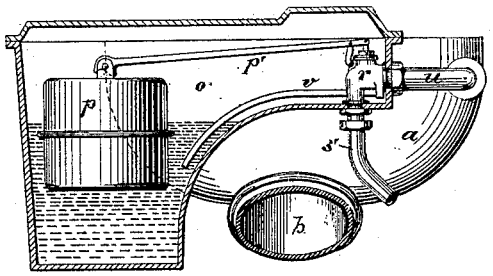
(No Model.)

H. H. CRAIGIE.

BALANCED FLOAT VALVE.

No. 418,276. Patented Dec. 31, 1889.

FIG. 1.



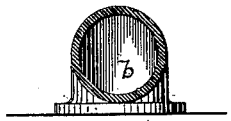


FIG. 2.

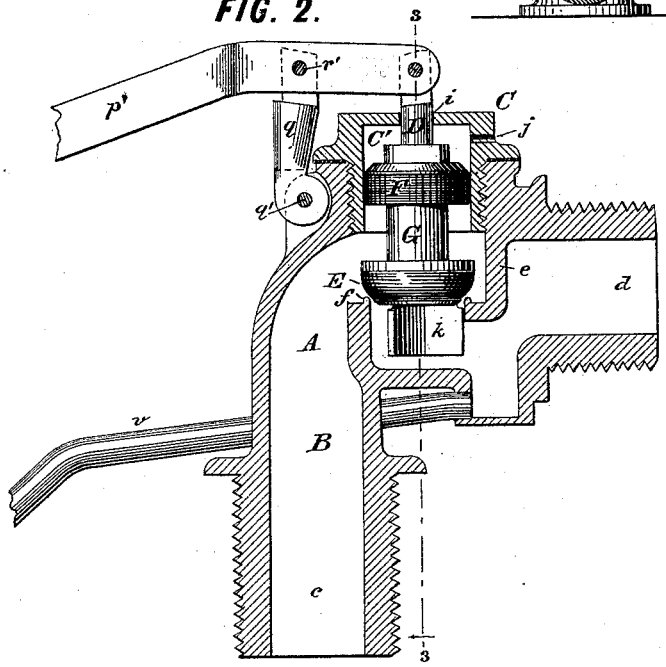


FIG. 3.

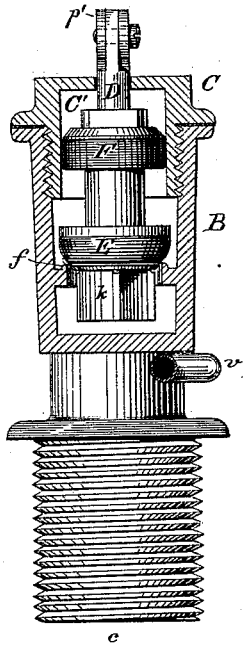


FIG. 4.

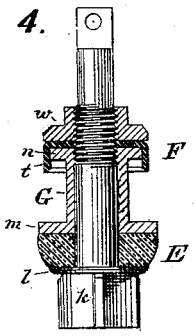
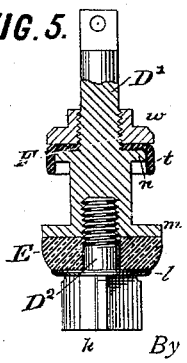


FIG. 5.



WITNESSES:

C. K. Fraser.

George Dixon.

INVENTOR:

Hugh H. Craigie,

By his Attorneys,

Arthur C. Fraser & Co.

UNITED STATES PATENT OFFICE.

HUGH H. CRAIGIE, OF STAMFORD, CONNECTICUT.

BALANCED FLOAT-VALVE.

SPECIFICATION forming part of Letters Patent No. 418,276, dated December 31, 1889.

Application filed May 15, 1888. Serial No. 273,980. (No model.)

To all whom it may concern:

Be it known that I, HUGH H. CRAIGIE, a citizen of the United States, residing at Stamford, Fairfield county, Connecticut, have invented certain new and useful Improvements in Balanced Float-Valves, of which the following is a specification.

Float-valves as ordinarily made open either with or against the water-pressure, so that the pressure of water tends either to lift the float out of the water in which it is immersed or to depress it still lower in the water. Such valves are subject to the defects of operating with a considerable degree of frictional and other resistance and of vibration or "hammering." To obviate these defects float-valves have been constructed as balanced valves, so that the pressure of the water does not tend either to open or close the valve, whereby the valve is caused to operate with less resistance and the objectionable hammering is in great part obviated. Such valves as heretofore devised have, however, been defective in construction, so that their parts have been inaccessible or difficult of access, and they have been unduly complicated and expensive.

My invention aims to produce an improved construction of balanced valve adapted to be operated by a float or other means, and which shall be free from the defects and disadvantages of such valves as heretofore made.

My improved valve is shown in the accompanying drawings, wherein—

Figure 1 is a vertical section cut longitudinally through the valve-chamber of a plunger water-closet, showing my improved valve applied thereto. Fig. 2 is a view on a larger scale, showing my improved valve in mid-section. Fig. 3 is a vertical transverse section thereof on the line 3 3 in Fig. 2. Fig. 4 is a view of the valve-stem and its attached parts removed from the shell and in longitudinal mid-section. Fig. 5 is a similar view to Fig. 4, showing a modified construction.

The water-closet shown in Fig. 1 is introduced in order to illustrate the application or use for which my improved valve is more especially designed. The water-closet shown in this figure is of the construction illustrated in my application for Patent, Serial No. 254,157, filed November 3, 1887, to which reference is made for a complete understanding of the construction of the water-closet. Suffice it to say here that in Fig. 1 *a* designates the bowl of the closet; *b*, the outlet or soil-passage leading to the sewer; *o*, the float-chamber; *p*, the float; *p'*, the float-lever; *r*, the float-valve; *s'*, the water-inlet or service pipe leading thereto; *u*, the water-outlet pipe leading from the valve to the flushing-rim of the bowl *a*, and *v* an auxiliary water-outlet pipe of reduced area leading from the float-valve into the lower portion of the plunger-chamber *o* to supply water to the latter. All these parts are referred to by the same letters of reference in my said prior application.

I will now proceed to describe my improved valve with reference especially to Figs. 2, 3, and 4.

Let A designate the valve as a whole. Its stationary portions consist of the valve-shell or valve-casing B and the cup or hollow cap C, which is united to the shell. The valve-shell B is formed with an inlet-opening *c* and an outlet-opening *d*, with a partition or diaphragm *e* between them, in which is formed an inner inwardly and upwardly projecting annular rim beveled off to an edge at its top and forming the valve-opening or valve-seat *f*. The water-inlet *c* is adapted for connection in the usual way with the water service or supply pipe *s'*, Fig. 1, and the water-outlet opening *d* is adapted for connection with the pipe *u*, Fig. 1, leading to the bowl of the closet. The shell B is formed with an opening *g*, opposite and in line with the center of the valve-seat *f*, and the cup *c* has its interior portion screw-threaded, and is adapted to be screwed into this opening *g*, so that the cup shall close the opening by means of a flange *h* formed on it, under which a packing-ring may be placed and shall make a tight joint with the shell B. The interior of the cup C is made cylindrical, and this cylindrical portion or cylinder (lettered C') is concentric with the axial line of the valve. The inner diameter of the hollow cap or cup C is substantially just equal to the inner diameter of the annular rim *f*, constituting the valve-seat. The closed top of the cup C is formed with a concentric hole or opening *i* through it to admit the passage of the valve-

stem. The cup is also formed, by preference, with a hole *j*, Fig. 2, at its side to permit the escape of water from it; but this is not essential, as the hole *i* may serve this purpose.

The movable parts of the valve consist of the valve-stem D, with its attached parts—viz., the valve disk or cushion or valve proper E and the balancing-piston F. The valve-disk E fits against the seat *f* and is of a size to slightly overlap the same, and the piston F neatly fits and works in the cylinder C′. The piston being of very nearly the same diameter as the valve-disk at the point where the latter comes in contact with the seat *f*, and both being on the water-inlet side of the diaphragm *e*, where they receive the pressure of the entering water, the piston F serves to balance, or very nearly so, the valve-disk E, so that the valve may be opened or closed without offering any material resistance to its movement. In order to relieve the piston F of any pressure above it, due to the accumulation of water which might leak past it into the upper portion of the cylinder C′, the hole *j* is provided to afford free escape to this water, and also to establish atmospheric pressure on the upper side of the piston. The upper end of the stem D passes out through the hole *i* in the cup C and is jointed to the end of the float-lever *p*′. This lever is fulcrumed to a link *q*, which is pivoted at *q*′ to a lug cast on the exterior of the shell B. The stem D is guided at its lower end by the winged guide *k*, which, as shown, consists of three vertical equidistant radial plates or blades working in the opening of the valve-seat *f*. Any easy equivalent construction may be substituted for these three blades—such, for example, as the usual prongs or fingers. The stem is further guided by the movement of the piston F in the cylinder C′, and also to some extent by the stem itself where it passes through the hole *i*.

As long as the float-chamber *o*, Fig. 1, is filled with water up to the customary level the valve remains closed; but upon the descent of the water-level and the consequent lowering of the float the valve-stem D is lifted, the valve-disk *e* is raised from the seat *f*, and the water flows from the inlet-passage *c* through the seat *f* to the outlet *d*, whence it escapes through the flushing-pipe *u*, Fig. 1, and the small pipe *v*, if the latter be used. The small pipe may, however, be dispensed with. The water-level is thus eventually restored, and as the float rises the valve is slowly closed.

If it becomes necessary to take the valve apart or to gain access to its working parts, this can be done by unscrewing the cup C, the float-lever *p*′ being first disconnected by removing its fulcrum-screw *r*′ or the pivoted screw *q*′ of the link *q*, as may be preferred. On thus unscrewing the cup C the valve-stem and its attached valve-disk and piston may be lifted out of the valve-shell, and the interior of the valve-shell is at once accessible through the large opening *g*. It is to be observed that this opening *g* is larger than the diameter of the valve-disk E or of any portion of the stem D or its attached parts, so that the latter may be readily removed through this opening. It is also to be observed that by constructing the stem D to pass out through a hole in the cup C the removal of this cup or cap enables the valve-stem to be withdrawn from the valve-shell. Furthermore, upon the removal of the cup C it may be separated from the piston F, and the interior of its cylinder C′ may be inspected in order to take out and remove any grit or obstruction that may possibly find lodgment there. Thus the simple removal of this one part, the cup C, gives complete access to the only parts of the valve which a reliable to get out of order—viz., the valve-seat *f*, the cylinder C′, the valve disk E, and the piston F.

In balanced valves as heretofore made the cylinder C′, in which the piston F works, has been usually constructed rigidly as a part of the valve shell and inseparable from the water-inlet opening or port thereof, and the valve-stem has passed out of the shell at a point on the opposite side thereof from said cylinder, thereby necessitating some sort of packing at its exit. With such a construction it is necessary to disconnect the inlet and outlet pipe and take the valve-shell apart in order to get access to the interior of the cylinder or to the piston, valve, or valve-seat.

According to another construction the cylinder has been formed as part of a cup screwed to the shell on the water-inlet side of the seat, and the valve-stem has been carried out of the shell at the opposite side thereof from said cylinder and jointed to the float-lever, being necessarily made in two sections screwed together in said shell in order to admit of its removal. The improved construction provided by my invention avoids the disadvantages incident to these and other prior constructions of valves of this character.

My invention provides, also, an improved construction for the attachment together of the valve-disk, valve-stem, and piston, as shown best in Fig. 4. The valve-stem D consists of a round spindle formed at its bottom end with a flanged head or disk *l*, to which the winged guide *k* is attached, all being preferably cast in one piece. The valve-disk E consists of a cushion of india-rubber or other suitable slightly-yielding material, which is perforated at its center and is slipped over the valve-stem against the disk *l* thereof. A spool-shaped filling-piece G is then slipped over the valve-stem until its flange or disk *m* on its lower end comes against the valve-disk E, so that the latter is confined between the disks *l* and *m*. The cup-leather *t*, forming the packing of the piston F, is then slipped over the valve-stem and comes against the smaller flange or disk *n*, formed on the upper end of the filling-piece G. The disk or nut *w* is finally passed over

the valve-stem and screwed or otherwise fastened thereon, so that it clamps the cup-leather *t* against the disk *w*. This disk *w* is preferably a nut having threads engaging threads cut on the exterior of the stem D, so that as this nut is screwed down it not only clamps the cup-leather *t*, but also, through the medium of the filling-piece G, it clamps the valve-disk E fast against the disk *l*. Thus this construction accomplishes the union of the valve-stem D, valve-disk E, and piston F with the fewest and simplest practicable parts. The disk *l*, which, when the valve is closed, comes within the valve-seat, should be reduced on its under side nearly to an edge, as shown, in order that it shall obstruct as little as possible the passage of water between the valve-disk and valve-seat.

Fig. 5 shows a modified construction of the valve-stem and attached parts which may be substituted for it, but is considered less desirable. The valve-stem in Fig. 5 is made in two parts D′ and D², the part D′ having formed on it the flanges or disks *m* and *n* of the filling-piece G, while the part D² screws into the lower end of the part D′ and has formed on it the flange or disk *l* and the winged guide *k*. This construction necessitates the cutting of two male and female screw-threads instead of one, as in the previous construction. It is also undesirable to make a valve-stem in two sections, because of the difficulty of making the guiding-surfaces with sufficient accuracy and the liability of their getting out of line in screwing them together. I therefore prefer the construction shown in Fig. 4.

My improved float-valve may be used as a ball-cock for flushing-tanks and in other ways in which float-valves are used. It may also be used without a float, the valve-stem being moved through the medium of the lever *p*′ by hand or otherwise.

I claim as my invention the following-defined improvements in balanced float-valves substantially as hereinbefore specified, viz:

1. The combination, with the valve-casing having an inner inwardly and upwardly projecting annular rim beveled off to an edge at its top and forming the valve-seat and a hollow cap united to the casing above the valve-seat, the inner diameter of the cap being substantially just equal to the inner diameter of the annular rim, of the valve-stem having a valve at its lower end which is of a size to slightly overlap the valve-seat, and a piston neatly fitting and working within the cap, a guide secured to the under side of the valve and working within the annular rim, and a float-lever pivoted to the upper end of the valve-stem, the inlet for the water being between the valve and piston, substantially as described.

2. The combination, with the valve-casing having an inner inwardly and downwardly projecting annular rim beveled off to an edge at its top and forming the valve-seat and a hollow cap screwed into the casing above the valve-seat, the inner diameter of the cap being substantially just equal to the inner diameter of the annular rim, of the valve-stem having a valve at its lower end which is of a size to slightly overlap the valve-seat, and a piston neatly fitting and working within the cap, a guide comprising a central screw-threaded stem, a beveled-edge disk, and radiating wings screwed into the under side of the valve and working within the annular rim, and a float-lever pivoted to the upper end of the valve-stem, the inlet for the water being between the valve and piston, all as described, and for the purposes stated.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

HUGH H. CRAIGIE.

Witnesses:
ARTHUR C. FRASER,
JNO. E. GAVIN.