F. N. ROEHRICH.

ELECTRIC VALVE.

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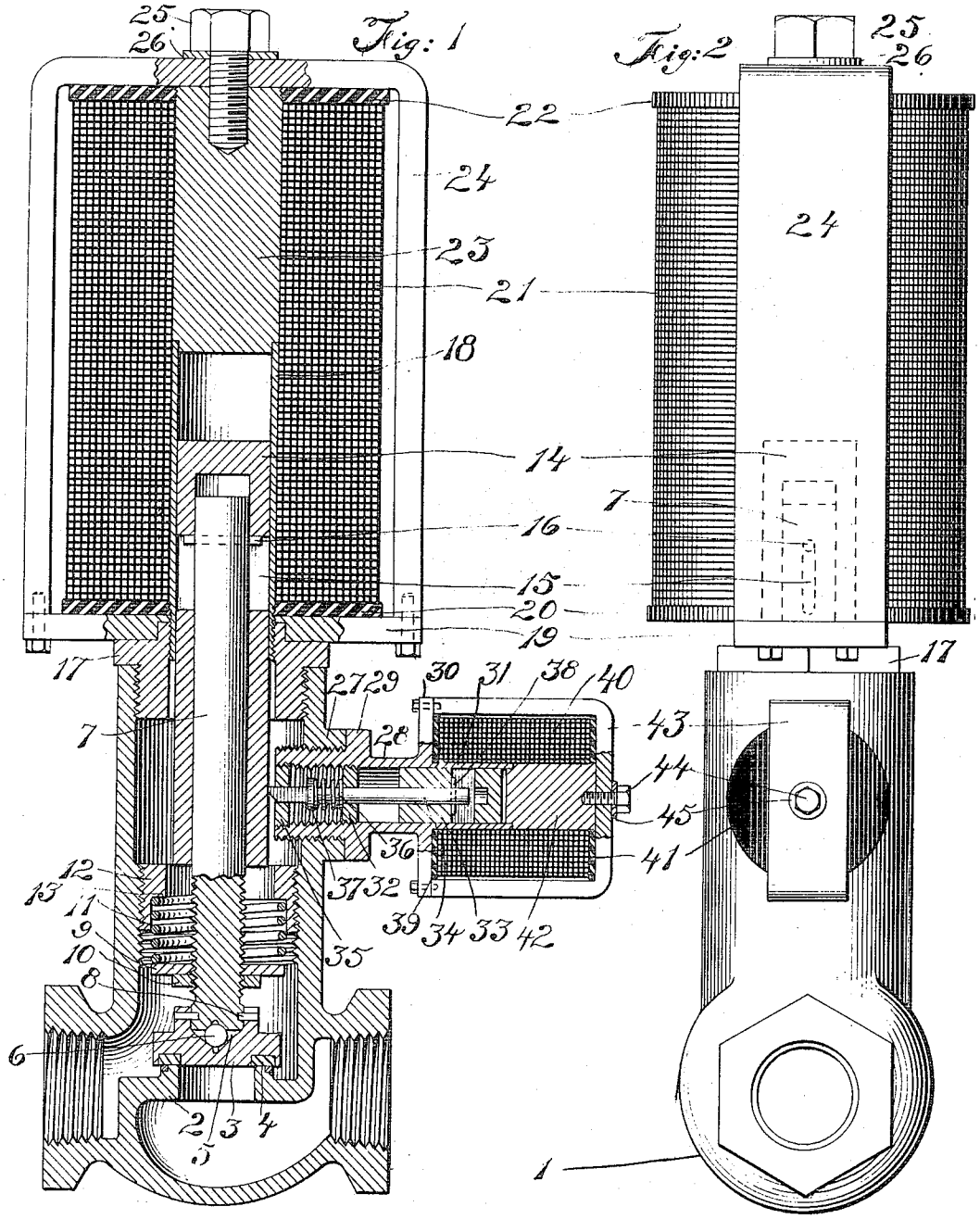
959,609. **Patented May 31, 1910.**



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ELECTRIC VALVE.

959,609. Specification of Letters Patent. Patented May 31, 1910.

Application filed July 30, 1909. Serial No. 510,490.

To all whom it may concern:

Be it known that I, FRANK N. ROEHRICH, a citizen of the United States, residing at the city of Jersey City, Hudson county, State of New Jersey, have invented a new and useful Electric Valve, of which the following is a specification.

My invention relates to electrically actuated valves and consists of means for opening a valve, for keeping it open and for closing it without the intervention of any moving part extending from the outside of the valve chamber to the valve within the chamber and of means for so doing without the passage of current between the time when the valve is opened and the time when it is closed. It thus not merely avoids the liability of leakage arising from a loose stuffing box and of loss of power from a tight stuffing box, but also prevents any waste of current during the time the valve remains open. It therefore constitutes an improvement on the construction set forth in the like entitled application of Schmidt, filed May 6, 1909, Ser. No. 494,391. The means employed are as will appear.

In the drawings Figure 1 is a partial vertical section and partial front elevation of my invention. Fig. 2 is a right side elevation of the same.

A valve body 1, preferably of brass, has midway between its ends a flat horizontal valve seat 2, having a circular rim at its top. A valve disk 3 has inserted on its under side a babbitt ring 4 so that when the disk is seated the ring fits closely upon the rim of the seat and closes the passageway through the body. In the center of the top of the disk is a circular pocket 5, concave at the bottom so as to hold a ball 6 at the exact center of the disk. The top of the disk thus forms a rim around the pocket. A stem 7 has a central concavity at its lower end so as to fit over the ball 6 and is secured to the disk by two opposed pins 8 passing through the rim at its top and into the stem. There is sufficient play of the stem about the pins and over the ball so that, as the stem is thrust down, the disk is seated perfectly flat. Just above the disk 3 the stem 7 is threaded for an internally threaded supporting disk 9, kept in any desired vertical position by a lock nut 10 underneath it. A coiled spring 11 surrounds the stem and abuts at its lower end against the upper surface of the disk. A little distance above the valve seat 2 the chamber 1 is internally threaded for supporting an externally threaded ring 12 having a shoulder 13 fitting over the top of and bearing down upon the spring 11. The spring, acting through the disk 9, the stem 7 and the ball 6, thus constantly tends to seat the disk 3 upon the seat 2. A core 14 has a hollow bore, extending from its lower end up to near its top and, toward its top, is slotted on both sides at 15. The upper and major part of the stem 7 loosely fits in the bore of the core and is transversely pierced near its top by a pin 16 extending at each end into the slots 15. When the core is unmagnetized the pin is in the top of the slots and supports the core as shown. The inside of the top of the casing 1 is threaded for the securing of a flanged ring 17, externally threaded underneath the flange, and fitting into and over the top of the casing. A thin tube 18, open at both ends, is externally threaded at its lower end and is then inserted into the inside of the top of the ring 17. The core 14 makes a reciprocating fit within the tube 18.

Surrounding the tube 18 and fitting over a rim on the central top of the ring 17 is a plate 19, supporting an insulating disk 20. In part surrounding the tube 18 and supported by the disk 20 is a solenoid coil 21 of insulated copper wire. A centrally perforated insulating disk 22 covers the top of the coil. A plug 23 passes through this latter disk and the upper half of the coil 21; and at its lower end, where it is of slightly less diameter, it fits tightly within the top of the tube 18. A yoke 24 fits over the plug 23 and the disk 22 and has its lower ends firmly bolted to the plate 19. A bolt 25 passes through a washer 26 and the center of the top of the yoke 24 into the plug 23 so as to hold the parts in firm position. It is understood that the usual connecting wires lead to and from the coil 21.

The parts 8 and 16 are preferably made of any steel suitable for pins and the part 11 is

preferably made of any steel suitable for springs. The ball 6 is preferably of hard steel. The tube 18 is preferably of brass. The parts 3, 7, 9, 10, 12, 19, 23, 24, 25 and 26 are preferably made of low carbon steel.

Projecting from the side of the body 1 near its top is a perforated and internally threaded boss 27. A casing 28, having a longitudinal cylindrical passage, at one end is internally threaded and is also there externally threaded for screwing into the corresponding thread of the boss 27; and it has an outer flange 29 closing over the outside end of the boss. Between the flange 29 and the other end of the casing 28 is an external plate 30 cast integral with the casing and similar to but much smaller than the plate 19. Outside of the plate 30 the casing 28 consists of a thin tube 31 similar in shape to but much smaller than the tube 18.

An annular stopper 32 fits into the internal thread of the casing 28 toward the outside of the boss 27. A transversely slotted core 33, similar to the core 14, but of less relative length, has a longitudinal perforation extending a little distance from the left of its imperforate right end as seen in Fig. 1 and through its other end; the core also makes a reciprocating fit in the casing 28 outside of the stopper 32. A rod latch 34 has one end within the slot of the core 33, passes through its perforation, the stopper 32 and a squared opening in a guide 35, so that it may bear at its other end against a part of the core 14 between the rings 17 and 12. The guide 35 fits into the internal thread of the casing 28 at its extreme end within the body 1. A light coiled spring 36 surrounds the latch 34 and bears at one end against the stopper 32 and at its other end against a collar 37 secured to the latch between the stopper 32 and the guide 35 before the latter is screwed into place. The end of the latch 34 adapted for bearing against the core 14 is preferably beveled as shown so as to present a somewhat sharp edge transverse to the core. The end of the latch 34 within the slot of the core 33 is secured in place by a transverse pin 38 similar to the pin 16. The latch 34 is thus free to reciprocate a little distance within the perforation of the core 33, but is limited in its movements by the pin 38.

Surrounding the tube 31 against the plate 30 is an insulating disk 39. In part surrounding the tube 31 and against the disk 39 is a solenoid coil 40 of insulated copper wire. A centrally perforated insulating disk 41 covers the outside of the coil. A plug 42 passes through this latter disk and the outer half of the coil 40; and at its inner end, where it is of slightly less diameter, it fits tightly within the outer end of the tube 31. A yoke 43 fits over the plug 42 and the disk 41 and has its inner ends firmly bolted to the plate 30. A bolt 44 passes through a washer 45 and the center of the outer end of the yoke 43 so as to hold the parts in firm position. It is understood that the usual connecting wires lead to and from the coil 40.

The parts 28, 33, 34, 43, 44 and 45 are preferably made of low carbon steel. The parts 32, 35 and 37 are preferably made of brass.

The method of operation is as follows: The parts being in the initial position as shown, the thrust of the spring 11 is holding the disk 3 upon its seat 2 so as to prevent any passage through the body 1; and also the thrust of the spring 36 only lightly holds the latch 34 against the core 14. When a sufficient electric current is passed through the coil 21, the consequent lines of magnetic force pass through the plug 23, the yoke 24, the plate 19 and the minor magnetizable parts in the same pathway so as to quickly pull the core 14 up toward the plug 23. In its ascent the lower ends of the slot 15 come in contact with the pin 16, delivering a hammer blow. The effect on the pin is to lift the stem 7, the disk 9 and the pin 8 so as to raise the disk 3 from off its seat 2, and also to compress the spring 11. Thereupon the spring 36, acting on the collar 37, presses the beveled end of the latch 34 against the core 14 in its elevated position to hold in such position after the cessation of current through the coil 21. Thus a momentary current through the coil 21 results in an opening and a keeping open of the valve without the use of any more current than is sufficient to open the valve. When, however, it is desired to close the valve a less electric current is passed through the coil 40. The consequent lines of magnetic force pass through the plug 42, the yoke 43, the plate 30 and the minor magnetizable parts in the same pathway so as to quickly pull the core 33 outward toward the plug 42. In this movement the slot of the core, acting on the pin 38, carries the latch 34 just far enough to release the core 14. Thereupon the spring 11 reseats the disk 3 and the valve is closed. This result also only requires a momentary current through the coil 40. Upon the cessation of such latter current the spring 36, acting on the collar 37, presses the beveled end of the latch 34 against the core 14 in the initial position as shown.

It will be noted that the nut 17, the tube 18 and the plug 23 all form parts of the top wall of the valve chamber; that the casing 28 and the plug 42 also form parts of the wall of this chamber; and that the wall of the chamber is imperforate except at the ends.

As before indicated the opening and closing of the valve is accomplished by one brief current through the coil 21 and another brief current through the coil 42 without any intervening use of current.

This construction of valve is especially useful for controlling the flow of gas to the burners of an instantaneous water heater, as is more fully described in my copending application entitled Water controlled switch.

I claim:

1. In combination a valve chamber having a valve seat, a valve adapted first to be positioned in one position in relation to said seat and then in another position in relation to said seat, a magnetizable device wholly within said chamber, normally holding said valve in whichever position it may be positioned and operating when magnetized to release said valve, and an electric device wholly without said chamber and operating when energized to magnetize said magnetizable device.

2. In combination a valve chamber having a valve seat, a valve adapted first to be positioned in one position in relation to said seat and then in another position in relation to said seat, means tending to position said valve in one of said positions, a magnetizable device wholly within said chamber, normally overcoming the tendency of said means and operating when magnetized to release said means, and an electric device wholly without said chamber and operating when energized to magnetize said magnetizable device.

3. In combination a valve chamber having a valve seat, a magnetizable valve wholly within said chamber and adapted first to be positioned in one position in relation to said seat and then in another position in relation to said seat, means tending to position said valve in one of said positions, a magnetizable device wholly within said chamber, normally overcoming the tendency of said means and operating when magnetized to release said means, an electric device wholly without said chamber and operating when energized to magnetize said magnetizable device, and an electric device wholly without said chamber and operating when energized to magnetize said valve so as to position it in the other of said positions.

4. In combination a valve chamber having a valve seat, a valve adapted first to be positioned in one position in relation to said seat, a reciprocating member secured to said valve and adapted for so positioning said valve, a magnetizable device wholly within said chamber, normally holding said member in whichever position it may be positioned, thereby holding said valve in a corresponding position, and operating when magnetized to release said member, and an electric device wholly without said chamber and operating when energized to magnetize said magnetizable device.

5. In combination a valve chamber having a valve seat, a valve adapted first to be positioned in one position in relation to said seat and then in another position in relation to said seat, a reciprocating member secured to said valve, means tending to position said valve in one of said positions, a magnetizable device wholly within said chamber, normally acting on said member so as to overcome the tendency of said means and operating when magnetized to release said member, and an electric device wholly without said chamber and operating when energized to magnetize said magnetizable device.

6. In combination a valve chamber having a valve seat, a valve wholly within said chamber and adapted first to be positioned in one position in relation to said seat and then in another position in relation to said seat, a magnetizable reciprocating member secured to said valve, means tending to position said valve in one of said positions, a magnetizable device wholly within said chamber, normally acting on said member so as to overcome the tendency of said means and operating when magnetized to release said member, an electric device wholly without said chamber and operating when energized to magnetize said magnetizable device, and an electric device wholly without said chamber and operating when energized to magnetize said member so as to position said valve in the other of said positions.

7. In combination a valve chamber having a valve seat, a valve adapted first to be postioned in one position in relation to said seat and then in another position in relation to said seat, a reciprocating part secured to said valve and adapted for positioning said valve in one of said positions, means tending to position said valve in the other of said positions, a magnetizable latch wholly within said chamber and adapted when deënergized to engage said part so as to hold said valve in position notwithstanding the tendency of said means, a spring wholly within said chamber and tending to force said latch into such engagement, and a magnet winding wholly without said chamber and operating when energized to withdraw said latch from such engagement.

8. In combination a valve chamber having a valve seat, a valve adapted first to be positioned in one position in relation to said seat and then in another position in relation to said seat, a magnetizable reciprocating part secured to said valve and operating when magnetized to position said valve in one of said positions, means tending to position said valve in the other of said positions, a mag-

netizable latch wholly within said chamber and adapted when deënergized to engage said part so as to hold said valve in position notwithstanding the tendency of said means, a spring wholly within said chamber and tending to force said latch into such engagement, a magnet winding wholly without said chamber and operating when energized to withdraw said latch from such engagement, and an electric device operating when energized to magnetize said part.

9. In combination a valve chamber having a valve seat wholly within said chamber and adapted first to be positioned in one position in relation to said seat and then in another position in relation to said seat, a magnetizable reciprocating part wholly within said chamber, secured to said valve and operating when magnetized to position said valve in one of said positions, means tending to position said valve in the other of said positions, a magnetizable latch wholly within said chamber and adapted when deënergized to engage said part so as to hold said valve in position notwithstanding the tendency of said means, a spring wholly within said chamber and tending to force said latch into such engagement, a magnet winding wholly without said chamber and operating when energized to withdraw said latch from such engagement, and an electric device wholly without said chamber and operating when energized to magnetize said part.

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