No. 619,732. Patented Feb. 21, 1899.

J. DOUGLAS.

BALL VALVE.

(Application filed June 3, 1896.)

(No Model.)

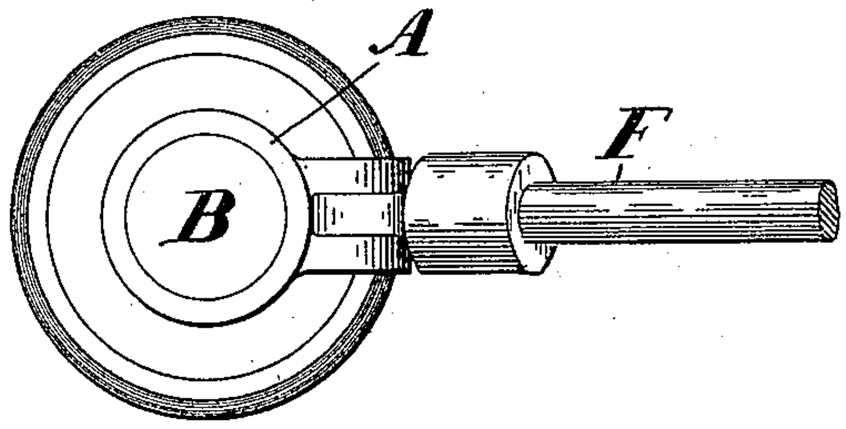
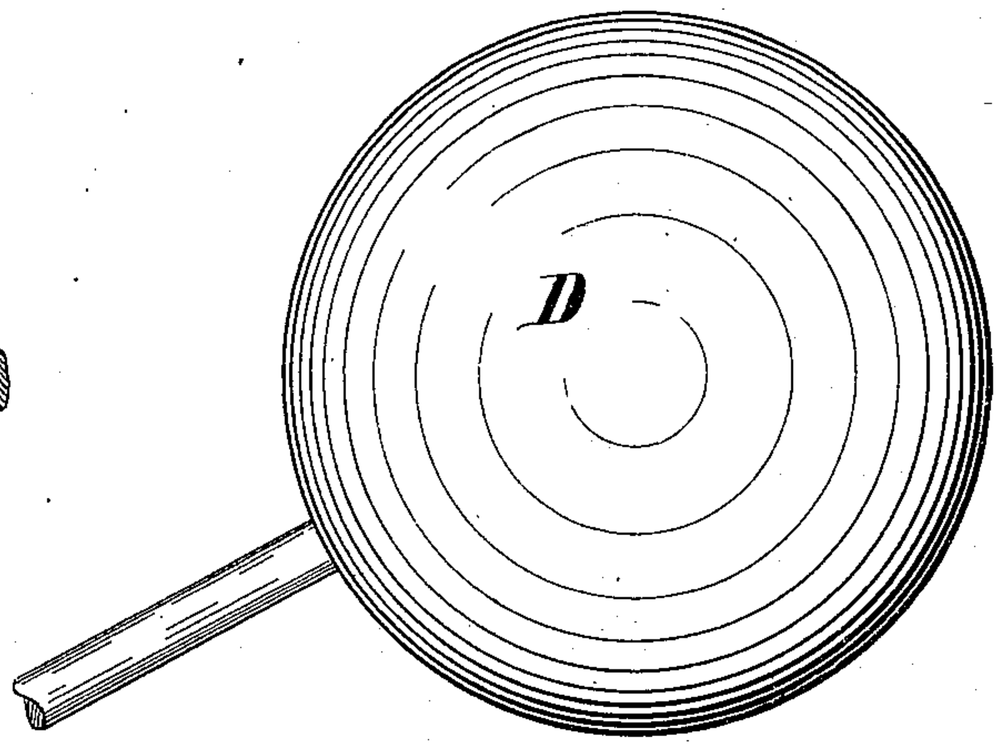


Fig. 1



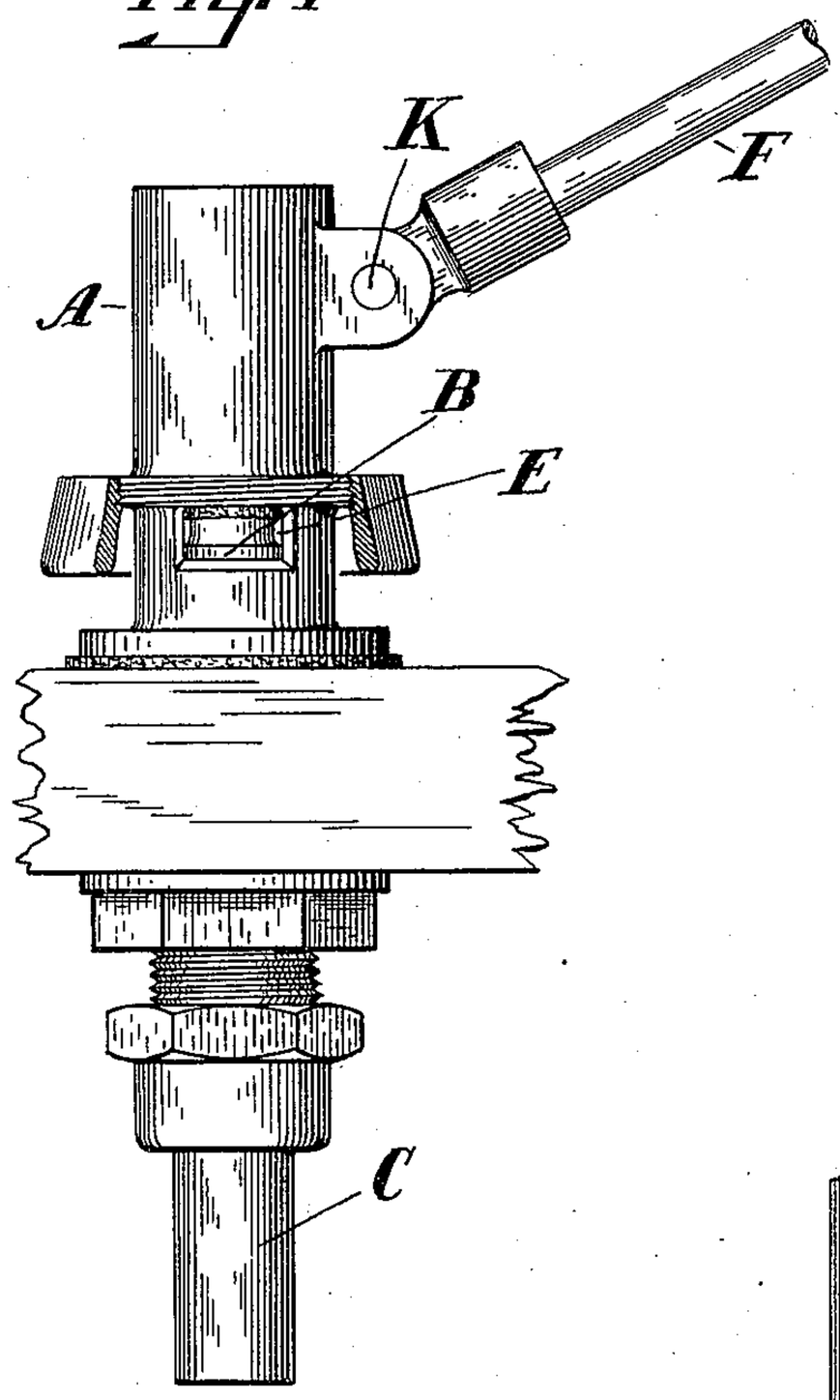


Fig. 2

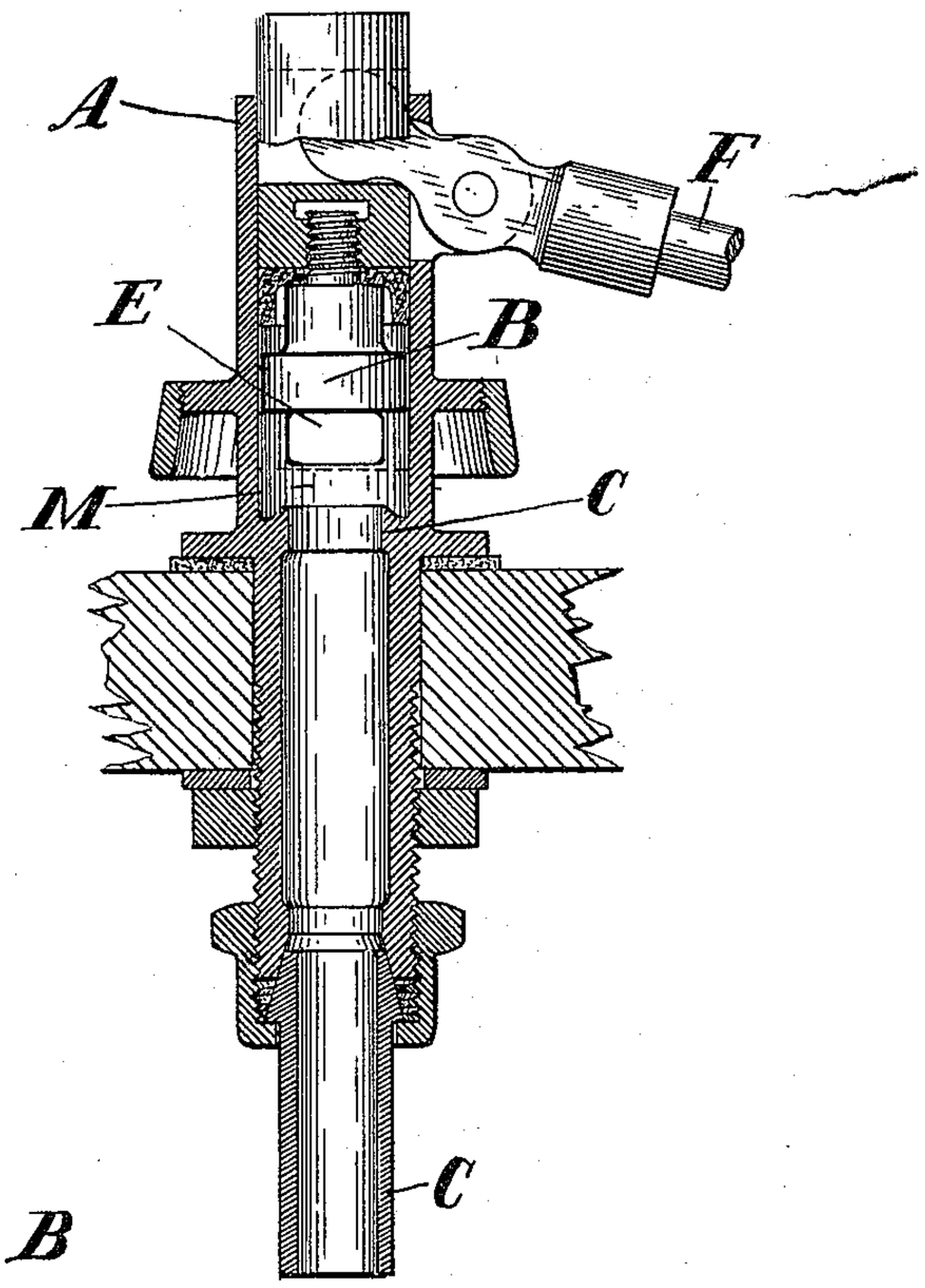


Fig 3

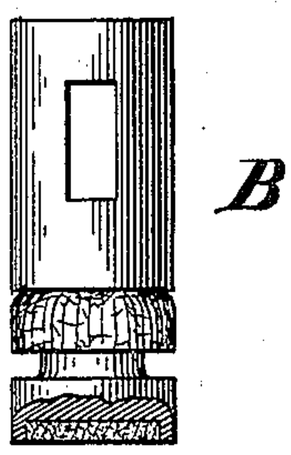


Fig. 4

WITNESSES

George Heidmann

Harvey G. Edwards.

INVENTOR

John Douglas

William Stein

Atty.

UNITED STATES PATENT OFFICE.

JOHN DOUGLAS, OF NORWOOD, OHIO.

BALL-VALVE.

SPECIFICATION forming part of Letters Patent No. 619,732, dated February 21, 1899.

Application filed June 3, 1896. Serial No. 594,061. (No model.)

To all whom it may concern:

Be it known that I, JOHN DOUGLAS, a citizen of the United States, residing at Norwood, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Ball-Valves, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to an improvement in ball-valves—that is, valves attached to and operated by a floating ball in the tank which rises on the surface of the water as the tank is filled until it closes the valve and stops the inflow of the water. They are specially adapted for use in connection with water-closet tanks which are flushed from a tank holding a small quantity of water, and as the tank becomes exhausted the ball moves down to the bottom of the tank and opens the inlet-valve, through which the tank is refilled until the ball is lifted to the point where the inlet-valve is closed and the inflow of water stopped. The objections to these valves as ordinarily constructed is that they produce a hissing sound and a rapid wearing away of the valve-seat and consequent leakage. In operation as the ports become partly closed the inflow is diminished and the movement of the float and the valve becomes slower and slower, so that the valve is closed gradually, and the nearer it comes to the point of final closing the slower the movement, and for a period before the water is completely cut off there is a hissing sound, which is annoying, and the valve-seat, especially where there is any sand or mineral in the water, is rapidly worn away. My invention is intended to overcome these disadvantages and produce a valve which will permit the water to flow into the tank freely, but when it approaches the closing-point pauses momentarily and then moves quickly and closes off the flow at once, entirely and sharply, and prevents the seeping, the hissing sound, and the unnecessary wear upon the seat.

The novel features of my invention will be more fully hereinafter set forth.

In the accompanying drawings, Figure 1 is a top plan view of the valve with a part of the arm to which the floating ball is attached. Fig. 2 is a side elevation. Fig. 3 is a side elevation partly in section, and Fig. 4 is a side elevation of the plunger.

A is a vertical cylinder in which the plunger B moves up and down and is fitted snugly and at the same time loose enough to move easily and freely and does not make a water-tight joint between it and the walls of the cylinder. The ball D is attached to the arm F, which is pivoted at K and attached to the plunger B, so that when the ball reaches the lowest extremity, as shown in Fig. 3, this arm F lifts the plunger B, so that its bottom surface is just above the top of the ports E, allowing the water under pressure and entering through the inlet-pipe C to pass freely into the tank. The inlet-pipe C is considerably smaller in diameter than the lower face or base of the plunger B and terminates at a point below the ports E in the cylinder A, leaving a chamber, as indicated at M, Fig. 3, below the port E and above the upper end of the inlet-pipe C, which chamber is of course of the same diameter as the rest of the cylinder A and considerably larger in diameter than the mouth or opening of the inlet-pipe C. The valve is of course closed entirely and tightly only when the bottom of the plunger is seated firmly on the opening at the top of the inlet-pipe C inside this chamber, (shown at M.)

As the ball D is lifted by the inflow of water through the ports E the plunger B is gradually moved downward until it substantially closes the ports E and reaches the point indicated by the dotted lines in Fig. 3. When this stage is reached, we have the upward pressure of the water from the inlet-pipe C pressing against the bottom of the plunger, which is considerably larger in diameter than the inlet-pipe and which does not fit so tightly within the cylinder as to prevent entirely the escape of water around its edges. The operation would seem to be that the pressure of the inflowing water when the ports are open is augmented by the momentum of the inflowing current, which when the ports or outlet-passage is nearly closed is reduced with comparative suddenness to a considerable degree and acts to produce a slight water-hammer, which will increase the submergence of the float, and that as soon as this water-hammer has become exhausted the float, acting with increased buoyant power, will

quickly close the valve and immediately stop all inflow or seeping of the water past the valve, with the consequent hissing sound and wearing of the seat. The effect of this balancing of pressures within this chamber M is to hold the plunger, as it were, suspended for a short time and to resist the increasing power of the ball D, and it will remain in this position until the ball D is more or less submerged, according to the pressure of the water, to such a degree as to break the balance between the downward pressure of the valve and the upward pressure of the water coming through the inlet-pipe into the chamber M, and when this accumulation of force has become sufficient the ball D will then rise, forcing down the plunger B, until it reaches a point above its seat C, and when that point is reached so that the volume of water that passes between the seat C and the bottom of the plunger B will be a smaller volume of water than can freely pass around the plunger B the accumulated pressure under the float D will then be stronger than the pressure under the plunger B and the float D will rise sharply, forcing down the plunger B quickly, closing off the water at once.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

In a ball-valve, the combination of an inlet-pipe, a chamber into which said inlet-pipe opens and larger in diameter than the opening from the inlet-pipe, said chamber provided with ports a short distance above the opening from the inlet-pipe, a plunger operated by a float moving in this chamber downwardly toward its seat upon the opening of the inlet-pipe, the plunger being slightly smaller than the chamber so as to permit the retarded passage of the water after it has passed in its downward movement the ports, substantially as shown and described.

JOHN DOUGLAS.

Witnesses:
GEORGE HEIDMAN,
HARVEY EDWARDS.