will be noted that during the upward movement of the slidable member, the valve member 28 is maintained in the position shown in Fig. 1 by the pressure exerted against the lower face thereof, and hence, during the upward movement of the valve no communication is possible between the fluid inlet and the fluid outlet passages. When the mechanism is in the position shown in Fig. 2, the head 42 of the stem 43 will lie clear of the sleeve 39; hence, a passage for fluid will be established through the sleeve 39 and the opening 47, into the chamber 11, and through the space 40 between the sleeve 39 and the bore 38, and through the passage 48 into the chamber 11, so that liquid will enter by these means into the chamber 11 during the downward movement of the slidable member. The pressure of the liquid through the space 40 during the downward movement of the slidable member will serve to keep the flanged end 41 of the sleeve 39 in the position shown in Fig. 2, so that communication will always be established into the chamber 11 through the passage 48 and the space 40 during such downward movement. Hence, during the downward movement of the valve member, liquid will freely flow into the chamber 11. When the valve member 28 is unseated by contact with the head 42, pressure will then be relieved from the lower face of the valve, because of the fluid entering through the ports 32. And the weight of the slidable member together with the pressure of the fluid above the piston in the chamber 11 will serve to return the valve to its lowermost position; and, as heretofore stated, during the lowering operation, fluid will pass freely into the upper chamber 11 so that after the initial operation, a certain amount of fluid will always be present in the chamber 11, and by reason of the free passage of fluid into the chamber 11 and the elimination of pressure upon the lower face of the slidable member, the downward movement of the slidable member will be relatively fast in comparison with the upward movement. Then, as the valve is moved upward, this fluid in the chamber 11 will be forced outward therefrom through the space between the head 42 and the interior walls of the sleeve 39. As heretofore stated, this space is restricted so that a slow passage of fluid out from the chamber 11 is maintained. This serves to produce a relatively slow upward movement of the slidable member, so that communication between the inlet and outlet ports is cut off for a relatively long time and established for a relatively short time. It is understood that the valve is

moved from the position shown in Fig. 1 to that shown in Fig. 2 by being engaged by the head 42, and that it is moved from the position shown in Fig. 2 to that shown in Fig. 1 by contact with the plate 34, and that it is maintained in the position shown in Fig. 1 during the upward movement of the slidable member 18 by fluid pressure acting upon the outer face of the lower end of the valve member, and that it is maintained in the position shown in Fig. 2 by the downward pressure of the fluid acting upon the upper surface of the valve member 29 and also by the action of gravity. That is to say, the fluid passing through the opening 32 will exert a downward pressure against the upper surface of the valve member, which, together with the action of gravity, will tend to hold the same in the position shown in Fig. 2.

It will be noted that when the parts are in the position shown in Fig. 1, the fluid being forced from the chamber 11 will exert a pressure upon the flanged end 41 of the sleeve 39, maintaining it in the position shown in Fig. 1, whereby communication is cut off between the upper chamber 11 and the space 40 intermediate the sleeve 39 and the bore 38. When the head 42 passes out from the sleeve 39, the lower end of the head will not quite contact the valve 28, so that the restriction in the sleeve will be broken before the head contacts the valve, and the movement of the slidable member necessary to have the head contact the valve will be fast. This will unseat the valve by means of a quick thrust, thus obviating the slow grinding action that would result if the unseating were done while the slidable member was retarded in its movement by the restriction in the sleeve 39, so that no cutting of the packing will result from the constant movement of the valve member.

I claim:

1. In a flushing valve, the combination of a casing, having a fluid chamber therein, a fluid inlet passage and a fluid outlet passage communicating with said chamber, a movable member within the fluid chamber, a head upon each end of the movable member, the head on one end having a valve member therein, controlling communication between the inlet and outlet passages of the fluid chamber, said valve being held in closed position during the actuation of the movable member in one direction, by fluid pressure exerted against the face thereof, means for shifting the valve to open position, whereby communication is established between the inlet passage and the outlet passage, and means for returning the valve to normal position, substantially as described.

2. In a flushing valve, the combination of a casing, having a fluid chamber therein, a fluid inlet passage and a fluid outlet passage communicating with said chamber, a slidable member within the fluid chamber, a head upon each end of the slidable member, the head on one end having a valve member therein, controlling communication between the inlet passage and the outlet passage, said valve being held in closed position by fluid pressure during the movement of the slidable member in one direction, means for shifting said valve when the slidable member has reached its limit of movement in one direction, to establish communication between the inlet and outlet passages, said shifting changing the point of application of fluid pressure on the valve member, whereby it remains in its shifted position during the movement of the slidable member in the opposite direction, and means for returning the valve to closed position when the slidable member reaches its limit of movement in the opposite direction, substantially as described.

3. In a flushing valve, the combination of a casing, having a fluid chamber therein, a fluid inlet passage and a fluid outlet passage communicating with said chamber, a movable member within the fluid chamber, a head upon each end of the movable member, the head on one end having a slidable valve member therein, controlling communication between the inlet and outlet passages of the fluid chamber, a head upon each end of the valve member for limiting its movements, said valve being held in closed position during the actuation of the movable member in one direction by fluid pressure exerted against the face thereof, means for shifting the valve to open position, whereby communication is established between the inlet passage and the outlet passage, and means for returning the valve to normal position, substantially as described.

4. In a flushing valve, the combination of a casing, having a fluid chamber therein, a fluid inlet passage and a fluid outlet passage communicating with said chamber, a movable member within the fluid chamber, a head upon each end of the movable member, the head on one end having a valve member therein, controlling communication between the inlet and outlet passages of the fluid chamber, said valve being held in closed position during the actuation of the movable member in one direction, by fluid pressure exerted against the face thereof, an adjustable member for contacting and shifting the valve to open position, whereby communication is established between the inlet passage and the outlet passage, and an adjustable member for contacting and returning the valve to normal position, substantially as described.

5. In a flushing valve, the combination of a casing, having a fluid chamber therein, a fluid inlet passage and a fluid outlet pas-

sage communicating with said chamber, a slidable member within the fluid chamber, actuated in one direction by fluid pressure and in the opposite direction by the combined forces of fluid pressure and gravity, a head upon each end of the slidable member, the head on one end having a valve member therein, controlling communication between the inlet passage and the outlet passage, said valve being held in closed position by fluid pressure during the movement of the slidable member in one direction, means for shifting said valve when the slidable member has reached its limit of movement in one direction, to establish communication between the inlet and outlet passages, thereby changing the pressure upon the slidable member and permitting it to return to normal position, said shifting changing the point of application of fluid pressure on the valve member, whereby it remains in its shifted position during the movement of the slidable member in the opposite direction, and means for returning the valve to closed position when the slidable member reaches its limit of movement in the opposite direction, substantially as described.

6. In a flushing valve, the combination of a casing, having upper and lower chambers therein, an inlet passage and an outlet passage communicating with the lower chamber, a slidable member within the casing, an upper head and a lower head on the slidable member, a valve member in the lower head, means for actuating said valve member to regulate communication between the inlet and outlet passages, means for establishing communication between the upper and lower chambers, whereby fluid is admitted to the upper chamber during the movement of the slidable member in one direction, said fluid being forced from the upper chamber by the movement of the slidable member in the opposite direction, said slidable member having a restricted passageway therein, through which said fluid from the upper chamber is discharged, whereby said fluid in the upper chamber exerts a counterpressure upon the slidable member, retarding its movement in one direction, substantially as described.

7. In a flushing valve, the combination of a casing, having an upper and a lower chamber, and having a fluid inlet passage and a fluid outlet passage therein, a slidable member within the casing, having a head on each end thereof, one of the heads traveling within the upper chamber and the other head traveling within the lower chamber, said slidable member having a longitudinally extending bore therein, a stem mounted in the casing and entering said bore, a slidable valve member carried by the lower head, said valve controlling communication between the inlet and outlet passages, and said valve being held in closed position by fluid pressure during the upward movement of the slidable member, said stem contacting said valve after the slidable member has moved a predetermined distance to shift said valve and open communication between the inlet and discharge passages, substantially as described.

8. In a flushing valve, the combination of a casing, having an upper and a lower chamber, and having a fluid inlet passage and a fluid outlet passage therein, a slidable member within the casing, having a head on each end thereof, one of the heads traveling within the upper chamber and the other head traveling within the lower chamber, said slidable member having a longitudinally extending bore therein, a stem mounted in the casing and entering said bore, a slidable valve member carried by the lower head, said valve controlling communication between the inlet and outlet passages, and said valve being held in closed position by fluid pressure during the upward movement of the slidable member, said stem contacting said valve after the slidable member has moved a predetermined distance to shift said valve and open communication between the inlet and discharge passages, said stem serving as a restriction for the fluid passing from the upper to the lower chamber during the upward movement of the slidable member, substantially as described.

9. In a flushing valve, the combination of a casing, having an upper and a lower chamber, and having a fluid inlet passage and a fluid outlet passage therein, a slidable member within the casing, having a head on each end thereof, one of the heads traveling within the upper chamber and the other head traveling within the lower chamber, the latter head having a chamber therein and having ports entering into said chamber, said slidable member having a longitudinally extending bore therein, a stem mounted in the casing and entering said bore, a slidable valve member entered into the chamber in the lower head and having flanges on each end thereof to limit its movement within the chamber, said valve controlling communication between the inlet and outlet passages, and said valve being held in closed position by fluid pressure during the upward movement of the slidable member, said stem contacting said valve after the slidable member has moved a predetermined distance to shift said valve and open communication between the inlet and discharge passages, substantially as described.

10. In a flushing valve, the combination of a casing, having an upper and a lower chamber, and having a fluid inlet passage and a fluid outlet passage therein, a slidable member within the casing, having a head on each

end thereof, one of the heads traveling within the upper chamber and the other head traveling within the lower chamber, the latter head having a chamber therein and having ports entering into said chamber, said slidable member having a longitudinally extending bore therein, a stem mounted in the casing and entering said bore, a slidable valve member entered into the chamber in the lower head and having flanges on each end thereof to limit its movement within the chamber, said valve member having a chamber therein, an opening at its upper end and an opening adjacent to its lower end, the flange on the lower end of the valve member presenting a face for fluid pressure to act upon to maintain the valve seated, said valve controlling communication between the inlet and outlet passages, and said valve being held in closed position by fluid pressure during the upward movement of the slidable member, said stem contacting said valve after the slidable member has moved a predetermined distance to shift said valve and open communication between the inlet and discharge passages, substantially as described.

11. In a flushing valve, the combination of a casing, having an upper and a lower chamber, and having a fluid inlet passage and a fluid outlet passage therein, a slidable member within the casing, having a head on each end thereof, one of the heads traveling within the upper chamber and the other head traveling within the lower chamber, said slidable member having a longitudinally extending bore therein, a stem mounted in the casing, a sleeve in said bore of a smaller diameter than said bore, said stem having a sliding fit in said sleeve, means for cutting off communication between the upper chamber and the space intermediate the sleeve and bore during the upward movement of the slidable member, causing the fluid forced from the upper chamber to pass out therefrom through the restricted passageway between the stem and sleeve, a slidable valve member carried by the lower head, said valve controlling communication between the inlet and outlet passages, and said valve being held in closed position by fluid pressure during the upward movement of the slidable member, said stem contacting said valve after the slidable member has moved a predetermined distance to shift said valve and open communication between the inlet and discharge passages, substantially as described.

12. In a flushing valve, the combination of a casing, having an upper and a lower chamber, and having a fluid inlet passage and a fluid outlet passage therein, a slidable member within the casing, having a head on each end thereof, one of the heads traveling within the upper chamber and the other head traveling within the lower chamber, said slidable member having a longitudinally extending bore therein, a stem mounted in the casing, a sleeve in said bore of a smaller diameter than said bore, said stem having a sliding fit in said sleeve, a flange on the upper end of the sleeve held in position by fluid pressure to cut off communication between the upper chamber and the space intermediate the sleeve and bore during the upward movement of the slidable member, causing the fluid forced from the upper chamber to pass out therefrom through the restricted passageway between the stem and sleeve, and raised by fluid pressure to open communication between the upper chamber and the space surrounding the sleeve during movement of the slidable member in the opposite direction, a slidable valve member carried by the lower head, said valve controlling communication between the inlet and outlet passages, and said valve being held in closed position by fluid pressure during the upward movement of the slidable member, said stem contacting said valve after the slidable member has moved a predetermined distance to shift said valve and open communication between the inlet and discharge passages, substantially as described.

13. In a flushing valve, the combination of a casing, having an upper and a lower chamber, and having a fluid inlet passage and a fluid outlet passage therein, a slidable member within the casing, having a head on each end thereof, one of the heads traveling within the upper chamber and the other head traveling within the lower chamber, said slidable member having a longitudinally extending bore therein, a stem mounted in the casing, a sleeve in said bore of a smaller diameter than said bore, said stem having a sliding fit in said sleeve, a flange on the upper end of the sleeve held in position by fluid pressure to cut off communication between the upper chamber and the space intermediate the sleeve and bore during the upward movement of the slidable member, causing the fluid forced from the upper chamber to pass out therefrom through the restricted passageway between the stem and sleeve, and raised by fluid pressure to open communication between the upper chamber and the space surrounding the sleeve during movement of the slidable member in the opposite direction, an adjustable abutment for limiting the upward movement of the sleeve, a slidable valve member carried by the lower head, said valve controlling communication between the inlet and outlet passages, and said valve being held in closed position by fluid pressure during the upward movement of the slidable member, said stem contacting said valve after the slidable member has moved a predetermined distance to shift said

valve and open communication between the inlet and discharge passages, substantially as described.

14. In a flushing valve, the combination of a casing, having an upper and a lower chamber, and having a fluid inlet passage and a fluid outlet passage therein, a slidable member within the casing, having a head on each end thereof, one of the heads traveling within the upper chamber and the other head traveling within the lower chamber, said slidable member having a longitudinally extending bore therein, a stem mounted in the casing, a sleeve in said bore of a smaller diameter than said bore, said stem having a sliding fit in said sleeve, a flange on the upper end of the sleeve held in position by fluid pressure to cut off communication between the upper chamber and the space intermediate the sleeve and bore during the upward movement of the slidable member, causing the fluid forced from the upper chamber to pass out therefrom through the restricted passageway between the stem and sleeve, and raised by fluid pressure to open communication between the upper chamber and the space surrounding the sleeve during movement of the slidable member in the opposite direction, the upper end of the slidable member having a chamber therein, an adjustable ring in said chamber, said ring serving as an abutment to limit the upward movement of the sleeve, and said ring having an opening for the passage of fluid, a slidable valve member carried by the lower head, said valve controlling communication between the inlet and outlet passages, and said valve being held in closed position by fluid pressure during the upward movement of the slidable member, said stem contacting said valve after the slidable member has moved a predetermined distance to shift said valve and open communication between the inlet and discharge passages, substantially as described.

15. In a flushing valve, the combination of a casing, having an upper and a lower chamber, and having a fluid inlet passage and a fluid outlet passage therein, a slidable member within the casing, having a head on each end thereof, one of the heads traveling within the upper chamber and the other head traveling within the lower chamber, said slidable member having a longitudinally extending bore therein, a sleeve within the bore of a less diameter than the bore, a stem through said sleeve, a head on said stem, having a sliding fit in said sleeve, and forming a restriction for the fluid passing from the upper chamber during the movement of the slidable member in one direction, a slidable valve member carried by the lower head, said valve controlling communication between the inlet and outlet passages, and said valve being held in closed position by fluid pressure during the upward movement of the slidable member, said stem contacting said valve after the slidable member has moved a predetermined distance to shift said valve and open communication between the inlet and discharge passages, substantially as described.

SAMUEL C. LAIDLEY.

Witnesses:
WM. P. BOND,
PIERSON W. BANNING.