Jan. 21, 1930. D. O. MARKS 1,744,276

VALVE POSITION INDICATING MEANS AND CIRCUIT CLOSER

Filed Dec. 7, 1925 2 Sheets-Sheet 1

Fig. 1

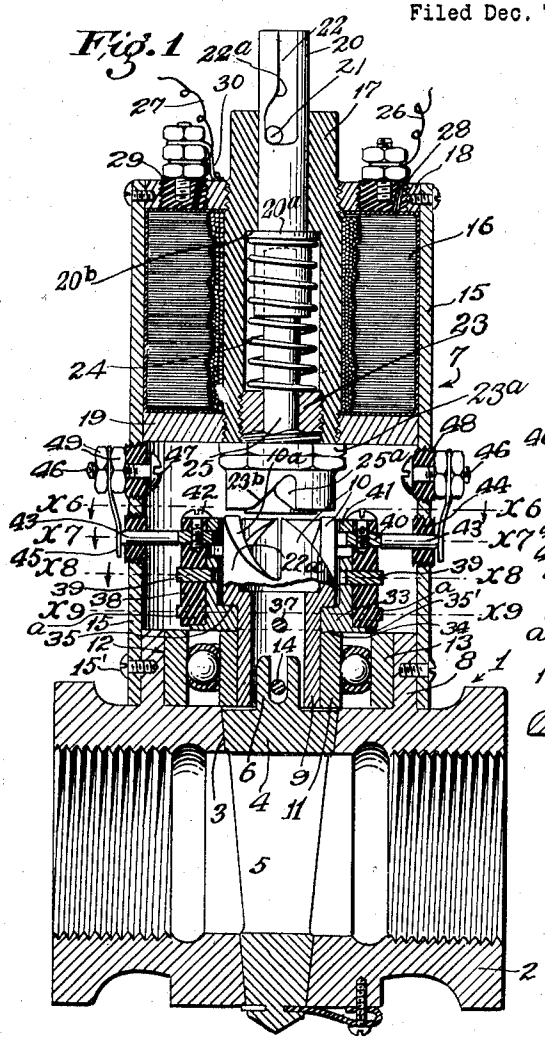


Fig. 2

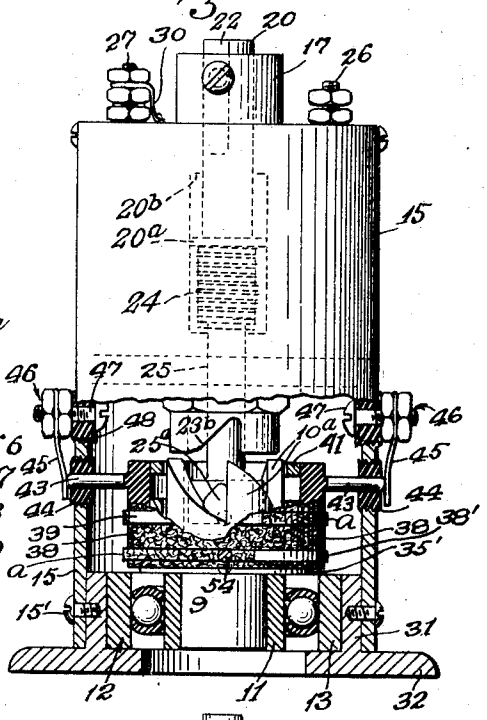


Fig. 3

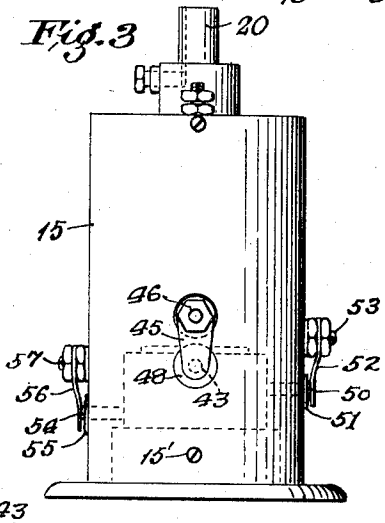


Fig. 4

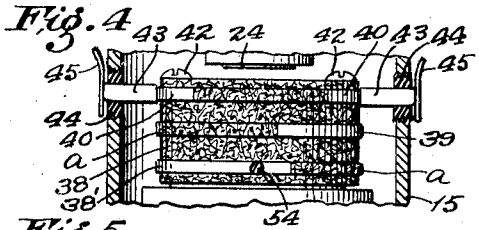
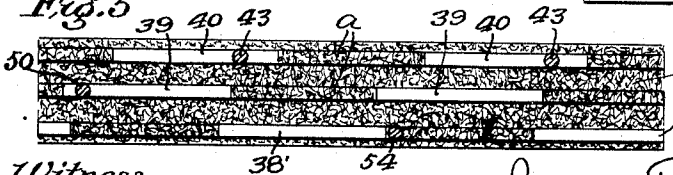


Fig. 5



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VALVE POSITION INDICATING MEANS AND CIRCUIT CLOSER

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Fig. 6

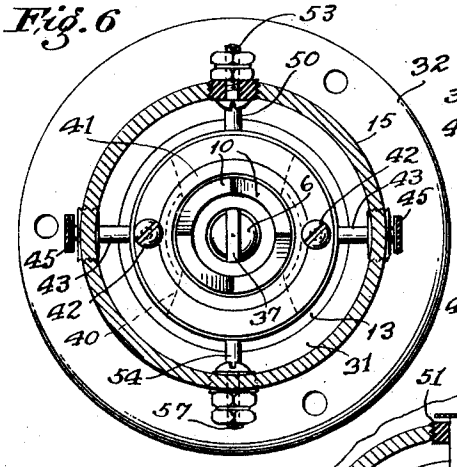


Fig. 7

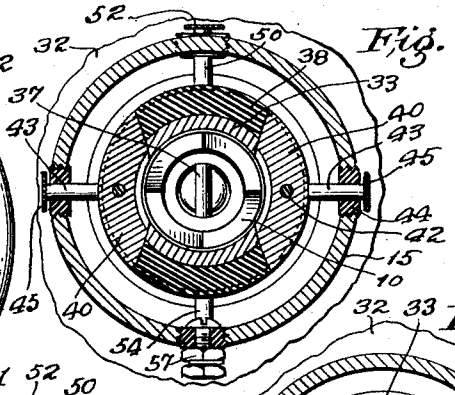


Fig. 9

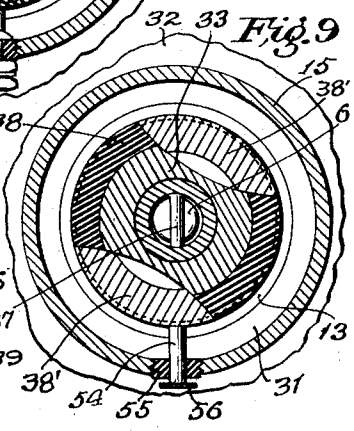


Fig. 8

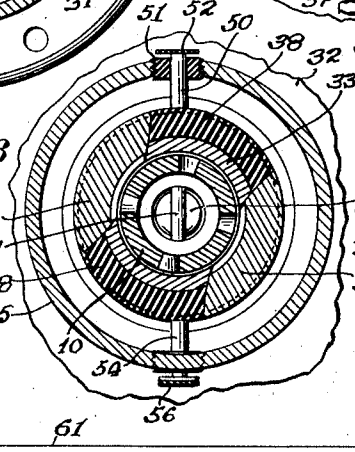


Fig. 11

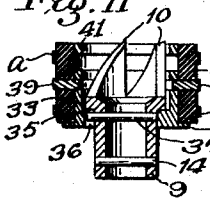
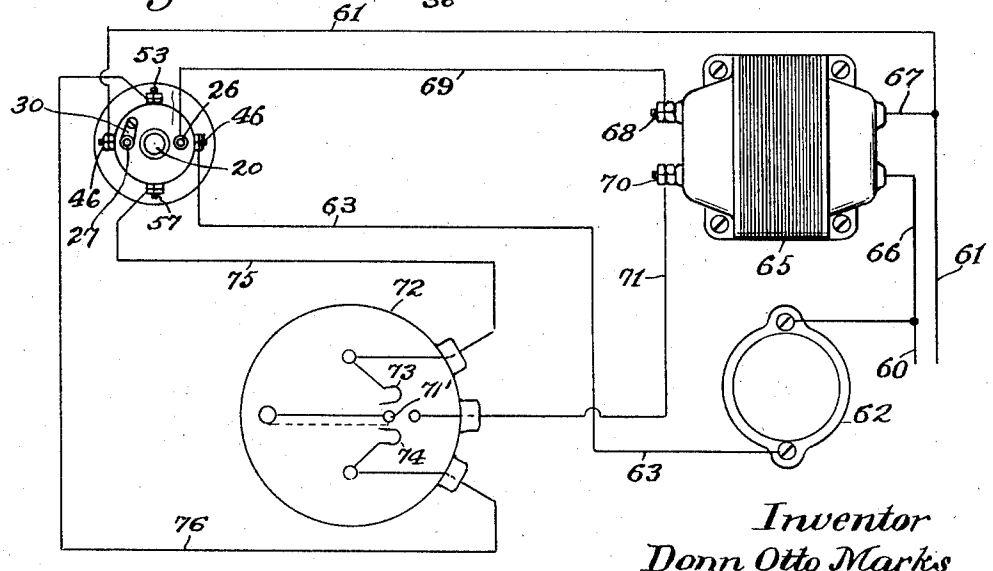


Fig. 10



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UNITED STATES PATENT OFFICE

DONN OTTO MARKS, OF LOS ANGELES, CALIFORNIA, ASSIGNOR TO GEORGE GARTLING, OF LOS ANGELES, CALIFORNIA

VALVE-POSITION-INDICATING MEANS AND CIRCUIT CLOSER

Application filed December 7, 1925. Serial No. 73,692.

My invention relates to improved and novel means more particularly adapted to be operated by the electro-magnet means disclosed in my co-pending application filed May 28, 1923, Serial No. 641,950.

An object of my invention is to provide novel means whereby a circuit may be closed to electrically indicate the position of a valve actuated by a common means for moving the valve spigot and the circuit closing means.

An object is to provide novel means of the above character in which all the electrical connections are easily accessible for installation purposes.

In certain types of refrigerator systems in which an electric motor drives a pump which circulates the cooling medium, it is necessary to intermittently start and stop the motor to regulate the circulation of the cooling medium to maintain a practically constant temperature in the refrigerator.

Another object is to provide novel electrically operated means which may be used in conjunction with a thermostat to automatically close and open the circuit to a refrigerator cooling medium circulating motor.

A further object is to provide a simple and effective means of the above character which will not readily get out of order, and which will require but minimum attention.

Features of my invention reside in the applicability of the device to indicate the position of a valve or for use merely as a switch.

Other objects, advantages and features of invention may appear from the accompanying drawings, the subjoined detailed description and the appended claims.

The drawings illustrate my invention in the form that I at present deem best, showing the invention applied for use in connection with an electro-magnet controlled valve and for use merely as a circuit breaker.

Figure 1 is a longitudinal sectional view of my invention applied to a valve.

Fig. 2 is a side elevation of my invention adapted for use as a circuit breaker, and with parts broken away to show the interior construction.

Fig. 3 is a side elevation of the device shown in Fig. 2, looking from the right hand side of Fig. 2.

Fig. 4 is a fragmentary sectional view showing an elevation of the electric timing cylinder.

Fig. 5 is a development of the timing cylinder and movable contact segments.

Fig. 6 is a sectional view on line x^6, Fig. 1.

Fig. 7 is a sectional view on line x^7, Fig. 1.

Fig. 8 is a sectional view on line x^8, Fig. 1.

Fig. 9 is a sectional view taken on line x^9, Fig. 1.

Fig. 10 is a diagrammatic wiring view of my invention applied as a circuit breaker for use in connection with a refrigerator motor.

Fig. 11 is a fragmental sectional view showing the connection between the rotatable sleeve and metal ring.

The valve 1 is of the stop cock type and comprises a body 2 provided with a taper socket 3 in which is rotatably mounted a taper spigot 4 through which a passageway 5 is provided to permit the passage of fluid therethrough.

The upper end of the spigot 4 is provided with a slotted extension 6, which is adapted to be engaged by valve operating means 7 fitted to a circular extension 8 of the valve body 2. The valve operating means are arranged above and in axial alignment with the valve spigot.

The valve operating means comprises a sleeve 9 the upper end of which is enlarged and provided in the present instance with four equi-distant teeth 10 which are engaged by a reciprocating pole piece of a solenoid to thus rotate said sleeve and open and close the valve.

The sleeve 9 is snugly fitted to an inner ring 11 of a combined annular and thrust bearing 12, the outer ring 13 of which is fitted to the inner surface of the extension 8.

A pin 14 extends through the sleeve 9 and is adapted to fit into the slot in the extension 6 to form a coupling between the sleeve and the valve spigot.

A metal tube 15 telescopes with the outside of the annular extension 8 and is secured thereto by screws 15′. A solenoid 16 is mounted in the upper end of the tube 15 and

is provided with a hollow core 17 that extends through the windings of the solenoid, and said core 17 is mounted in end plates 18 and 19 that are suitably secured to the tube 15.

A reciprocating steel pole piece 20 is slidably mounted within the hollow core 17 and is provided adjacent its lower end with a flange 20^a which is adapted to strike against a shoulder 20^b formed within the hollow core 17 and limits the upward movement of the pole piece. The hollow core 17 carries a shifting pin 21 which operates in a guide way 22 of pole piece 20, which latter has a cam surface 22^a and such cam surface, by coming into engagement with the shifting pin 21, will serve as a means to partially accelerate or advance the rotation of said pole piece. A bottom bearing 23 is threaded into the lower end of a hollow core 17, and is provided with a sleeve 23^a formed with a wrench seat at its upper part and on its lower peripheral edge with a cam surface 23^b extending in opposite direction to the spiral surface 10^a of teeth 10 of sleeve 9.

Solenoid coil terminals 26 and 27 extend into insulating bushings 28 and 29, respectively in the end plate 18, and are connected to the windings of the solenoid. The terminal 27 is connected to the metal tube 15 by a coupling 30 to thereby ground one end of the coil.

If it is desired to dispense with the valve 1, as illustrated in Fig. 2, the tube 15 is suitably secured to an annular flange 31 rising from a base 32 in the same manner as the extension 8 rises from the base or valve body 2. A metal ring 33 has an inwardly extending flange or shoulder 34 which rests upon the inner ring 11 of bearing 12 and is clamped between said ring 11 and a shoulder 35 formed on the sleeve 9. The flange 34 is provided with a slot 36 which is adapted to receive one end of a pin 37 which has a drive fit with, and extends from the sleeve 9 to thereby relatively fix the ring 33 to the sleeve 9 and spigot 4.

The ring 33 has a thin outwardly extending flange 35′ which serves as a means to space from the outer ring 13, a fiber collar 38 which surrounds the ring 33 and rests upon said flange 35′ and extends above the top of the ring 33.

Oppositely disposed metallic segments or movable contacts 38′ are mounted in the collar 38 adjacent the lower end thereof, and extend through the collar and into the ring 33 to form a contact therewith.

Other movable contacts in the form of metallic segments 39, preferably two in number, are mounted in the collar 38 above the segments 38′ and in staggered and slightly overlapping relation thereto and the contacts 39 extend through the insulation of the collar 38 and into the metallic ring 33 to form a contact therewith.

A third set of movable contacts or metallic segments 40 are mounted in the collar 38 adjacent the top thereof and in staggered and overlapping relation to the segments 38′ and 39. The segments 40 do not engage the ring 33 but instead are insulated therefrom by the collar 38.

An annular metallic ring 41 is positioned at the top of the collar 38 and bears against the metallic segments 40 which protrude slightly into the bore through said collar. The ring 41 is held into place in the collar 38 and against the segments 40 by the overlapping heads of screws 42 that are threaded into the collar 38 and segments 40. This construction provides for a good electrical connection between said segments 40 and ring 41.

A pair of stationary contacts in the form of longitudinally reciprocatory pins 43 extend through insulating bushings 44 threaded in the cylinder 15, and are positioned 180° apart and bear against the periphery of the collar 38 at such point to engage the segments 40 as the collar is rotated. A pair of spring clips 45 bear against the outer ends of the pins 43 and resiliently hold the pins in contact with the periphery of the collar.

The spring clips 45 are secured to binding posts 46 which comprise screws 47 extending through fiber bushings 48 threaded in the cylinder 15 and clamping nuts 49 threaded on the screws 47.

A suitable electrical connection may be attached to the binding post 46. The utility of this connection will be further described.

A stationary contact in the form of a pin 50 extends through a fiber bushing 51 secured in the cylinder 15 and is adapted to contact with the periphery of the fiber collar 38 at such point as to engage the movable contacts 39 when the collar 38 is rotated.

The pin 50 is held in position by a spring clip 52 extending from and secured to a terminal 53 in a similar manner to pins 43 and terminals 46.

A stationary contact or pin 54 extends through a fiber bushing 55 secured in the cylinder 15 and is adapted to contact with the periphery of the fiber collar 38 at such point as to engage the movable contacts 38′ when the collar is rotated. The pin 54 is held into contact with the collar 38 by a spring clip 56 secured to a binding post 57.

In the present instance the segments 40, pins 43 and binding posts 46 are in the motor circuit and control said motor, which operates under a comparatively high voltage, 110 volts or 220 volts. The two lower pairs of segments 38′ and 39 with the respective co-acting pins 54 and 50 operate under a lower voltage and control the solenoid 16 and

consequently the operation of the switch and valve, as will be further described.

I have shown the fiber collar 38 as being provided with raised portions or annular projecting flanges *a* at the various points on the periphery of said collar that are engaged by the stationary contact pins and the various movable contacts or segments are positioned in such flanges *a* which are of a width smaller than the diameter of the contact pins so that wear of the fiber collar and movable segments will not result in a groove that may hold the contact pins away from their respective movable contact segments.

Referring to the wiring diagram in Fig. 10, the high voltage line is illustrated at 60 and 61. The lead 61 extends to one binding post 46. The lead 60 extends to one terminal of a motor 62 and from the other terminal of the motor a lead 63 extends to the binding post 46 opposite the post to which the lead 61 is connected.

Tracing this circuit through, the current enters the binding post 46, follows through the clip 45 to the pin 43 from which it is adapted to pass into the metallic segment 40 when the same is moved into contact with pins 43, the current then flows through the ring 41 to the opposite segment 40, thence through the opposite pin 43, spring clip 45 to the opposite binding post 46, thence through the lead 63, motor 62 to the line 60, thus completing the circuit to operate the motor.

With the circuit to the motor closed, upon rotation of the ring 33 and collar 38 the movable contacts 40 will be moved away from the pins 43, thus breaking the circuit and stopping the motor.

The primary side of a step down transformer 65 is connected to the high voltage leads 60 and 61 by leads 66 and 67.

One of the low voltage or transformer secondary terminals 68 is connected by a lead 69 to terminal 26 of the solenoid 16.

The other terminal 70 of the transformer secondary terminals is connected through the lead 71 to the movable member of any standard type of thermostat 72.

This thermostat has a contact 73, which may be designated as the hot contact and a contact 74 which may be designated as the cold contact.

The hot contact 73 is connected through lead 75 to the terminal post 57, and the cold contact 74 is connected through the lead 76 to the terminal post 53.

In the operation of the valve with the latter in high position as shown in Fig. 1, the circuit will be completed between the thermostat contacts 73 and 71′, 71 and thereby energizes the coil 16, the magnetic force of which will draw the steel pole piece 20 toward the coil, thereby forcing the non-magnetic pole extension 25 downward. The inclined surfaces of the projections 25^a will engage the spiral teeth 10 and rotate the sleeve 9 in the direction that is called a right hand turn and the valve spigot 5 will be turned in the same direction, through the medium of the pin 14 that fits into the slot in the extension 6. When the pole piece 20 has moved downward a sufficient distance, so that the projections 25^a have engaged the teeth 10, the cam surface 22^a in the guide way 22, by engaging the pin 21, will serve to partially accelerate or advance the rotation of the pole piece 20 and its extension and thereby position the sleeve 9, so that its teeth 10 will be positively engaged in the next downward operation of the pole piece. When the circuit is broken, the magnetic force of the pole piece 20 is released and the spring 24 and cam surface 23^b will return the pole piece to normal position as shown in Fig. 1.

During the upward travel of the pole piece, the projections 25^a which have been turned in a right hand turn, away from normal position, are returned to such normal position in a partial left hand turn. This is because the projections 25^a will engage the cam surface 23^b and continued upward travel of the pole piece causes the projections 25^a to ride along the surfaces 23^b of the sleeve 23^a and thus partially rotate the pole piece in a direction reverse to that caused by the cam surfaces 22^a in the guideway 22, until the pole piece and projections are returned to normal position shown in Fig. 1. In this position the projection 25^a will have passed over the points of the spiral teeth and the operation of the valve is thus made positive at all times.

From the foregoing it will be seen that in case the source of electric energy should be cut off, the valve may be normally operated by pressing the pole piece downward by any manual means, such as the finger.

In operation we will suppose that the movable thermostat contact 71′ is on the hot terminal 73. The current flows from the transformer 65 through the leads 71 and 75 to the terminal 57, thence it passes through the clip 56 to the pin 54, which is contacting with one of the metallic segments 38′.

The current now passes into the ring 33, which is coupled to the sleeve 12 and through the bearing 9 to the cylinder 15, and passes into terminal 27 of solenoid 16, through the coils of the solenoid 16 out of the terminal 26 and through the lead 69 back to the transformer. The solenoid is thus actuated which causes the pole piece 20 and extension 25 to move downwardly bringing the teeth 25^a into engagement with the cam teeth 10^a and rotating the sleeve 9 and ring 33 and collar 38, which form the switch.

In the present instance this rotation is through 90° and carries the pin 54 off of the segment 38′.

The segments 39 are so arranged that when the pin 54 leaves the segments 38′ the pin 50

will engage one of the segments 39. The reason for this is obvious since when the movable contact 71′ of thermostat 72 swings from the hot terminal to the cold terminal to form contact through the terminal post 53 and pin 50 this pin is already engaging a metallic segment 39, which again operates the solenoid over the same circuit as previously described and again rotates the switch. Thus it will be seen that each time the solenoid is operated the switch will be turned 90°; the segments 40 being two in number alternately start and stop the motor 62 depending on the position of the segments with relation to the pins 43.

It is also obvious from the foregoing explanation of the rotation of the sleeve 12 that the spigot 5 will also be rotated through the pin 14, and extension 6 to open or close the valve 1 to the flow of gas therethrough depending on the position of the orifice through the spigot.

From the foregoing it is apparent that the pins 43 may be connected to a light bulb instead of the motor 62 to thereby indicate the position of the valve in a manner analogous to that in my copending application above referred to.

I claim:

1. A switch control comprising a rotatable switch; a motor having contacts on said switch; means to rotate said switch to open or close the circuit to said motor; means to operate said rotating means; means for controlling the rotating means; a valve; a spigot in said valve, and means connecting said rotating means and said spigot.

2. A switch control comprising a rotatable switch, a motor, motor contacts on said switch, brushes engaging said contacts and connected to said motor, means to rotate said switch to open or close the circuit to said motor; electrical means to operate said rotating means, contacts on said switch, brushes engaging said contacts, said electrical means being connected to said last named brushes.

3. A switch control comprising a rotatable switch, a motor, motor contacts on said switch, brushes engaging said contacts and connected to said motor, means to rotate said switch to open or close the circuit to said motor; electrical means to operate said rotating means, contacts on said switch, brushes engaging said contacts, said electrical means being connected to said last named brushes, and thermostatic means controlling the circuit going to said last named brushes.

4. A switch control comprising a rotatable switch, a member connected to said switch, a solenoid, a pole piece in said solenoid, an extension connected to said pole piece and adapted to move into engagement with said member to rotate said switch, contacts on said switch, said contacts being connected to said solenoid; a motor, motor contacts on said switch, leads extending from said contacts to said motor, whereby said motor is controlled.

5. A switch control comprising a rotatable switch, a member connected to said switch, a solenoid, a pole piece in said solenoid, and extension connected to said pole piece and adapted to move into engagement with said member to rotate said switch, contacts on said switch, said contacts being connected to said solenoid, a motor, motor contacts on said switch, leads extending from said contacts to said motor, whereby said motor is controlled, a valve, a spigot in said valve, and means connecting said switch and said spigot whereby said spigot is rotated.

6. A switch control comprising a cylinder, a solenoid in said cylinder, a pole piece in said solenoid, a rotatable switch in said cylinder, means operated by said pole piece for rotating said switch, motor contacts on said switch, solenoid control contacts on said switch, and a circuit including said solenoid control contacts and said solenoid.

7. A switch control comprising a cylinder, a solenoid in said cylinder, a pole piece in said solenoid, a rotatable switch in said cylinder, means operated by said pole piece for rotating said switch, motor contacts on said switch, solenoid control contacts on said switch, a circuit including said solenoid control contacts and said solenoid; and thermostatic means to open and close said circuit.

8. A switch control comprising a cylinder, a solenoid in said cylinder, a pole piece in said solenoid, a rotatable switch in said cylinder, means operated by said pole piece for rotating said switch, said switch comprising an insulating collar, a metallic ring upon which said collar is mounted, motor contacts in the upper end of said collar, solenoid control contacts on the lower end of said collar and electrically joined through said ring, and a thermostat adapted to control the current going to the solenoid contacts.

9. A switch control comprising a cylinder, a solenoid in said cylinder, a pole piece in said solenoid, a rotatable switch in said cylinder, means operated by said pole piece for rotating said switch, said switch comprising an insulating collar, a metallic ring upon which said collar is mounted, motor contacts in the upper end of said collar, solenoid control contacts on the lower end of said collar and electrically joined through said ring, and a thermostat adapted to control the current going to the solenoid contacts, a valve, a spigot in said valve; and means coupling said switch and said spigot whereby said spigot is rotated.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 28th day of November, 1925.

DONN OTTO MARKS.