

Sept. 27, 1927.

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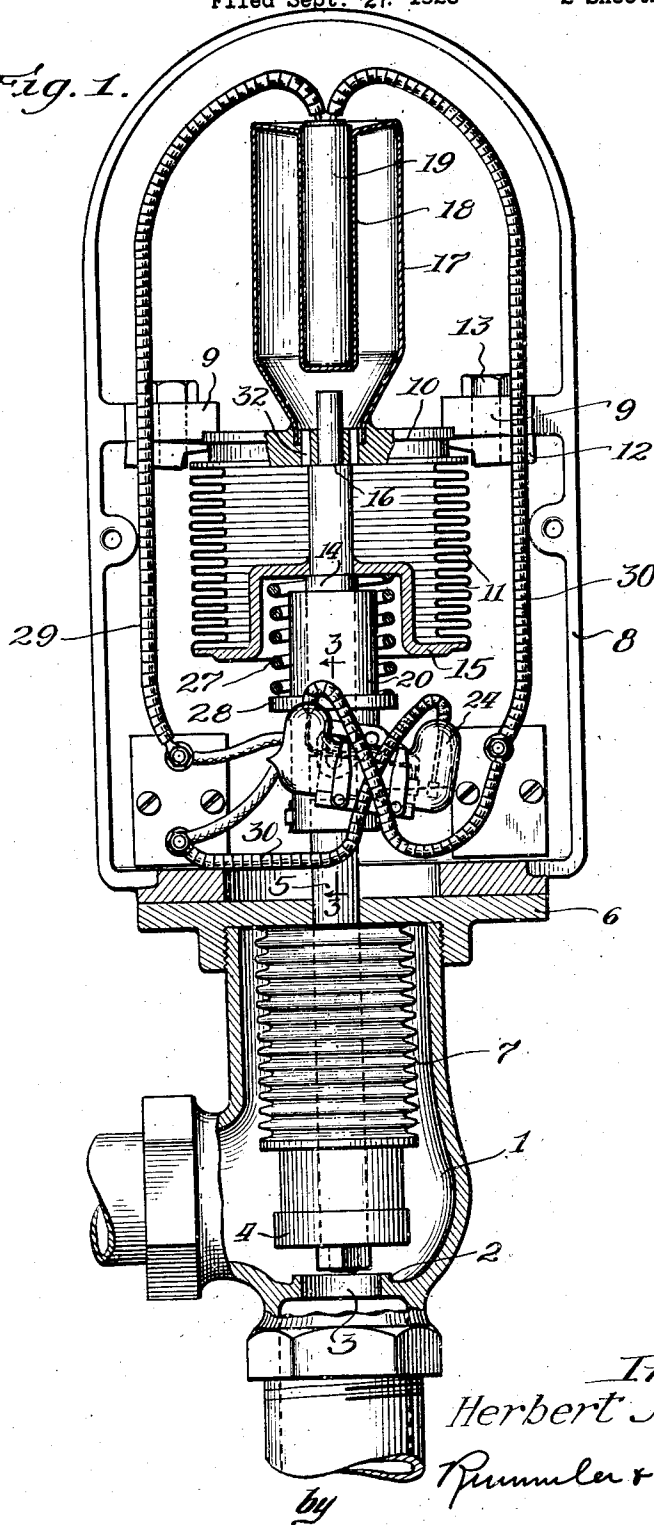
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ELECTRICALLY OPERATED VALVE

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2 Sheets-Sheet 1

Fig. 1.



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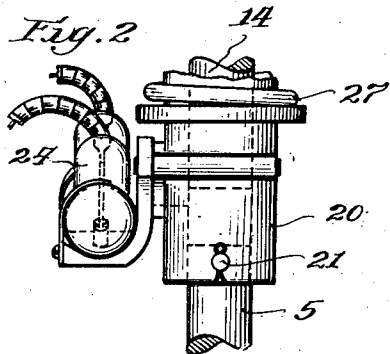
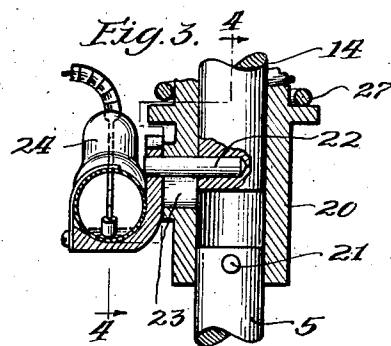
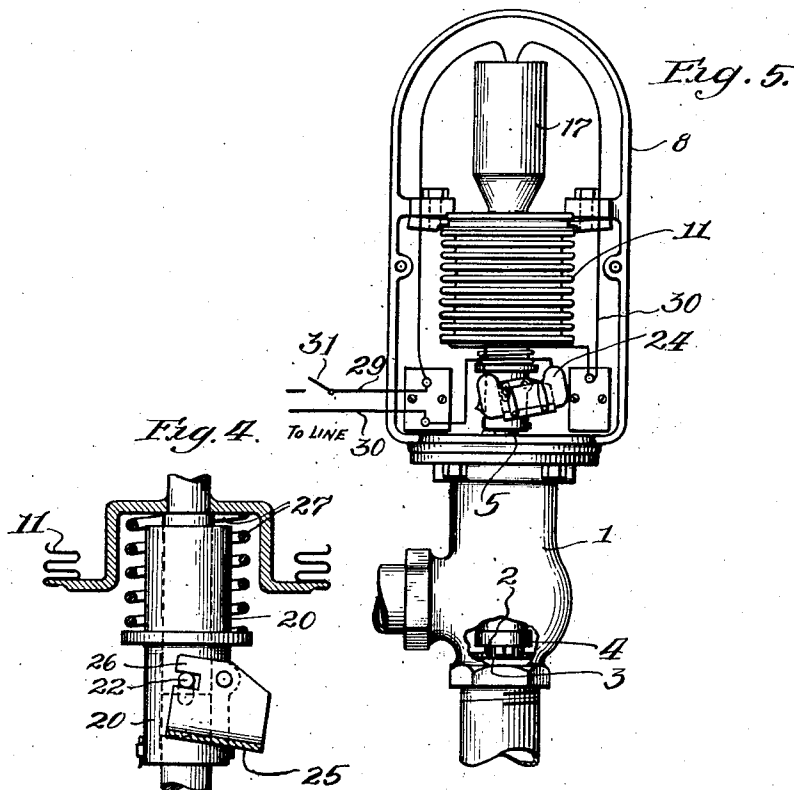
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UNITED STATES PATENT OFFICE.

HERBERT J. SAUVAGE, OF CHICAGO, ILLINOIS, ASSIGNOR TO ELECTRO THERMOSTATIC CONTROL COMPANY, OF CHICAGO, ILLINOIS, A COMMON-LAW TRUST.

ELECTRICALLY-OPERATED VALVE.

Application filed September 27, 1926. Serial No. 138,099.

This invention relates to improvements in electrical means for operating valves and the like, and is chiefly distinguished by having the controlling switch carried directly by the valve stem and operated by relative movement between the stem and an electrically driven plunger which is in yieldable engagement with the stem. The movement is caused by the plunger being operated slightly while the valve is in contact with its seat, the connection being sufficiently rigid to prevent relative movement when the valve is off the seat.

Heretofore the switch was separately mounted and operably engaged by a pin or lug fixed to the valve stem. This arrangement did not permit any movement for operating the switch after the valve was seated, so that the switch had to open simultaneously with the closing of the valve. This arrangement also involved complicated constructions and possessed other disadvantages, which it is desired to overcome in this invention.

The main objects of the present invention are to provide a more simplified structure in which the difficulties of securing perfect alinement between the valve stem and the housing are avoided; to provide an electrically operated valve which may be remotely controlled in a simple manner without requiring an excessive amount of current, and which is readily adaptable for many different types of installations and uses; and to provide such a device in which no stops or special means are required for holding the valve closed, nor for holding the valve in the open position, the positions being controlled entirely by the special form of electrical motor.

An illustrative embodiment of this invention is shown in the accompanying drawings, in which:

Figure 1 is a sectional front elevation of the device in normal position, with the cover of the switch housing removed.

Fig. 2 is a fragmentary side elevation of the switch mounting.

Fig. 3 is a section on the line 3—3 of Fig. 1.

Fig. 4 is taken on the line 4—4 of Fig. 3.

Fig. 5 is an elevation of the valve with the cover removed, showing the closed position with the switch open.

Referring to the drawings, a standard type

of valve construction is shown having the cast valve body 1, in which is formed the valve seat 2 surrounding the port 3. The valve head 4 is attached to the valve stem 5, which is slidable through the upper flange 6 of the valve body. The bellows 7 is sealed to the valve head and to the flange 6, and serves to prevent leakage past the valve stem.

A hood-shaped switch housing 8 is secured to the flange 6, and is provided with oppositely disposed lugs 9. The lugs 9 are the only portions of the switch housing which are used for attaching any of the moving parts. The head 10 of the bellows 11 is gripped to the lugs 9 by means of blocks 12, which are drawn up by means of the cap screws 13. The plunger 14 is sealed into the lower recessed head 15 of the bellows, and extends slidably through the center of the upper head 10. The plunger 14 is provided with a shoulder 16 which contacts with the lower surface of the head 10 and provides a stop for limiting the bellows compression. An inverted cup-shaped member 17 is sealed into the upper head 10. The member 17 is provided with a cylindrical recess 18 in the upper end for receiving the electrical heater cartridge 19.

The upper end of the valve stem 5 is terminated a short distance above the flange 6, and carries a sleeve 20 which is rigidly secured to the end of the stem by means of the pin 21. The lower end of the plunger 14 extends slidably into the sleeve 20 and carries a pin 22, which projects through a slot 23 in the walls of the sleeve 20.

The mercury bulb switch 24 is attached to the lever 25, which lever is pivotally mounted in the side of the sleeve 20 and is provided with a fork 26, in which is engaged the outer end of the pin 22.

A spring 27 is seated on the annular flange 28, which is integrally formed on the sleeve 20, and the upper end of the spring 27 bears against the bottom of the recess in the lower bellows head 15. The spring 27 tends to separate the ends of the plunger 14 and the valve stem 5. This raises the pin 22 into contact with the upper end of the walls of the slot 23, and rotates the lever 25 counterclockwise, as viewed in Fig. 1, to tilt the switch 24 into closed position.

The wires 29 and 30 lead from the opposite terminals of the heater cartridge 19 and may be connected directly to the com-

mon 110 volt power lines. The line 30 is connected through the switch 24, and a remote control switch 31 may be inserted in either of the lines 29 or 30. This switch 31 may be operated in any desirable manner, as by hand or by means of a thermostatic control.

In the open position, shown in Fig. 1, it may be seen that the bellows 11 is collapsed by the contraction of the fluid enclosed therein, which draws the shoulder 16 of the plunger 14 into contact with the bellows head 10, which is rigidly secured to the switch housing 8. The spring 27 is extended and holds the plunger pin 22 in contact at the upper end of the slot 23. This positions the control switch 24 in the "on" position, and the valve head 4 is then raised from contact with the seat 2. When the lines 29 and 30 are energized, the fluid in the member 17 is heated and expanded. The pressure is communicated into the bellows through ports 32, provided in the head 10, and the bellows is thereby expanded. The lower head 15 of the bellows then moves downwardly as the fluid continues to expand and drives the valve head 4 into contact with the seat 2, for closing the valve port 3. As soon as the downward motion of the head 4 is stopped, the continued expansion of the bellows moves the end of the plunger 14 downwardly in the sleeve 20. This downward movement of the pin 22 rotates the switch lever 25 so that the bulb switch 24 is tilted to the "off" position, as shown in Fig. 5. The heater 19 is then disconnected and further expansion is stopped.

When the fluid in the bellows 11 cools, the plunger 14 moves upwardly in the sleeve 20 before the valve head 4 can be lifted from its seat. If the switch 31 is still closed, the heater 19 will be re-energized when the bulb 24 is tilted to the closed position. The bellows will then be re-expanded before the valve head 4 is lifted, and the tilting of the switch 24 will be repeated from "on" to "off" positions, holding the valve closed until the remote control switch 31 is opened. When the switch 31 is opened and the lines 29 and 30 de-energized, the fluid in the bellows 11 contracts to draw the bellows together and completely open the valve.

By carrying the control switch directly on the stem of the valve, the construction is greatly simplified, and accuracy is easily attained since all the alinements which are required are in relation to the sleeve 20. The operating structure including the bellows and the switch, is contained in the housing 8, which may be attached to the valve flange in the rotative position required. The use of a special valve stem is eliminated and the regular form of stem may be used by

attaching the sleeve 20 to the upper end. Also a very important advantage is the simple manner in which the valve may be controlled.

While but one specific embodiment of this invention has been herein shown and described, it will be understood that numerous details of the construction shown may be altered or omitted without departing from the spirit of this invention as defined by the following claims.

I claim:

1. In combination, a support, a member movably mounted in said support, means for limiting the movement of said member, a second member mounted in the support and yieldably engaged with the first member, electrical means for moving the second member, and a switch for controlling said electrical means, said switch mounted on one of said members and operatively connected to the other member so that the switch is operated when the second member is moved while the first member is held from moving.

2. In combination, a housing having a seat, a member movably mounted in the housing for movement into and out of contacting relation with said seat, a second member yieldably engaged with said member, electrically operated means for moving the second member, and a switch for controlling said means, said switch mounted on one of said members and connected to the other member so that the switch is operated when the one member moves relatively to the other member.

3. In combination, a housing having a valve seat, a valve stem having a valve head movably mounted in the housing for movement into and out of contacting relation with said seat, a plunger slidably engaged with said stem for limited relative movement therewith, a spring compressed between the stem and plunger, electrical means for moving the plunger, and a switch for controlling said means, said switch mounted on the stem and connected to the plunger so that the switch is operated when the plunger moves with respect to the stem.

4. In combination with a valve having a movable member for opening and closing the valve, the movement of said member being stopped when the valve is closed, a sleeve mounted on said member, a plunger mounted with a limited sliding movement in the sleeve, electrical means for moving the plunger, and a switch for controlling said means, said switch mounted on the sleeve and operatively connected to the plunger.

Signed at Chicago this 25th day of Sept., 1926.

HERBERT J. SAUVAGE.