N. B. JOHNSON.

SUPPLY VALVE.

APPLICATION FILED FEB. 11, 1907.

973,511. Patented Oct. 25, 1910.

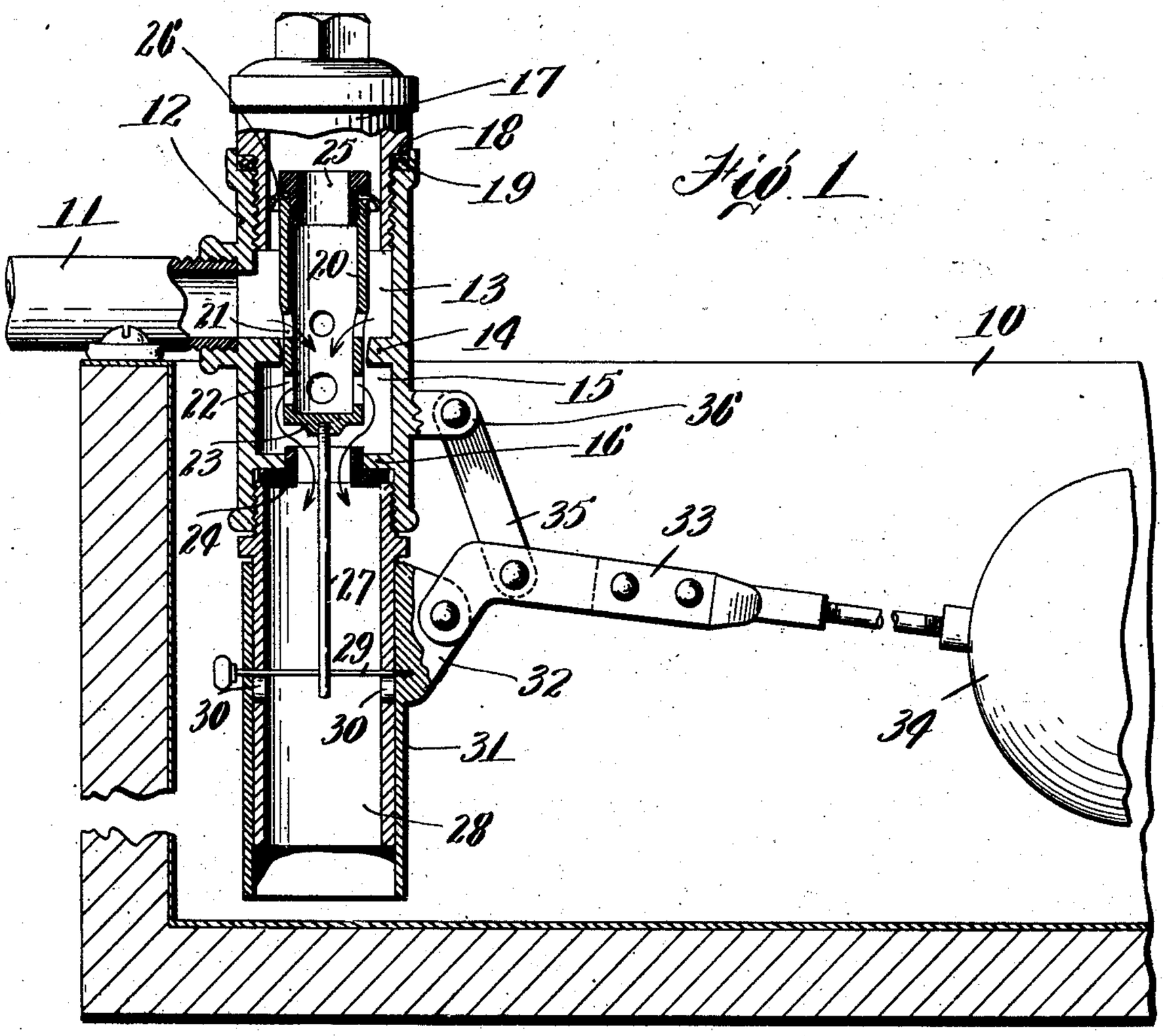

Fig. 1.

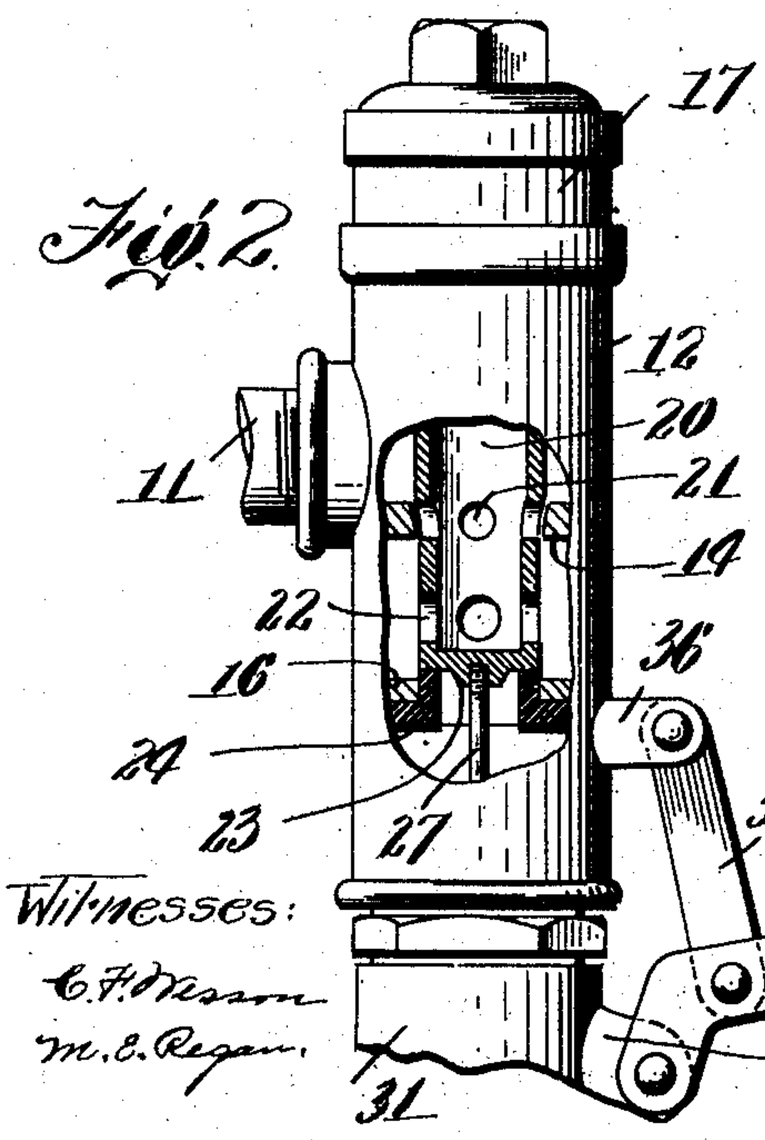

Fig. 2.

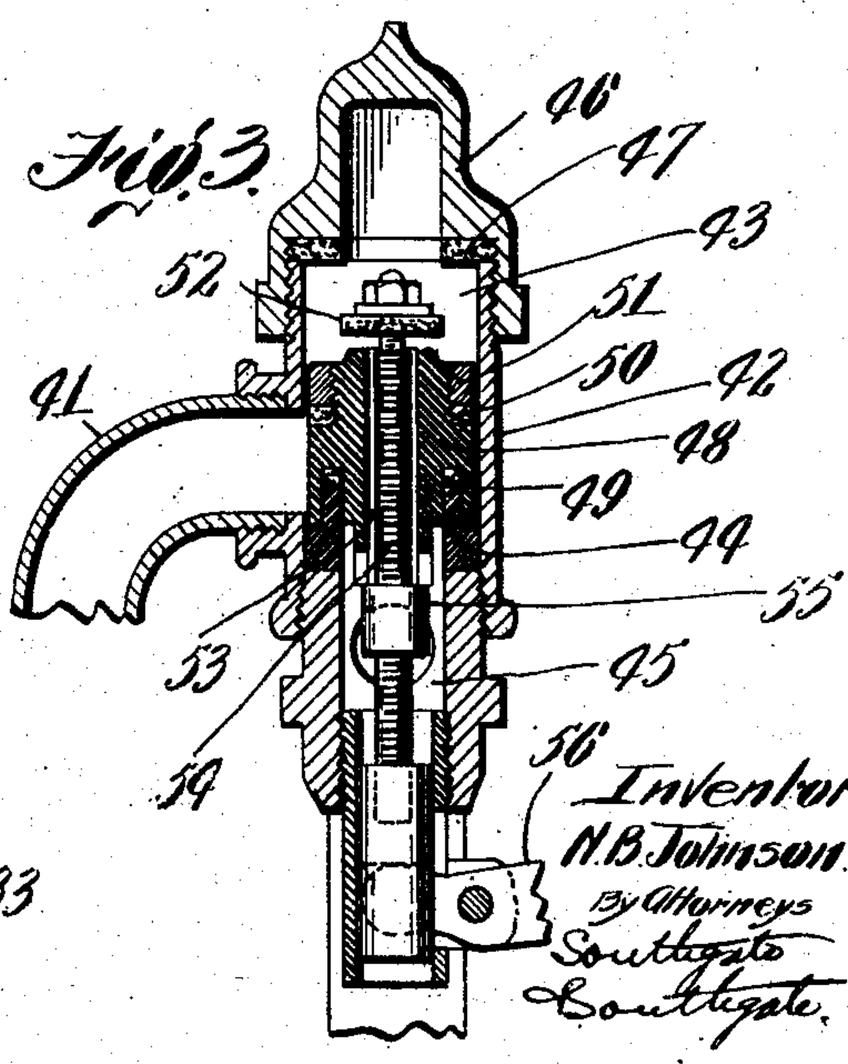

Fig. 3.

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UNITED STATES PATENT OFFICE.

NELSON B. JOHNSON, OF WEBSTER, MASSACHUSETTS.

SUPPLY-VALVE.

973,511. Specification of Letters Patent. Patented Oct. 25, 1910.

Application filed February 11, 1907. Serial No. 356,727.

To all whom it may concern:

Be it known that I, NELSON B. JOHNSON, a citizen of the United States, residing at Webster, in the county of Worcester and State of Massachusetts, have invented a new and useful Supply-Valve, of which the following is a specification.

Many attempts have been made to secure a practical and efficient supply valve in which the pressure of the water will act directly on the surface of the valve when closed to keep the valve on its seat. So far as I am aware, however, devices constructed with this object in view have always been open to objection, usually in one or more of the following ways. On account of the pressure of the water on the valve, considerable force is obviously required to open it, this being secured by the use of a heavy float which is undesirable. Special packings also are usually required to prevent leakage, these being not only expensive but necessitating frequent overhauling of the device to repair or replace them. Several of these packings are often required and more than one valve is used in many instances. In certain cases, also, metal chips are liable to get into such valves, either plugging them up or getting between the seat and the valve so as to prevent the latter from coming to its seat.

The principal objects of the present invention are to provide a valve adapted to operate so as to save water, in which the pressure of water will act directly upon it when closed to help hold it to its seat, the valve also being under the influence of nearly the entire buoyancy of the float, with a powerful leverage if desired, the leather packing thus being compressed and hardened to such an extent that it will last for years, as it cannot get water-soaked; to provide a valve closing directly with the water so that it cannot get balanced, thereby avoiding water-hammering and vibration, the construction of the device being such that it is a matter of some difficulty for the ball-float to rise and bring the valve down to its seat, and therefore requiring nearly the entire buoyancy of the ball-float in a manner very similar to that in valves closing against water-pressure, but when the valve finally touches the seat, the water acts instantaneously directly on the valve, holding it to its seat. This avoids the disadvantages of those constructions in which a valve closes against the water head, and simply receives the buoyancy of the ball-float, and such ordinary leverage as the same may have, this not being sufficient to compress or harden the leather packing, whereby the latter gets water soaked and causes leakage and renders repacking necessary. Furthermore, as the ball-float at this stage is pretty well submerged it is impossible for the ball-float to descend far enough to start the packing of the valve from its seat, which would cause vibration and water-hammer, as it takes nearly the entire weight of the ball-float to lift the valve against the water-pressure.

Further objects of the invention are to provide a construction which will have only one valve that has to be tight, this valve acting on a seat which is readily removable and replaceable; which can be used either for top, bottom or end supply in high tanks and in low-down tanks; in which the valve closes suddenly when the water has filled the tank to the required height; which will have no other inside packings that have to be tight and consequently which will avoid the necessity of keeping such inside packings in order; which will have provision whereby any chips which can enter the valve at all must necessarily pass from it and be discharged; which will be so constructed that the valve as well as the seat can be readily removed without the use of special tools; and which will be substantially noiseless in action as the packing leaves its seat wide, and the water not having to strike any part on flowing through the valve all whistling and other noisy action is avoided; and which in general will be simple, inexpensive and efficient and not likely to get out of order.

Reference is to be had to the accompanying drawings which illustrate two forms in which this invention may be carried out and in which,

Figure 1 is a central, vertical, sectional view of one form of valve showing the valve open. Fig. 2 is a side elevation of the same with parts in section to show the position when the valve is closed, and Fig. 3 is a vertical sectional view of another form in which the invention can be carried out.

Referring first to Figs. 1 and 2, the tank 10 is provided with any desired kind of supply pipe 11. This opens into a valve casing 12 which has a chamber 13 therein. The bottom of this chamber is formed by a par-

tition 14 below which is a chamber 15 having a partition 16 forming the bottom thereof. The chamber 13 is closed by a cap 17 screwing into the top of the casing 12 and provided with a channel 18 at the top of the casing 12, this channel being provided with a packing 19. When the cap is screwed into the casing, it will be seen that this packing is compressed and that it is one of the simplest forms of packing and can readily be replaced in a simple and convenient manner should necessity arise. Mounted in the valve casing is a tubular valve 20. This valve is provided with openings 21 which, when the valve is open, as shown in Fig. 1, communicate with the chamber 13 and allow water to pass therefrom freely into the inside of the valve. At a point which is always below the partition 14 are a series of openings 22 of larger area than the openings 21, to permit the water in the valve to pass out into the chamber 15. The object of having the perforations 22 larger than the perforations 21 is to insure that in case metal chips or other obstructions pass from the supply pipe into the valve, they will be certain to have a means of egress therefrom. In other words, the perforations 21 are small enough to prevent any obstruction from entering the valve which could not escape from it. When the valve is open, there is a space between the bottom of the valve proper 23 and the valve seat 24, which is sufficient to allow any chip or other obstruction that passes from one of the openings 22 to escape entirely from the valve casing. It is to be noted that the partition 14 does not accurately fit the valve even when closed, as shown in Fig. 2. The clearance here, for the purpose of illustration, is shown somewhat exaggerated but it is intended that there shall be a sufficient passage to allow a small leakage through the partition 14 in all positions of the valve, but the partition constitutes means for preventing the water pressure from being applied to the seating surface of the main valve before it rests on its seat when in the act of closing. At the top of the valve is shown a hollow plug 25 for holding a cup packing 26. Cup packings, as ordinarily used in flush valves, are undesirable for the reason that they do not have a long life and it is necessary to replace them at comparatively short intervals, but in this instance this cup packing is not intended to be perfectly tight and any ordinary wear of the same will not interfere with the utility of the device. It will be seen from what has been stated, that the only valve or packing in the inside of this device which has to be tight and consequently which has to be kept in order, is the valve 23 seating on the valve seat 24. The other places where the valve and valve casing or packings come substantially into contact with each other are intended to be loose enough to allow leakage and consequently, all the ordinary repairs of these parts are avoided.

The valve is operated by a stem 27 and the operation of it is as follows: When the valve is in open position, as shown in Fig. 1, the water can pass freely from it and escape through the discharge pipe 28 to fill the tank. When the valve is lowered, automatically or otherwise, the passages 21 are cut off by the partition 14 and no water passes through the hollow valve 20 except what enters it by leakage. There is at this time an appreciable difference in pressure between the chamber 13 and chamber 15 for, although water is leaking into the chamber 15, around the hollow valve and up over the cup packing 26, the parts are so proportioned that this leakage is small in amount and consequently there is not the full pressure of the water system upon any part of the chamber 15. This permits the valve to be brought to its seat by external means, independently of the pressure of the water in the system, so that the closing of the valve may be gradual and is controlled from outside the valve, as will be explained. This avoids the too rapid closing of the valve which is a feature of many of the constructions in which a direct water pressure is brought to bear upon the valve to hold it to its seat. After the valve is closed, however, the leakage, either downwardly or upwardly or both from the chamber 13, results in filling the chamber 15 and the interior of the hollow valve and in fact, entirely filling the hollow space within the valve. After this occurs, the entire pressure of the system is brought to bear upon the top of the valve 23 and assists in holding it to its seat.

It will be observed that the valve seat 24, which consists of a disk and a hollow body, the latter passing through a perforation in the partition 16, is held in place by the disk portion resting on top of the pipe 28 which is screwed into the bottom of the casing 12. This pipe has a square or other shape formed at a point below the casing so that a wrench can be applied and the pipe removed so as to withdraw the valve seat for repairs or replacement. The valve seat may be made of any desired material suitable for this purpose and may be provided with a packing, if desired.

A preferred way of operating the valve will now be described.

The valve stem 27 is provided with a perforation through which passes a pin 29. This pin works in slots 30 in the pipe 28 and extends into a guide 31 which, in the present instance, is shown in the form of an external tube. This guide has a lug 32 thereon in which is pivoted a lever 33 carrying a float 34 which, as has been stated, may in the present case be as light as de-

sired, a heavy float not being required when connected with the guide 31 in the manner shown. The lever 33 is pivotally supported by a link 35 which is pivoted to a lug 36 on the valve casing. The point at which the link 35 is pivoted to the lever 33 is comparatively near the point at which the lever is pivoted to the lug 32 and above the same. The lever is substantially straight from the float to the point at which the link is connected with it, and then extends downwardly to the lug 32. By a comparison of the position shown in Figs. 1 and 2, it will be observed that when the float is up, as shown in Fig. 2 and the valve closed, at which time the water pressure is acting on the valve to hold it in closed position and to assist in holding the float up, the link and lever are in such position that the leverage of the float is at its maximum; consequently, the lowering of the water in the tank to drop the float will have a multiplying action upon the guide 31 of sufficient strength to lift the valve against the pressure of the water upon it. As soon as the valve is lifted from its seat sufficiently to allow the water to flow under it, the pressure upon it becomes negligible and consequently, it is not necessary that this leverage should be maintained as the float goes down, and it will be seen from the position of parts shown in Fig. 1 that the leverage decreases when the float drops. The dropping of the float after the valve is first slightly lifted, is sufficient without any special leverage to raise the valve to its highest position.

It is, of course, understood that one of the advantages of this type of valve is that it can be used for all kinds of supplies. In Figs. 1 and 2 it is shown as connected with the high supply and in Fig. 3 the form of the invention illustrated is indicated as connected with the bottom supply pipe 41. In this form, the supply pipe enters a valve casing 42 which has a chamber 43 therein. At the bottom of this chamber the external diameter of the casing is reduced and provided with a valve seat 44 below which is a passage 45 through which the water discharges. The valve casing is surmounted by a cap 46 which has a packing 47, similar to the packing 18 but in the present instance, it has been indicated inside. In this form, a hollow valve 48 is employed which has an annular recess 49 adapted to register with the valve seat 44. In this figure, the valve is shown as closed against this valve seat. The annular chamber 49 may, if desired, be provided with a packing. The top of the valve is provided with a packing 50 held in place by a ring 51 but like the other form described, a tight fit is not desired at this point as leakage upwardly, when the valve is closed, is desired in order that the chamber 43 may gradually fill with water and the full pressure of the same may act upon the valve to hold it against its seat. Here the lower part of the valve 48 constitutes means for preventing the water pressure from being applied to the seating surface of the valve before it rests on its seat when in the act of closing. In this form, in order to provide for efficient operation without the multiplying leverage, and secure the advantages incident to the construction shown in Fig. 1, a small valve 52 is shown to close the top of the passage 53 through the main valve. This is mounted on a stem 54 which has an adjusting nut 55 thereon. The device is shown as in the act of opening; that is, the valve 48 is resting on its seat but the valve 52 is still open. The valve 52 having a very much smaller area than the main valve, very little leverage is required to open it against the water-pressure. This valve thus takes the place of the compound leverage, and with this form of valve a ball-float of the lightest character may be used. When the valve 52 is open the water-pressure on the main valve is released so as to permit the same to open very easily. The sudden closing of this valve is prevented by the valve 48 fitting snugly against the sides of the chamber. Before the packing touches the seat the bottom of the valve 48 has entirely cut off the supply passage 41 so that it simply gets what water leaks by the sides of the valve 48 into the upper part of the casing. It will thus be seen that the main idea is the same as that shown in Fig. 1, it being carried out in a different way. The valve seat 44 preferably is held in place in substantially the same manner as that shown in Fig. 1, and is readily removable and renewable.

While I have illustrated and described two forms of the invention which secure the above mentioned and other advantages, I am aware that many modifications may be made therein without departing from the spirit of the invention as expressed in the claims. Therefore, I do not wish to be limited to the particular forms shown, but

What I do claim is:—

1. The combination with a supply valve casing having a valve seat, of a main valve for said seat, said valve being hollow, whereby water may be discharged therethrough, there being sufficient space between the valve and casing to permit water to leak from the supply into the valve chamber above the valve when the valve is closed, whereby the full pressure of the water in the supply acts on the valve to hold it closed, and means for preventing the water pressure from being applied to the seating surface of the main valve before it rests on its seat, and for permitting leakage from the supply to the valve seat in all positions of the valve.

2. The combination with a valve casing

having a seat, of a main valve therein adapted to engage said seat, said valve having a free passage therethrough which is always open, whereby the most of the water discharged passes through the valve, and having a loose engagement with the walls of the casing, whereby water may leak by the valve to fill the space above the same in the casing to act on the valve when it is closed to hold it against its seat, and means for preventing the water pressure from being applied to the seating surface of the main valve before it rests on its seat.

3. The combination with a valve casing having a partition, two chambers separated by the partition, and a valve seat at the bottom of the lower chamber, of a hollow valve in the casing having passages through its wall, said valve being adapted to engage said seat, the outside of said valve fitting the partition loosely, whereby leakage is permitted from the upper chamber to the lower chamber in all positions of the valve.

4. The combination with a valve casing having two chambers therein, a partition separating the chambers, and a valve seat at the bottom of the lower chamber, of a hollow valve adapted to seat on said valve seat, said valve having two series of perforations through its walls, one series being located above the partition and the other below the partition when the valve is open and both being located below the top of the partition when the valve is closed.

5. The combination with a valve casing, of a hollow valve therein having perforated walls, and an open top, a cup packing loosely fitting between the upper part of said valve and the walls of the casing, whereby the full force of the pressure is excluded from the top of the valve and leakage thereto is permitted.

6. The combination with a valve casing, of a hollow valve having perforations through its walls, and an open top, a loose packing between the upper part of the valve and the valve casing, a removable cap closing the top of the casing, and a packing located between the cap and top of the casing.

7. A supply valve comprising a casing having a valve seat, a hollow main valve therefor loosely fitting said casing, means whereby the full pressure of the water in the supply acts on the valve to hold it closed, means for allowing all the water leaking between the valve and casing to escape to the valve seat in all positions of the valve, and means whereby the action of the pressure on the seating surface of the valve during all the time that it is in the act of closing is prevented.

8. A supply valve comprising a casing, a valve seat, a hollow main valve loosely fitting said casing, means for allowing all the water leaking between the main valve and casing to escape from above upper end of the valve casing above the main valve through the hollow valve and valve seat into discharge pipe thereby preventing any water pressure on main valve and water to act on seating surface of the main valve during all the time that it is in the act of closing, and means whereby water pressure seeking equalization in the upper end of the valve casing forcing against upper end of main valve which area is larger than that of the valve seat causing upward and reversed resistance from that of closing, whereby the buoyancy of ball float used in connection with this valve has to bring main valve to its seat, and means whereby the entire water pressure is exerted on the main valve holding the same down on the valve seat when closed.

9. The combination with a valve casing having a valve seat therein, of a hollow valve having a solid bottom for engagement with said seat, and provided with an admission perforation, and a discharge perforation in its walls, the discharge perforation being of larger area than the admission perforation and being smaller than the space between the bottom of the valve and the seat when the valve is open.

In testimony whereof I have hereunto set my hand, in the presence of two subscribing witnesses.

NELSON B. JOHNSON.

Witnesses:

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W. B. CHAMBERLAIN.