No. 665,133. Patented Jan. 1, 1901.

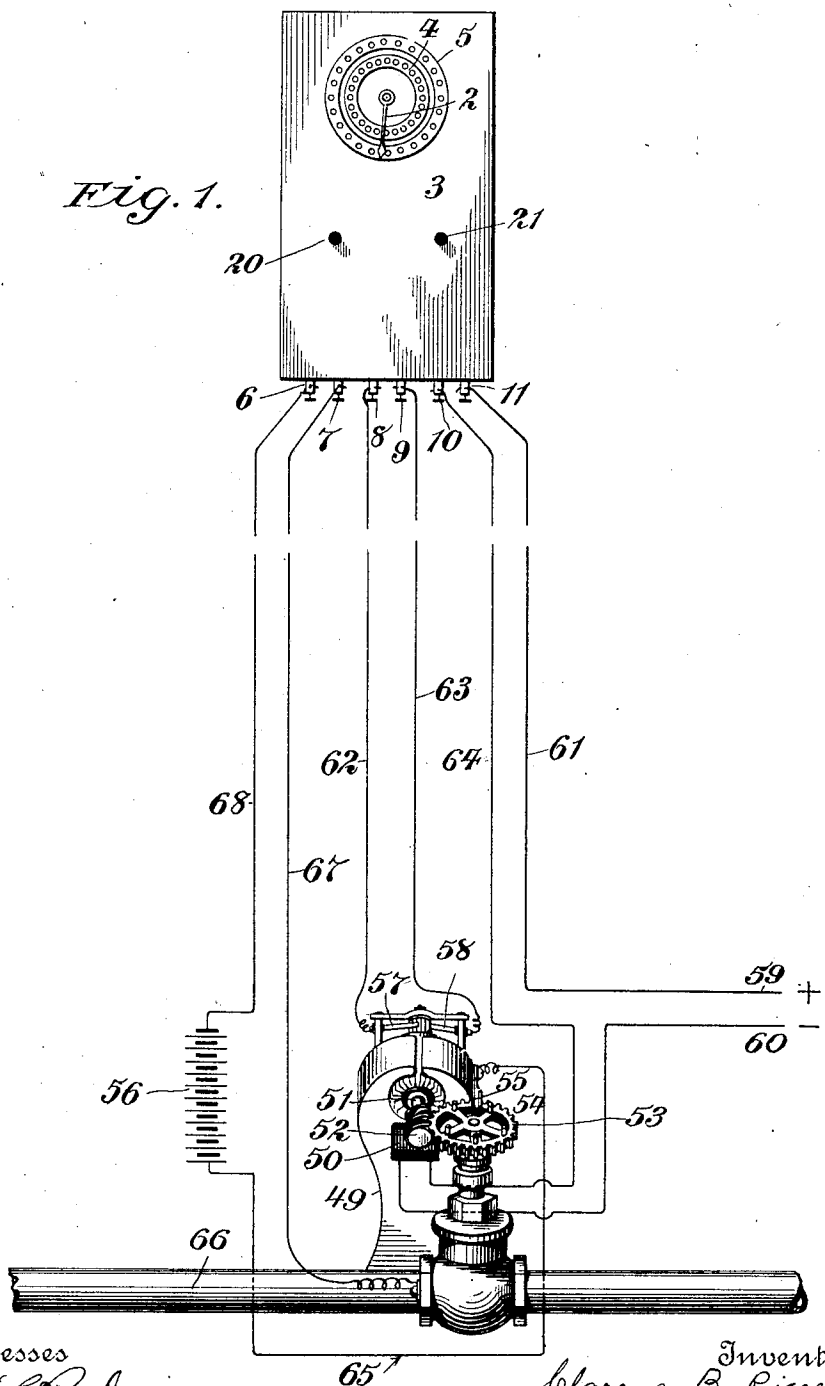
C. B. RIGGS.

ELECTRICAL VALVE CONTROLLER.

(Application filed Feb. 5, 1900.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



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(No Model.) 3 Sheets—Sheet 2.

Fig. 2.

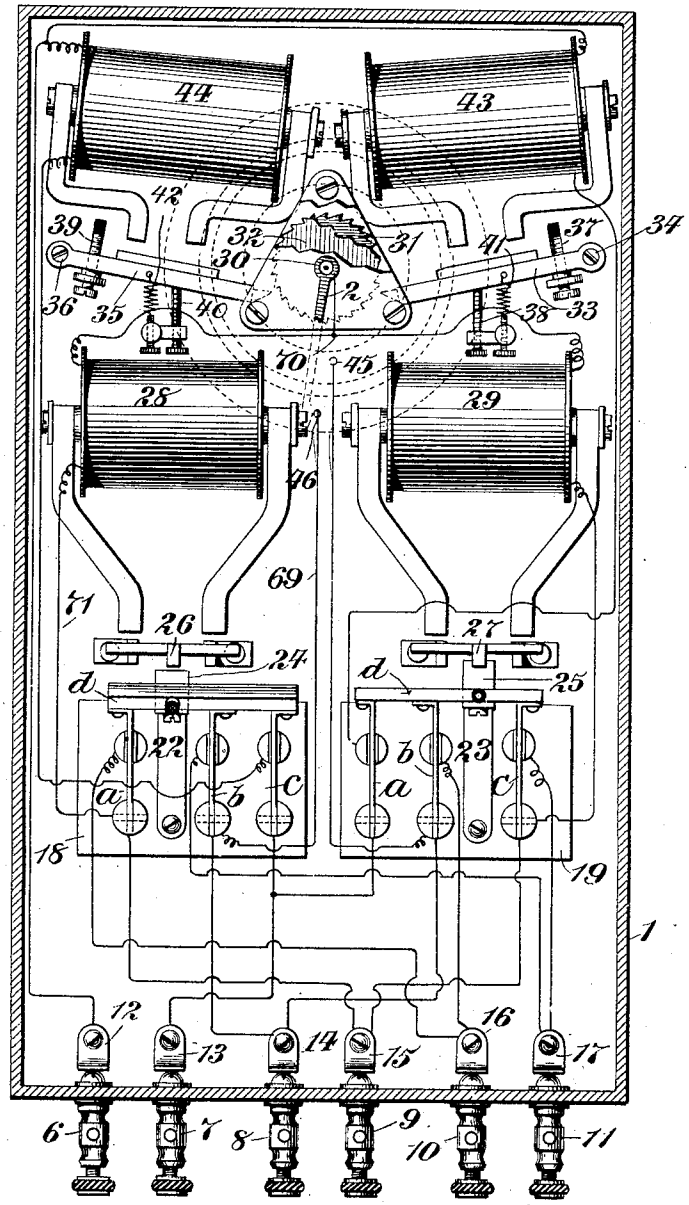

Fig. 3.

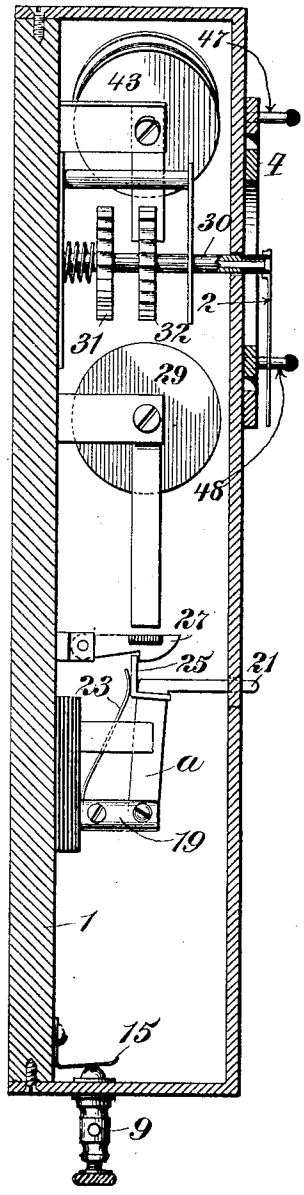

Fig. 4.

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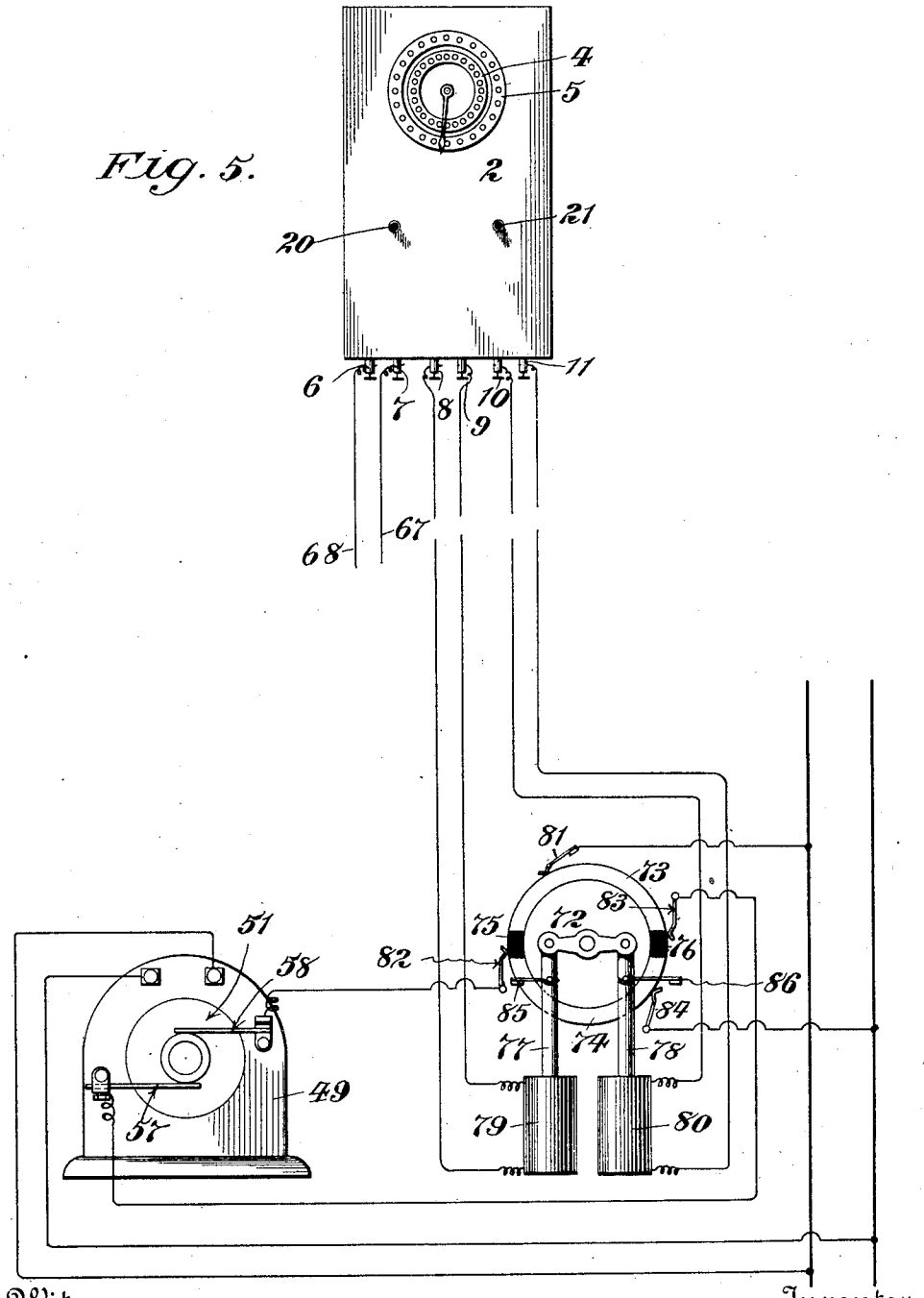
Fig. 5.



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UNITED STATES PATENT OFFICE.

CLARENCE B. RIGGS, OF NEW ROCHELLE, NEW YORK.

ELECTRICAL VALVE-CONTROLLER.

SPECIFICATION forming part of Letters Patent No. 665,133, dated January 1, 1901.

Application filed February 5, 1900. Serial No. 4,135. (No model.)

To all whom it may concern:

Be it known that I, CLARENCE B. RIGGS, a citizen of the United States, residing in the town of New Rochelle, in the county of Westchester and State of New York, have invented a certain new and useful Improvement in Electrical Valve-Controllers, of which the following is a specification.

My present invention relates to an improved apparatus for the control of gas, water, and steam valves and the like at a distance, and comprises a simple and economically-operated means whereby any number of valves may be singly or simultaneously opened or closed wholly or to such an extent as desired, said means being so constructed that the operator is informed at all times exactly where each valve in the system stands and in which direction it is being moved at any time.

The preferred form of my invention is illustrated with examples of modifications in the accompanying drawings, wherein—

Figure 1 shows in perspective the valve-moving parts of my invention as applied to a water or gas pipe system and in diagram the electric connections between the same and the controlling-box at the operator's station. Fig. 2 is an interior plan view of my preferred form of controlling-box. Fig. 3 is a central longitudinal section of the box shown in Fig. 2. Fig. 4 is a detail view of a modified form of my invention, wherein the automatic release is operated mechanically instead of magnetically; and Fig. 5 shows in diagram the application of a relay system to the purposes of my invention.

My invention, broadly considered, covers the use of a valve or valves operated by electric motors, a central device for closing the circuit of said motors so as to operate them in one direction or the other, a central means for opening the circuit so closed, and electric circuits controlled by contact-makers at the valves, whereby the main-circuit-opening means may be operated.

In its best form this invention includes an indicator moving with the main-circuit-opening means and adjustable so as to open said main circuit at any point of time desired.

The accompanying drawings illustrate one preferred embodiment of the invention above broadly outlined, wherein a controlling-box 1 carries the indicating-pointer 2 over its cover 3, said cover being preferably made of insulating material, so as to electrically separate the concentric metal rings 4 and 5, carried upon said cover and provided with holes at intervals for a purpose hereinafter described. The cover carries appropriate terminals or binding-posts 6, 7, 8, 9, 10, and 11, projecting into the box, where they make contact with the springs 12, 13, 14, 15, 16, and 17, attached to the bottom of the box 1.

In that form of my invention wherein the main current which drives the valve-moving motor is directly controlled at the central box and passes through said box there are provided two three-knife switches 18 and 19 or equivalent means for properly making and breaking the main circuit and directing the current through the motor elements, as also to control the automatic releasing means. These three-knife switches are capable of being pressed down toward the bottom of the box by means of the buttons 20 and 21, which project through the cover of the box, but are held normally open by means of proper springs 22 and 23. In Fig. 2 the switch 18 is shown open and switch 19 is shown closed or depressed. Each switch comprises three separate blades or knives *a b c*, connected by an insulating-bar *d*, which latter carries a lip or projection 24 25, adapted to coöperate with corresponding latches 26 27 to hold the switch closed when depressed manually. These latches act either by gravity or in any other well-known manner.

At 28 and 29 are shown two electromagnets, whose respective poles are brought together opposite the latches 26 and 27, which latter act as armatures, being attracted at the proper time to open one or the other switch 18 or 19.

The indicating-pointer 2 is carried upon a revoluble arbor 30, which also carries two pinions, having teeth oppositely turned, as shown at 31 and 32 in Figs. 2 and 3. This construction is made clear by the breaking away of a portion of wheel 32 in Fig. 2 to show the teeth on the wheel 31 beneath it. Opposite to the wheel 31 and in the same plane is placed the lever 33, pivoted at 34 and adapted to swing against the periphery of said wheel 31 to move the same one tooth forward when-

ever said lever is swung upward. Upon the other side of the arbor and in the same plane with the wheel 32 is a similar lever 35, pivoted, as at 36, and acting when swung upward to give to wheel 32 the opposite movement to that imparted by the lever 33. The two wheels 31 and 32 being fixed to a common arbor 30 move together, and consequently only one lever 33 or 35 can operate at once. The two levers are provided with adjustable screw-stops 37, 38, 39, and 40 to properly limit the back-and-forth movements of the levers 33 and 35. The normal position of each of these levers is away from its wheel, it being carried to this position by means of gravity, the springs 41 42, or by equivalent means.

At 43 and 44 are shown two magnets, whose respective poles are brought together opposite said levers 33 and 35, said levers acting as armatures to be attracted toward said poles when the magnets are energized for a purpose disclosed hereinafter.

The various parts herein described are connected by wires for operation in a manner described later, it being sufficient for the present to state that the inner and outer rings 4 and 5 (shown in dotted lines in Fig. 2) are respectively connected to proper wires at 45 and 46. Metal pins or pegs 47 and 48 are adapted to be adjusted into any desired holes in the rings. (See Fig. 3.)

The main driving-motor at each valve (shown at 49) comprises the usual field-magnet 50 and armature 51, the latter acting to drive a worm 52, which meshes with the worm-wheel 53 on the usual screw-shaft of the valve to be opened or closed. On the top of the gear-wheel 53 are a number of pins, as five, projecting upward, as at 54, and adapted to make contact with a metallic brush 55, attached to but insulated from the side of the motor or otherwise appropriately supported. The two terminals of any convenient source of electricity, as the battery 56, are connected, respectively, to the brush 55 and the box-terminal 6. The brushes of the driving-motor are shown at 57 and 58. The terminals of the main driving-circuit for the motor are shown at 59 and 60.

The operation of the specific device so far described is as follows: Supposing the valve to be entirely closed and that it be desired to partly open the same, before operation both switches 18 and 19 would be open and the motor 49 would stand still. Now if one of the switches, as 18, be closed by pressing the button 20 a circuit will be established as follows: The current entering at 59, following wire 61 to terminal 11 and spring 17, would cross knife *b* of switch 18, thence to spring 14 and terminal 8, and by wire 62 through the armature 51 from brush 57 to 58. Returning by wire 63, terminal 9, and spring 15, it would cross knife *a* of switch 18, thus reaching spring 16, terminal 10, wire 64, and thus through the field-magnet 50 and out to the main line at 60. This circuit would drive the motor for opening the valve, and as the wheel 53 revolved the pins 54 would come successively into contact with the insulated brush 55. Each time this contact occurred magnet 44 would be energized by the following circuit: beginning at battery 56 and by wire 65 to brush 55, to a pin 54, and thence to the pipe 66 and wire 67 or ground to terminal 7 at the central box. From terminal 7 the current would pass to spring 13, across knife *c* of switch 18, through magnet 44, back to spring 12 and terminal 6, and thence back to battery by wire 68. Each time the magnet 44 is energized it attracts the lever 35, the end of which strikes a tooth of the wheel 32, causing the indicating finger or pointer 2 to follow the movement of the distant wheel 53 by a movement of one tooth for each energizing of the magnet 44, since each time the circuit through battery 56 is broken the lever 35 falls away and clears the wheel 32. This movement of the valve-wheel 53 may be continued to any point desired and may be stopped at any point at will by inserting the metallic pin 47 into the proper perforation or hole in the outer ring 5. As shown by the dotted continuation of the pointer 2 in Fig. 2, this pin will lie in the path of movement of said pointer, and supposing the above operation to have taken place and to continue until the pointer 2 comes into contact with the pin 47 the following circuit will be set up on occurrence of this contact: from knife *b* of switch 18 by wire 69 to connection 46 with outer ring 5 and from this ring and its inserted pin 47 to pointer 2 and wire 70 through magnet 28 and wire 71 to knife *a* of switch 18. The first description of the main circuit made it clear that knives *a* and *b* of switch 18 were on opposite sides of the motor-armature, and therefore the circuit just described would be in shunt with the armature and would possess sufficient voltage to energize the magnet 28, thus attracting the latch 26 and permitting the spring 22 to throw open the switch 18 and stop the motor. It is obvious that the circuit needed for this last-named purpose need not necessarily be supplied from a shunt directly around the armature, but may be supplied from any desired source either connected with the main circuits or not.

It will be clear that the position of the pointer 2 can always be made to indicate clearly the condition of the valves controlled by the box to which it is attached, and the coöperation of the stopping, starting, and indicating means is of such a positive character that there is no opportunity for mistake in this particular.

Inspection of the drawings will make it clear that when it is desired to close the valve again in whole or in part the button 21 should be depressed, whereupon the motor 49 will start in the opposite direction, since under these conditions while the field-magnet current will remain constant in direction the armature-circuit will be reversed. The mag-

net 43 will act upon the lever 33 to operate the indicator in a corresponding direction, and the magnet 29 will act to open the driving-circuit at any point desired when the indicator 2 comes into contact with the pin 48, properly placed upon the inner ring 4.

It is to be understood that the mechanism and circuits so far described are capable of indefinite modification and adaptation of its parts to multiple circuits in a well-known manner. Many equivalents for various parts in this device may be substituted in a well-known way without departing from the spirit of the present invention.

In order to illustrate by a mere example the flexibility of my improved system, I have shown in Fig. 4 how my indicator may be made to act mechanically instead of through magnets 28 and 29 to open the main circuits and stop the driving-motors at the proper time. In this modification of my invention the latches 26 and 27 lie in the path of movement of the indicator 2, which is preferably geared to less than a whole revolution for the entire throw of the valve-gate desired. It is evident that with this form as soon as the moving indicator reaches the proper point one or the other of the latches 26 27 is drawn away from engagement with its coöperating lip and the corresponding switch is thrown open. While this form does not lend itself to as ready and complete adjustment for different movements of the valve, it is nevertheless useful in many cases as a substitute for the form shown in Fig. 2.

In Fig. 5 I have shown a modification of my system particularly adapted to the operation of valves at a considerable distance from the controlling-box—as would be used, for instance, in water-supply systems for towns. This system depends upon the control of the main driving-circuit by means of a distant switch 72, actuated by a comparatively light current, the main driving-current for the motor not being carried into the controlling-box. A number of means might be devised for this purpose, and in Fig. 5 I have shown, as an example, an insulating-disk 72, carrying metal strips 73 and 74 on its circumference, separated by insulating-pieces 75 and 76. The disk 72 is pivoted and may be turned in one or the other direction from the position shown by means of the two solenoid-cores 77 and 78, adapted to be moved by the solenoids 79 and 80. Four brushes 81, 82, 83, and 84 bear upon the outer parts, supported by the disk 72. Of these, 81 and 84 are connected to the two sides of the main circuit and bear constantly each on its own metal strip 73 and 74. When the motor stands still, its field-magnet is in circuit with the main line, as shown, but the brushes 82 and 83, connected to the armature-brushes, bear upon the insulating-pieces 75 and 76.

By an obvious modification of the connections shown in Fig. 2 the switches controlled by the buttons 20 and 21, respectively, close circuits which energize the solenoids 79 and 80, and thus the disk is turned in one direction or the other. Inspection will show that this sets up current in one direction or the other through the armature 51, with the desired result upon the valve. The wires 67 and 68 are shown cut off in this figure, as they coöperate with apparatus exactly like that shown in Fig. 1 and within the box in Fig. 2 for opening one or the other switch in said box at the proper time, and thus permitting the spring 85 or 86 to return the switch to the open-circuit position shown in the drawings.

My present invention is applicable to many situations and for governing all sorts of valves, and I do not wish to limit myself to the operation of valves of the class herein described.

What I claim is—

1. A valve, an electric motor for moving the same, a central device for closing the circuit of said motor, a second central device for opening said circuit, electromagnetic means for actuating said circuit-opening device, electric circuits for said electromagnetic means and contact-makers moving with the valve for controlling said circuits for automatically stopping the valve-motor.

2. A valve, an electric motor therefor, a driving-circuit and switch for said motor, a magnet for opening said switch, an indicator, driving means therefor controlled by movement of said valve and an adjustable circuit-closer for said magnet adapted to operate at one or another position of said indicator at will.

3. A valve, an electric motor therefor, driving-circuits and two switches for control of said motor for opposite directions of rotation, a tripping means for opening one or the other switch according to the direction of movement, oppositely-acting pawls for impelling said tripping means, an electromagnet for moving each of said pawls, circuits for said magnets and contact-makers moving with said valve for producing intermittent excitement of said magnets.

4. A valve, a worm-gear for operating the same, an electric motor and worm for driving said gear, pins on said gear, a brush making contact with said pins successively, a switch controlling the electric motor, electromagnetic means for opening said switch and a circuit for operating said electromagnetic means including said pins and brush.

5. A valve, electric valve-operating means and a main circuit therefor; in combination with a central box bearing a pointer, electromagnetic mechanism for opening said main circuit, a perforated metal ring adjacent to said indicator in circuit with said electromagnetic mechanism, mechanism controlled by movement of said valve for moving said indicator and an adjustable pin fitting into

the holes in said ring and adapted to close the circuit of said electromagnetic mechanism through said ring and pointer.

6. In an electric valve-operating device, a central controlling mechanism and an exterior valve and electric motor therefor; said controlling mechanism comprising a progressive indicator device, two three-knife switches and two electromagnets for driving said indicator device in one or the other direction, one blade of each of said switches being in circuit with its corresponding magnet.

7. In an electric valve-operating device, a central controlling mechanism and an exterior valve and electric motor therefor; said controlling mechanism comprising a progressive indicator device, two three-knife switches and two electromagnets for driving said indicator device in one or the other direction, two blades of each of said switches being connected to the exterior circuits for reversing the electric motor and the remaining blades of the two switches being connected to place one or the other of said electromagnets in circuit.

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