

No. 710,959.

Patented Oct. 14, 1902.

F. & F. H. ENGELHARD.

SELF CLOSING ANTIWATER HAMMER BALANCE VALVE.

(Application filed Oct. 10, 1901.)

(No Model.)

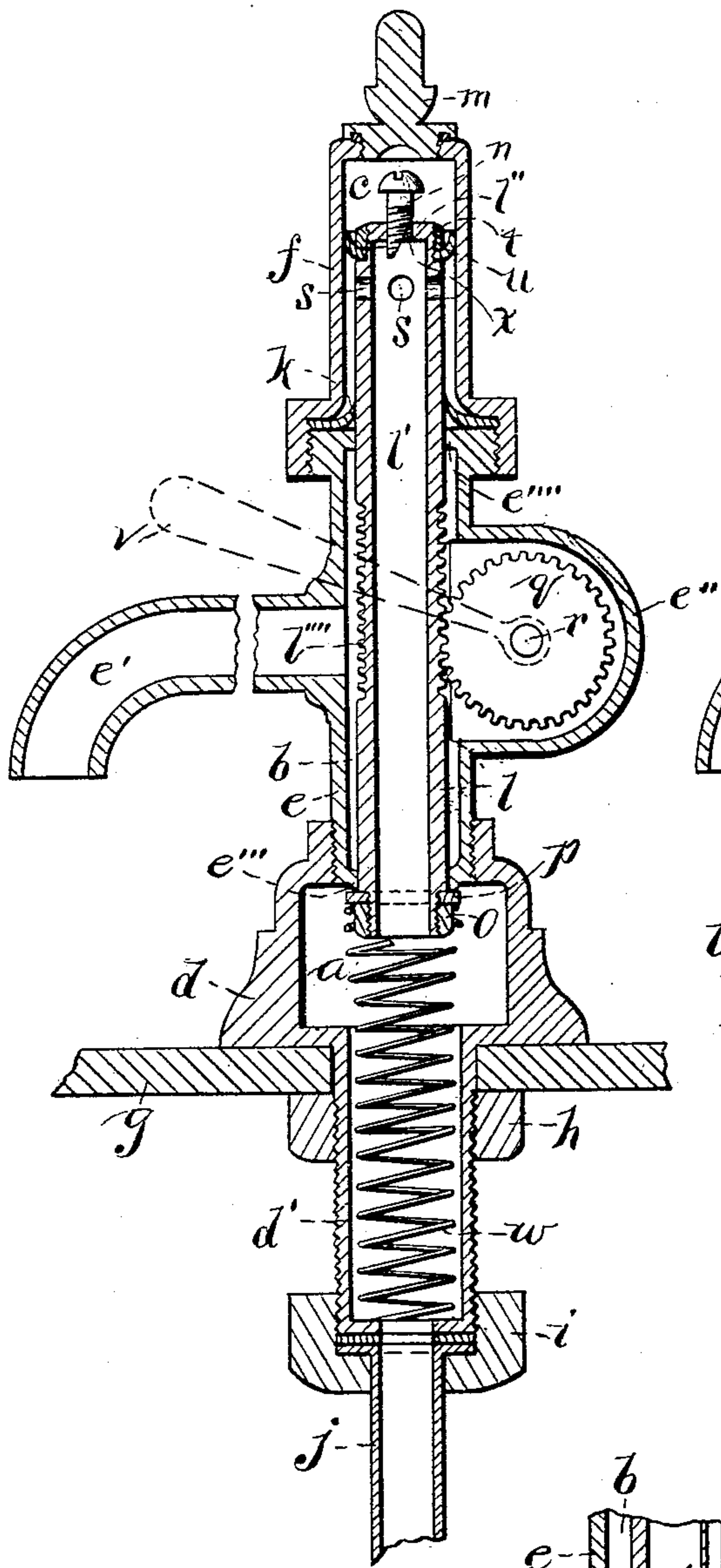


FIG. 1.

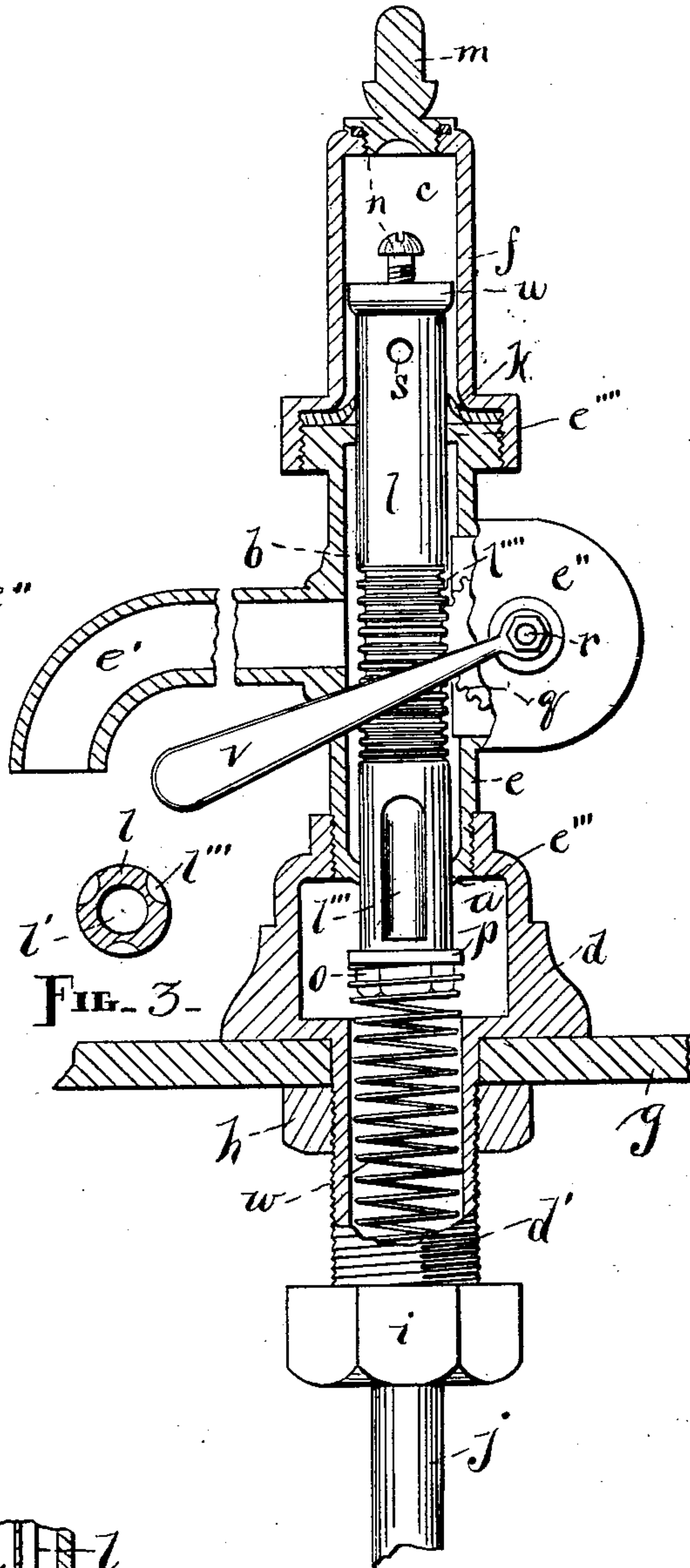


FIG. 2.

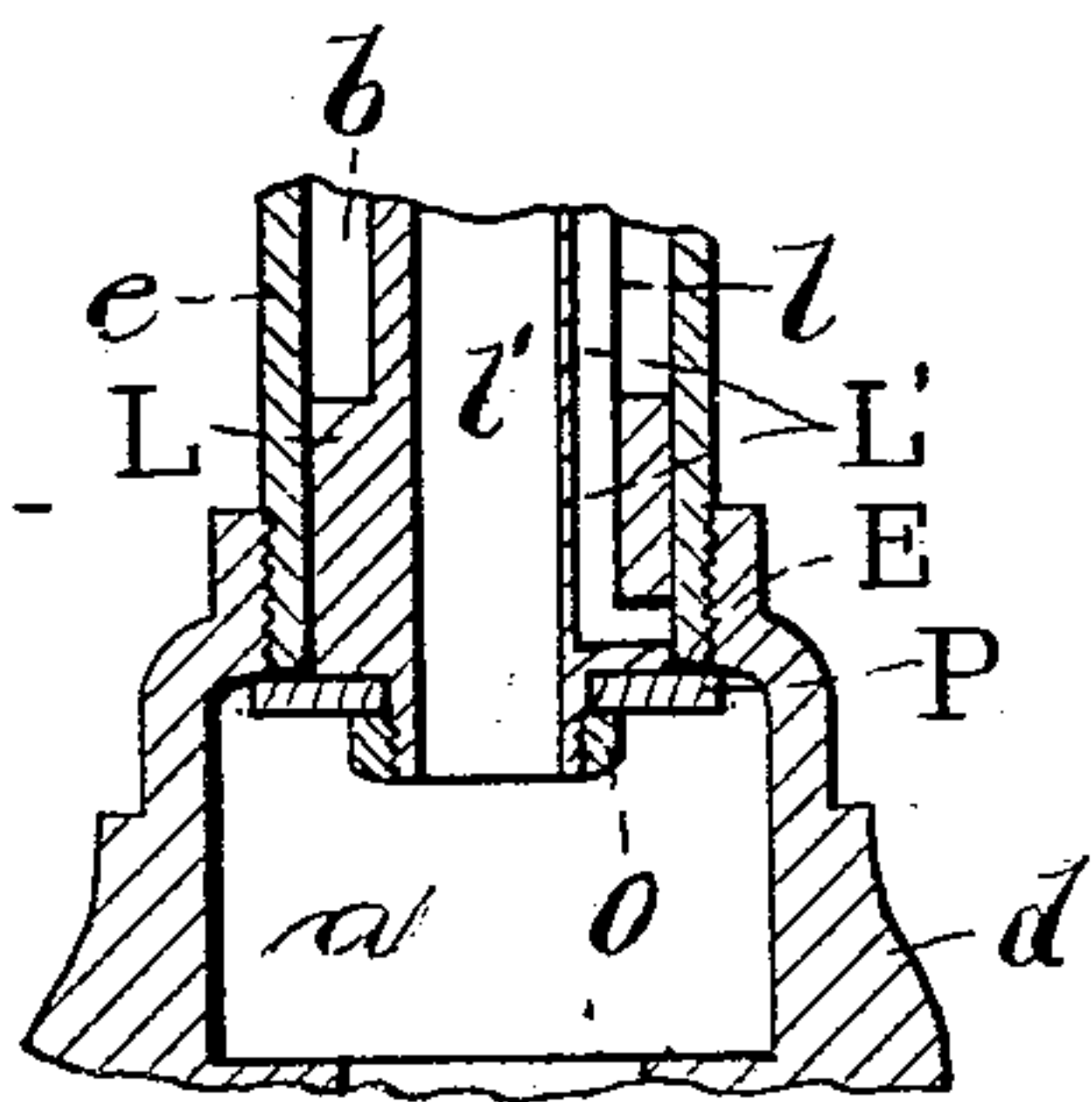


FIG. 4.

Witnesses

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SELF-CLOSING ANTIWATER-HAMMER BALANCE-VALVE.

SPECIFICATION forming part of Letters Patent No. 710,959, dated October 14, 1902.

Application filed October 10, 1901. Serial No. 78,173. (No model.)

To all whom it may concern:

Be it known that we, FRANK ENGELHARD and FREDERICK H. ENGELHARD, citizens of the United States, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented a new and useful Self-Closing Antiwater-Hammer Balance-Valve, of which the following is a specification.

Our invention relates to improvements in balance-valves for sinks, set-bowls, water-closets, &c., in which a peculiarly-constructed plunger operates in a trichambered casing, being manually actuated in one direction and automatically actuated in the other direction, all as hereinafter fully described, and especially pointed out in the claims.

The objects of our improvements are, first, to provide a self-closing valve which is compact, durable, and simple in construction; second, to furnish a valve that is free from water-hammer and otherwise noiseless, thus obviating a very undesirable feature or features common to almost all flushing devices for closets; third, to afford means for regulating the shutting off of the water-supply or, more explicitly, to equip our device with suitable means whereby the water above the cup-packing is permitted to escape in greater or less volume; fourth, to produce a device which when used in place of the ordinary self-closing faucets retains the advantages of convenience and economy without the disadvantage of requiring to be held open as the alternative of too quickly shutting off the water, and, fifth, to provide a device or apparatus embodying the advantages and accomplishing the objects herein set forth in an economical and practical manner. When employed in connection with a water-closet, our device takes the place of the expensive and troublesome tank and float-valve in common use and is more satisfactory in many ways, besides being superior from a sanitary point of view. We attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a vertical section of our invention, showing the members normally disposed and the valve closed; Fig. 2, a view showing the larger part of the casing in section and the position of the members at the instant the

valve is open to its fullest extent; Fig. 3, a cross-section of the lower part of the plunger, showing the waterway-grooves therein; and Fig. 4 a sectional view showing how to dispense with the spring.

Similar letters refer to similar parts throughout the several views.

The casing, which necessarily forms a part of our invention, is divided into three chambers *a*, *b*, and *c* in the manner hereinafter explained and preferably consists of three separable pieces—viz., the base *d*, the body *e*, and the cap *f*. The parts *d*, *e*, and *f* are screwed or otherwise securely fastened together, and the joints between them as well as all other joints in the device should be made watertight in any convenient and suitable manner, as by means of cement, rubber packing-rings, stuffing-boxes, &c.

The water-inlet chamber *a* is located in the base *d*, which rests on the seat or slab *g* and has a tubular part *d'* depending therefrom through a hole in the seat or slab. The part *d'* is externally screw-threaded to receive a nut *h*, which secures the device to the seat or slab *g*, and also a nut *i*, which holds the inlet-pipe *j* and a packing-ring in place. It will be observed that the supply or inlet pipe *j* opens into the chamber *a* through the tubular part *d'*, the bottom of which latter is closed except to the discharge from said pipe. Of course the methods herein shown and described for securing the device to a seat or slab and attaching the inlet-pipe to the base are not important elements in our invention and may be departed from at will, provided the essential features of the invention are not materially altered.

The body *e*, which contains the water-outlet chamber *b*, is provided with the outlet-pipe *e'* and the hollow extension *e''*. At the base of the body *e*, inside, is the valve-seat *e'''*, and under certain conditions communication between the chambers *a* and *b* is had through the opening in said valve-seat.

The chamber *c* in the cap *f*, Figs. 1 and 2, where the valve is balanced, is permanently cut off from direct communication with the chamber *b* by means of the hydraulic packing *k*, interposed between the body and said cap, and the plunger *l*, which is centered by an

annular shoulder e'''' at the top of said body and the valve-seat e''' at the bottom of the same. An opening in the top of the cap f is closed by the removable plug m , threaded into said opening.

The plunger l is preferably round and of the same diameter throughout, except as hereinafter specified, with a passage l' extending through the same. The passage l' is constricted at the top by the internal flange l'' , Fig. 1, internally threaded to receive the tapered screw n . The lower terminal of the plunger l is of less diameter than the major portion thereof and externally threaded to receive the nut o , which secures the valve on packing-ring p in place, and this ring is adapted to normally bear against the valve-seat e''' and render the joint between said plunger and valve-seat water-tight. In order to afford passage for the water from the chamber a into the chamber b when the plunger l is depressed, grooves l''' are provided in the lower part of said plunger, the bottoms of said grooves being closed to furnish an unbroken bearing-surface for the packing-ring p , as shown in Fig. 2. These grooves form external plunger-passages for the flow of water through the opening in the valve-seat p when the plunger is depressed. A cylindrical rack l'''' is formed on the plunger l to mesh with the gear q , which is carried by the spindle r in the extension e'' . In the upper part of the plunger l are one or more perforations or holes s , opening from the passage l' into the chamber c . The top of the spindle is of smaller diameter, like the bottom part, and threaded to receive a nut t , which secures the inverted-cup packing u in place.

A handle or lever v is fastened to the spindle r outside of the extension e'' and is the medium by means of which the valve is manually operated to open the same.

A spiral spring w is interposed between the packing-ring p and the floor of the tubular part of the base d to normally force the plunger l upward.

In Fig. 4 we show how the device may be constructed so as to dispense with the spring w , reliance being placed upon the force of the intake solely. Here a larger surface is provided for the water to impinge upon at the base of the plunger l . Some of the fluid that enters the chamber a escapes into the passage l' , but enough remains in said chamber to exert a force sufficient to elevate the plunger l . A packing-ring P of larger diameter than the packing-ring p may be used in this connection, which necessitates the enlargement of the diameter of the valve-seat and contiguous or adjacent parts. The valve-seat E for the packing-ring P is located at the base of the body e , the lower section of which is enlarged to accommodate the collar L , formed on the lower terminal of the plunger, which is otherwise unchanged. The collar L serves as a backing for the packing-ring P . The upper end of the base d must have an

enlarged opening, of course, to accommodate the enlarged bottom part of the body e . Waterway grooves and passages, as shown at L' , Fig. 4, are present in this construction, corresponding to the grooves l''' previously described. If desired, grooves may be cut into the collar L as well as into the sides of the plunger instead of the vertical and horizontal passages shown. The springless construction above described is believed to be quite as serviceable as the other, and we desire to include the same in the claims.

Assuming that the parts stand substantially as shown in Fig. 1, it will be understood that water rises through the pipe j to fill the chamber a , and that it also fills the passage l' in the plunger and escapes into the chamber c through the holes s and the opening x in the top of said plunger, but cannot enter the chamber b . The operation of our device will now be as follows: Depress the lever v from the position indicated by dotted lines in Fig. 1 to the position shown by full lines in Fig. 2 and release the same. The parts now stand substantially as shown in Fig. 2. The depression of the handle or lever forces down the plunger l against the resistance offered by the spring w or by the water in the chamber a , carries the packing-ring away from the valve-seat, and permits the water in the chamber a and from the inlet-pipe to flow into the chamber b through the grooves l''' or grooves and passages L' and escape through the outlet-pipe e' . At the same time the descent of the plunger l has drawn down the cup-packing u , and the water below the same in the chamber c causes said cup-packing to contract; otherwise the latter would not be able to descend freely, owing to the pressure of the water beneath it. As soon as the operating-lever is released the plunger comes under the influence of the pressure beneath the same and is raised by said pressure, but the plunger is permitted to move upward only so fast as the water above the cup-packing can be forced from the balance-chamber c into the passage l' through the opening x , because this water is now under pressure and causes said cup-packing to expand against the sides of the cap f , thereby preventing the passage of water outside of the plunger at this point. Although retarded in this manner the pressure in the chamber a continues to operatively exert itself until the valve is finally closed. The water continues to escape from the outlet-pipe until the grooves l''' or grooves and passages L' clear the valve-seat opening, when the packing-ring once more shuts off the flow. The parts now occupy their original positions ready for a repetition of the before-described operation. The time required for closing the valve is regulated by the tapered screw n , being increased or decreased by turning the latter out or in. Access is had to the screw n by removing the plug m .

Although this valve is described as for use in

connection with water, any other fluid can be successfully handled. It may be employed for drawing liquor in graduated quantities, for example.

5 We prefer to make the rack l'''' cylindrical, so that it will always mesh with the gear c , regardless of any rotary movement that may be imparted to the plunger l from any cause; but these serrations may be placed on one
10 side only, if desired, and some convenient means employed to prevent the plunger from turning, and although we have shown a gear it is plainly to be seen that a segment can be used in place thereof, in which event
15 the extension e'' may be made smaller. Moreover, any of the well-known equivalents for the rack and gear which are applicable may be employed in our invention.

We do not wish to be confined strictly to
20 the construction shown and described, as modifications such as those hereinbefore pointed out and others may be made without violating the spirit of our invention. Changes in shape, size, and position may also be made,
25 and in the number of grooves, holes, &c.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. In combination, a casing divided by a seat and a hydraulic packing into inlet and
30 outlet chambers and a balance-chamber, a plunger having an internal passage, extending through said outlet-chamber into said inlet and balance chambers and normally closing the seat-opening, the balance-chamber
35 terminal of said plunger having holes or openings therein, a cup-packing on said balance-chamber terminal between said hydraulic packing and the end of the plunger, said
40 holes or openings being arranged to afford communication between said passage and balance-chamber, both sides of said cup-packing, means for actuating the plunger in one direction, applied thereto intermediate of its
45 ends, and automatic means for actuating the plunger in the other direction, applied thereto at the inlet-chamber end, the plunger being retarded in the last-mentioned movement by the fluid in the balance-chamber and the cup-packing, substantially as set forth.

50 2. In combination, a casing divided by a seat and a hydraulic packing into inlet and outlet chambers and a balance-chamber, a plunger having an internal passage, extending through said outlet-chamber into said inlet and balance chambers and normally closing the seat-opening, the balance-chamber
55 terminal of said plunger having holes in the sides and an opening in the end, a tapered regulating-screw in said end opening, a cup-packing on said balance-chamber terminal
60 between said hydraulic packing and the end

of the plunger, said holes and opening being arranged to afford communication between said passage and balance-chamber, both sides of said cup-packing, means for actuating the
65 plunger in one direction, applied thereto intermediate of its ends, and automatic means for actuating the plunger in the other direction, applied thereto at the inlet-chamber end, the plunger being retarded in its last-men-
70 tioned movement by the fluid in the balance-chamber, the cup-packing and said regulating-screw, substantially as set forth.

3. In combination, a casing divided by a seat and a hydraulic packing into inlet and
75 outlet chambers and a balance-chamber, a plunger extending through said outlet-chamber into said inlet and balance chambers, a valve on the inlet-chamber end of said plunger, a spring arranged to normally force said
80 valve against said seat, means for actuating the plunger and valve against said spring, applied to the plunger intermediate of its ends, and a cup-packing on the balance-chamber
85 terminal of the plunger between the end thereof and said hydraulic packing, for automatically retarding the movement of the plunger and valve when released to the action of the spring, the plunger being provided with an
90 internal passage opening at one end into the inlet-chamber and at the other end into the balance-chamber, both sides of said cup-packing, substantially as set forth.

4. In combination, a casing divided by a seat and a hydraulic packing into inlet and
95 outlet chambers and a balance-chamber, a plunger extending through said outlet-chamber into said inlet and balance chambers, having an internal passage communicating with the two last-mentioned chambers, and outer
100 passages capable of communication with both the inlet and outlet chambers, a valve at the inlet-chamber end of the said plunger, adapted to close the seat-opening or to open the
105 same for the escape of fluid through said outer passages into the outlet-chamber, and a cup-packing on the balance-chamber terminal of the plunger between the end thereof and said hydraulic packing, adapted to retard the up-
110 ward movement of the plunger, communication between said internal passage and balance-chamber being through holes or openings both sides of said cup-packing, substantially as set forth.

In testimony whereof we have signed our
115 names to this specification in the presence of two subscribing witnesses.

FRANK ENGELHARD.

FREDERICK H. ENGELHARD.

Witnesses:

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WM. A. ENGELHARD.