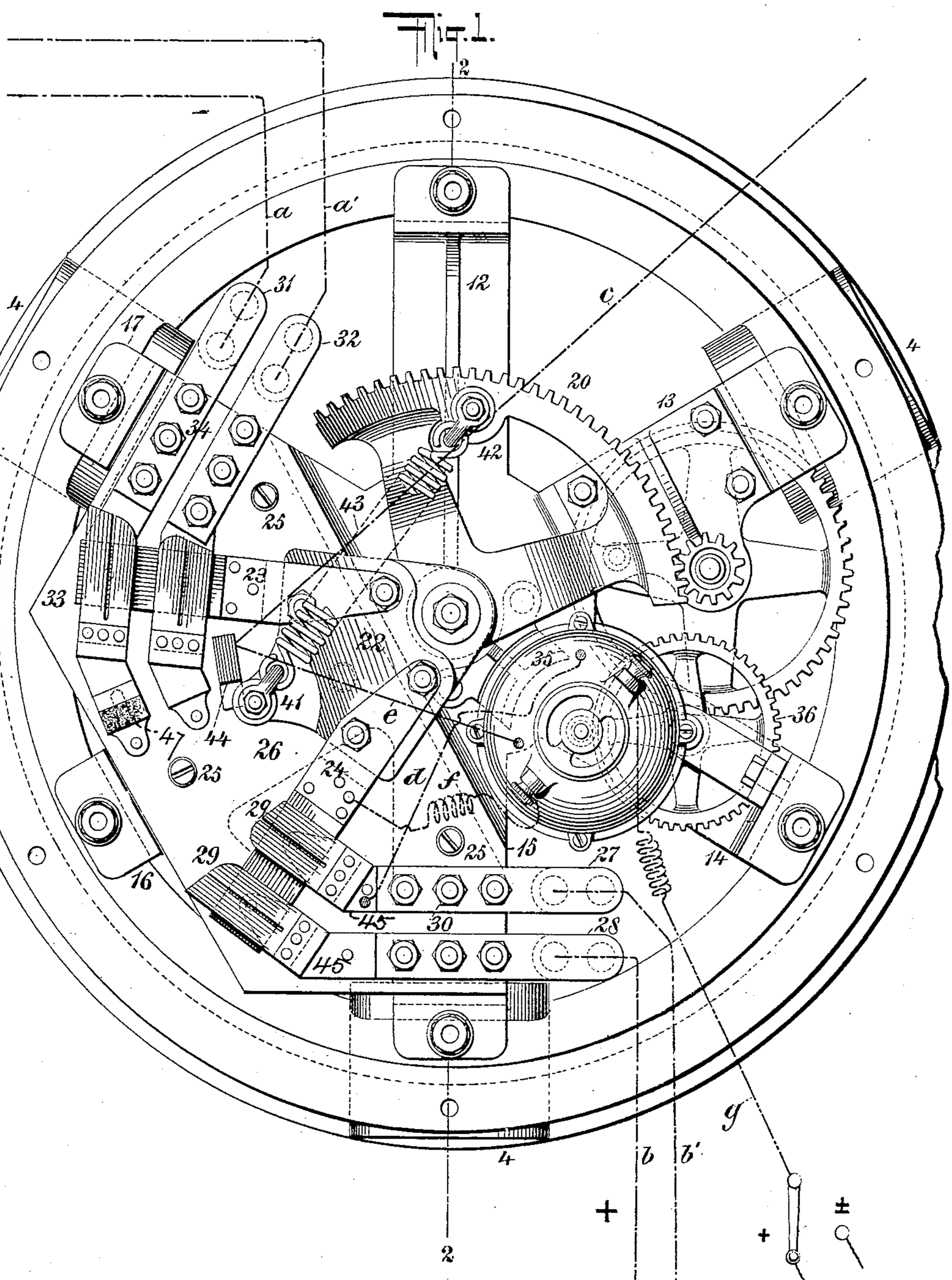
(No Model.) 3 Sheets—Sheet 1.

J. VAN VLECK.

CONTROLLABLE SWITCH BOX.

No. 560,766. Patented May 26, 1896.



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His ATTORNEY.

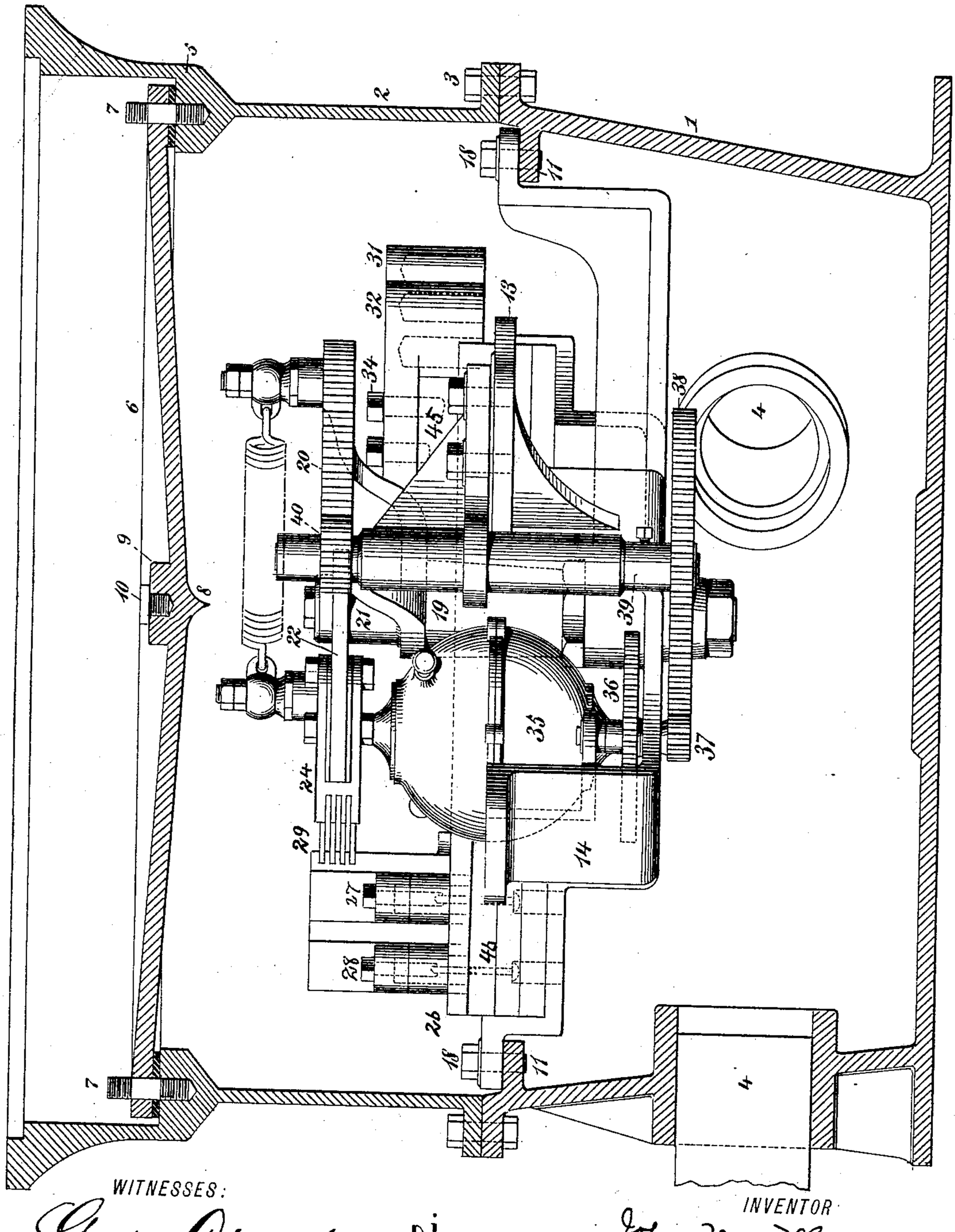
(No Model.)

3 Sheets—Sheet 2.

J. VAN VLECK.

CONTROLLABLE SWITCH BOX.

No. 560,766. Patented May 26, 1896.



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(No Model.)

3 Sheets—Sheet 3.

J. VAN VLECK.

CONTROLLABLE SWITCH BOX.

No. 560,766. Patented May 26, 1896.

Fig. 3.

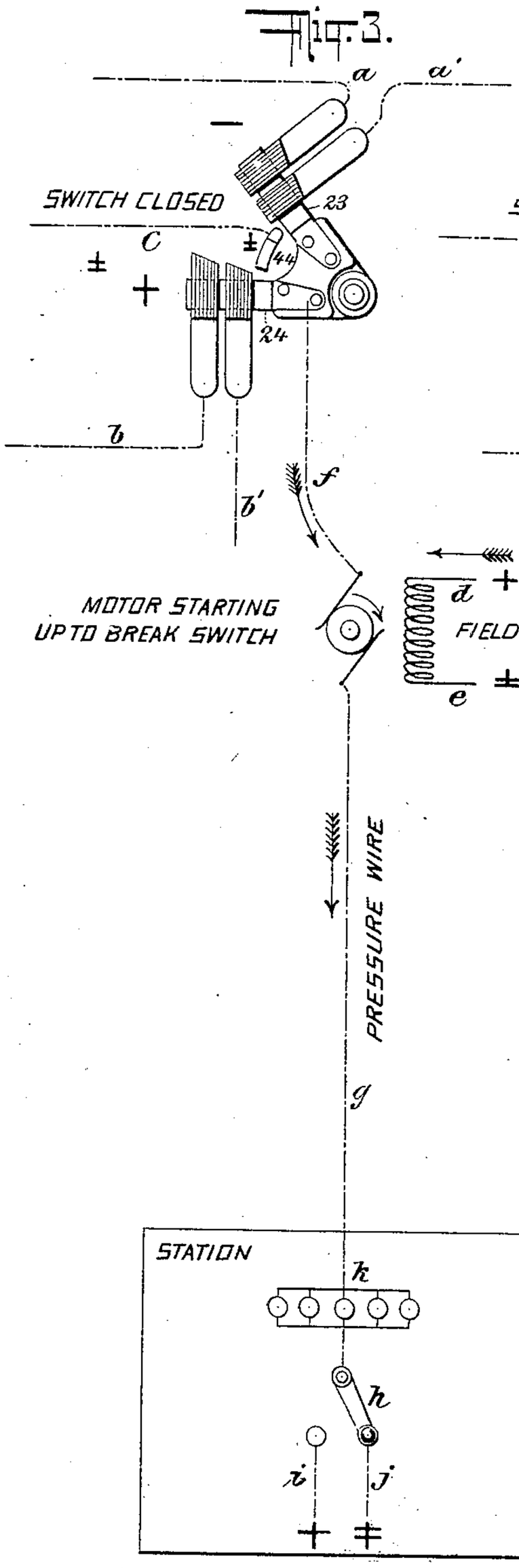
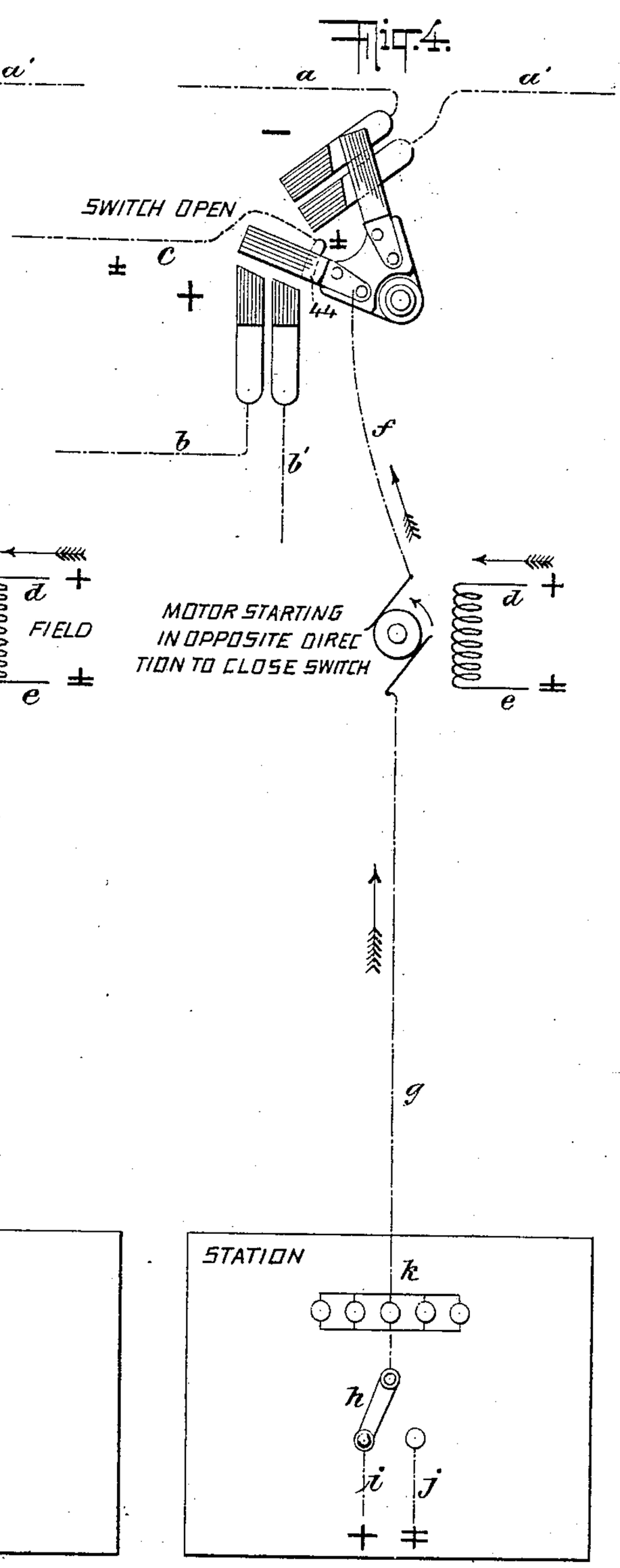


Fig. 4.



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UNITED STATES PATENT OFFICE.

JOHN VAN VLECK, OF NEW YORK, N. Y.

CONTROLLABLE SWITCH-BOX.

SPECIFICATION forming part of Letters Patent No. 560,766, dated May 26, 1896.

Application filed January 3, 1896. Serial No. 574,190. (No model.)

To all whom it may concern:

Be it known that I, JOHN VAN VLECK, of the city, county, and State of New York, have invented a new and useful Improvement in Controllable Switch-Boxes, of which the following is a specification.

The invention relates to a switch-box and to the mechanism thereof intended for use more particularly in the street conductors of electric-lighting, heating, or power systems. It serves to connect a given line to a point intermediate between its extremities, or to a circuit of two branches, so that every branch may be placed in electrical communication with the line, or it may be arranged at any point in a line consisting of a double electric conductor and serve to break circuit at said point, the mechanism being operated in each case from a distant station electrically connected with said box. The apparatus is herein shown connected with the positive, negative, and main conductors of a three-wire distributing system and operating simply to break circuit under the control of a line leading to a distant station.

The invention consists more particularly in the construction especially pointed out in the claims.

In the accompanying drawings, Figure 1 is a plan view of my controllable switch-box. Fig. 2 is a section of the case on the line 2 2 of Fig. 1, the internal mechanism being represented in side elevation. Figs. 3 and 4 are electrical diagrams showing the circuits in connection with the box and with the generating-station from which the box is controlled and also the relation of the parts and their mode of operation when the switch in the box is closed and when it is open.

Similar numbers and letters of reference indicate like parts.

The exterior casing is made in two parts—namely, a base portion 1 and an upper portion 2. These parts 1 and 2 are flanged and are united by bolts 3 passing through the flanges in the base portion 1. The base portion 1 has flanged openings 4, through which enter the cables or conducting-wires which are connected to the switch mechanism, in the manner hereinafter to be explained. In the upper portion 2 of the box is formed a seat 5, upon which rests the cover 6. The said cover is detachably secured upon said seat by the set-screws 7. The cover 6 has its inner face inclined downwardly to the center. At the center it has a point or projection 8. The object of this construction is as follows: When the cover is made flat on its under side, any moisture which may be present within the box will condense on said under side and fall off in drops of water at many different points thereof. It is important to prevent this condensed water from dropping upon the switch-contacts, which may occur under the condition above named. Therefore I provide the inclined lower face and a central projection 8 on the cover, so that the water of condensation will run along the incline and fall off only at the central point and thus drop upon a part of the mechanism below, where it can do no harm. Instead of inclining the under face of the cover downwardly toward the center I may incline it downwardly from the center to the circumference, the condensed water there dropping off at the circumference and in this way avoiding the mechanism below.

In the upper central part of the cover I form a boss 9, having a screw-threaded opening 10 for the insertion of a ring-bolt, which ring-bolt is used for convenience in lifting the cover. Of course the cover being detachably secured in place by the screws 7 it can be removed at any time to allow access to the interior of the box. So, also, by removing the screws 3 the upper part 2 of the box can be taken off, thus permitting access to the mechanism without disturbing the lower portion 1.

Within the lower part 1 of the case is a flange 11. Upon this flange rest the extremities of the six arms 12, 13, 14, 15, 16, and 17, which radiate from a central plate, so as to form a spider. The ends of the spider-arms are secured to the flange 11 by bolts 18. Passing through a hub 19 in the center of the spider is a shaft, loose upon the upper end of which is a toothed sector 20. Also loose upon said shaft and interposed between said sector and the shoulder 21 is a supporting-plate 22. Bolted to the plate 22, but insulated therefrom, are the metal switch-arms 23 and 24. Secured upon the arms 15, 16, and 17 of the spider and fastened thereto by screws 25 is a plate 26, which is preferably of slate or other

insulating material. Resting upon the insulating-plate 26 are plates 45, provided with the spring contact-leaves 29, between which leaves the switch-arm 24 enters.

At 27 and 28 are lugs secured by bolts 30 to the plates 45. In this way the lugs 27 and 28 and plates 45 are rigidly secured together, and the plates 45 are secured to the insulating-plate 26 by screws 46.

31 and 32 are lugs similar to 27 and 28 and pivoted by bolts 34 to a plate similar to 45, having spring-contacts 33, adapted to receive the switch-arm 23. These lugs 31 and 32, together with the associated parts, are bound to the spider-arm 17 by screws similar to 46.

Returning now to the plate 22, which carries the switch-arms 23 and 24, it will be obvious that when the parts are in the position shown in Fig. 1 of the drawings the switch-arms 23 and 24 are between the spring-contacts 33 and 29, and thus the arm 24 establishes electrical connection between the spring-contacts 29, while the arm 23 also establishes electrical connection between the spring-contacts 33. If, however, the plate 22 be turned upon its shaft in a suitable direction, the arms 23 and 24 will simultaneously be moved out of contact with the springs 29 and 33, and therefore circuit between the pair of springs 29 and also between the pair of springs 33 will be interrupted. It will be understood, therefore, that by combining with the plate 22 suitable mechanism for moving it on its supporting-shaft in one direction or the other I may move the switch-arms 23 and 24 into and out of electrical contact with the spring-plates 33 and 29.

I will now describe the mechanism for controlling the plate 22. Referring first to such mechanism, (which mechanism is located within the box, but is governed by a switch at a distant station, as will hereinafter be explained,) I have stated that the toothed sector 20 and the plate 22 are loose upon their shaft. Supported upon the arm 14 of the spider is an electric motor 35, which may be of any suitable construction. On the lower end of the armature-shaft of this motor is a pinion, which engages with the gear-wheel 36. On the shaft of the gear-wheel 36 is a pinion 37, which engages with the gear 38 on the lower end of the shaft 39, the bearing of which is supported on the spider-arm 13. On the upper end of the shaft 39 there is a pinion 40. This pinion engages with the teeth on the periphery of the sector 20. Consequently when the motor 35 is caused to rotate through the gearing described the sector 20 is turned. On the sector 20 and on the plate 22 are posts 41 and 42, provided with eyes, in which eyes engage the ends of the spiral spring 43. Finally, on the upper surface of the slate plate 26 there is a metal contact-clip 44.

I will now describe the operation of the parts above named.

As shown in Fig. 1, the switch-arms 23 and 24 are in contact with the spring-plates 29 and 33. The motor has, however, been actuated to move the sector 20 to the left, thus bringing the coil-spring 43 under strain and into the position represented, when it immediately operates to pull upon the post 41 and thus to turn the loose plate 22 on its shaft, so as to move the switch-arms 23 and 24 away from these spring-contacts 29 and 33 until the arm 24 strikes the stop 47, when further motion of the arms in that direction is prevented. The stop 47 is a block of soft insulating material, such as rubber. The arm 24 also makes contact with the clip 44. For reasons which will be shortly explained the apparatus now comes to rest. The circuit between the pair of spring-contacts 33 and the pair of spring-contacts 29 being broken, when the motor 35 is actuated in the reverse direction from what it was before, or, in other words, in such a direction as to move the sector 20 from left to right in Fig. 1, then the effect of the pull exerted on the spring 43 is to carry the plate 22 in such a direction as to bring the arms 23 and 24 again between the contact-plates 33 and 29.

I will now describe the circuits in the apparatus connected in a three-wire distributing system and the means whereby the motor is actuated in one direction or another to produce the results already stated. The main negative conductor is in two parts $a\,a'$, which are connected to the lugs 31 and 32. Communication between the parts $a\,a'$ of this conductor is therefore made and broken by the insertion of the switch-arm 23 between or its removal from contact with the plates 33. The main positive conductor is also in two parts $b\,b'$, which parts are connected, respectively, to the lugs 27 and 28. Therefore connection between said parts $b\,b'$ of this conductor is made by the switch-arm 24 through the spring-contacts 29. The main neutral conductor is represented at c and is connected to the clip 44. These connections are shown more conveniently in Figs. 3 and 4. The motor connection is as follows: One terminal of the field is connected to the plate 45 by the wire d, and therefore receives a plus current. The other terminal of the field is connected to the clip 44 by the wire e, so that that terminal is always neutral. Therefore the current from b' passes to plate 45, thence by wire d to the field-coil of the motor, thence to the wire e, thence to clip 44, and so to the main neutral conductor c. Therefore there is always a current through the field-coil of the motor from d to e. Two results follow from this—namely, first, the field of the motor is always energized, and, second, the field-coil itself is heated by the passage of the current. This last effect gives me a source of heat constantly present within the box and therefore a means always acting to dry up any moisture which may be caused therein.

It will be remembered that these boxes are often placed under ground and in conditions

favorable to the production of dampness within them, so that in my present device I meet this troublesome dampness in three ways—first, by constructing the casing so that it may be hermetically sealed; second, by constructing the lower portion of the cover so that the condensed moisture will run off at the center or the definite part thereof and thus be prevented from dropping upon the contacts in the device, and, third, by securing in the motor an always-energized field-coil and constant source of moderate heat, which will tend to dry up the dampness.

The armature-circuit of the motor is connected by wire *f* to the switch-arm 24 and by wire *g* (which I term the "pressure-wire") to the two-way switch *h*, located at the distant station. The contacts *i* and *j* of the switch *h* are respectively connected to positive and neutral conductors. In the wire *g* may be included a number of lamps, as shown at *k*, these lamps being located at the station where the switch *h* is placed.

Still referring to Figs. 3 and 4, I will explain the operation of the entire apparatus. Assuming the parts to be in the position shown in Fig. 3—that is, with the circuit closed through both positive and negative conductors—the switch is placed on the neutral contact *j* and the current then passes from the positive conductors *b b'*, through the armature-coil of the motor in the direction of the arrow adjacent to it. The wires *f* and *g* rotate said motor in the direction proper to move the switch-arms 23 and 24 out of contact with their spring contact-plates and to carry the arm 24 into contact with the neutral clip 44. When this last-named contact is made, it will be obvious that the armature-terminals are connected to neutral conductors, and therefore there is no force tending to rotate the armature of the motor, which stops. The mechanism within the box therefore comes to rest, and the main circuits therein are broken, as represented in Fig. 4. If now the switch *h* be moved from the contact *j* to the contact *i*, then the current will flow from the plus conductor, which communicates with contact *i*, to the neutral clip 44, and this current will act upon the motor-armature to rotate it in the opposite direction. The effect of thus rotating the motor-armature in an opposite direction is, as already explained, to carry the contact switch-arms 24 and 23 back to their original position in contact with the spring contact-plates 29 and 33, thus reëstablishing circuit through the main conductors *a a'* and *b b'*.

The object of the lamps *k*, located at the distant station, is to show when the current is established through the motor, and hence the proper operation of the switch-box, the lamps becoming incandescent whenever the current through the motor-armature is established. A galvanometer or other suitable indicating device may be used in place of the lamps.

I claim—

1. In an electric switch two fixed terminals as 28 and 44 respectively of definite and neutral electrical state, a contact-arm and an electric motor actuating said arm and moving the same into electrical contact with said terminals successively; one terminal of the armature-coil of said motor being connected to said arm, and the other terminal being connected to independently-controlled switch mechanism, whereby the electrical state of said terminal may be rendered definite or neutral, whereby when said arm is in contact with one of said terminals 28 or 44 the direction of current in said motor-armature may by said last-named means be reversed and the motor thus caused to operate and to actuate said arm in relatively opposite directions, substantially as described.

2. The combination in an electric switch of the definitely-charged conductors *b*, *b'* and terminal contact-plate 29, the neutral conductor *c* and contact-plate 44, the contact-arm 24 and electric motor 35 actuating said arm into successive contact with said plates 29 and 44; one terminal of said motor-armature being connected to arm 24 and the other terminal to a means of placing it in circuit with either a neutral or a definitely-charged conductor, substantially as described.

3. The combination in an electric switch of two fixed contact-plates 29, a shaft, a toothed sector 20 thereon, a supporting-plate 22 thereon, a contact-arm 24 on said supporting-plate and adapted to make contact with said plates 29, a spring extending from a point on plate 22 to a point on sector 20 and on one side of the center of said shaft an electric motor having a rotary armature actuating said toothed sector, and means for controlling the operation of said motor, whereby when said motor is actuated in one direction said arm 24 through said spring is moved out of contact with plates 29 and into contact with contact-plate 44 and when said motor is actuated in the opposite direction said arm is moved back to its original position, substantially as described.

4. The combination in an electric switch of the fixed contact-plates 29 and definitely-charged conductors *b*, *b'*, the fixed contact-plate 44 and neutral conductor *c*, the shaft, the loose plate 22 and the toothed sector 20 on said shaft, the arm 24 on said plate 22, the eccentrically-placed spring 43 extending between said plate 22 and sector 24, the electric motor 35 and intermediate gearing between said motor-armature and said sector 20; the said motor having one of its armature-terminals adapted to close circuit with either a definitely-charged or a neutral conductor.

5. The combination in an electric switch of the fixed contact-plates 29 and the positive conductors *b*, *b'*, the fixed contact-plates 33 and the negative conductors *a*, *a'*, the contact-plate 44 and the neutral conductor *c*, the shaft, the loose plate 22 and the toothed sector 20

on said shaft, arms 23 and 24 on said plate 22, the eccentrically-placed spring 43 extending between said plate 22 and sector 24, the electric motor 35 and intermediate gearing between said motor-armature and said sector 20; the said motor having one of its armature-terminals connected to arm 24 and the other of its armature-terminals adapted to close circuit with either a definitely-charged or a neutral conductor, substantially as described.

6. In combination with an electric mechanism having contacts an inclosing case for said mechanism having a detachable cover 6, the said cover having its inner surface inwardly inclined to a downwardly-projecting point so disposed that moisture condensing on said surface and dropping from said point will not fall upon said contacts.

JOHN VAN VLECK.

Witnesses:
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