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W. J. GREENE.

AUTOMATIC CUT-OUT FOR ELECTRICAL CONVERTERS.

No. 554,508 Patented Feb. 11, 1896.

Fig. 1.

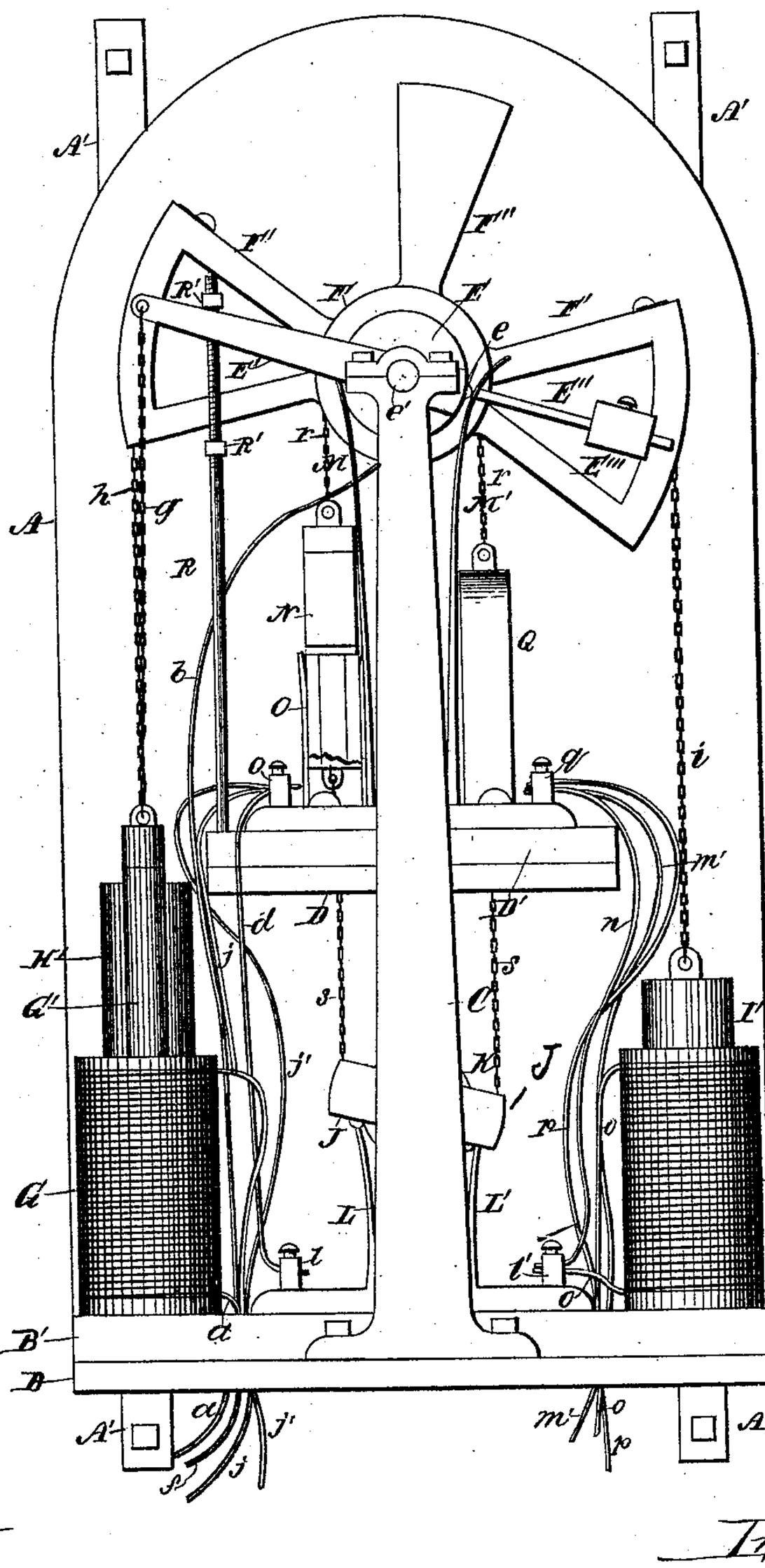

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Fig. 2.

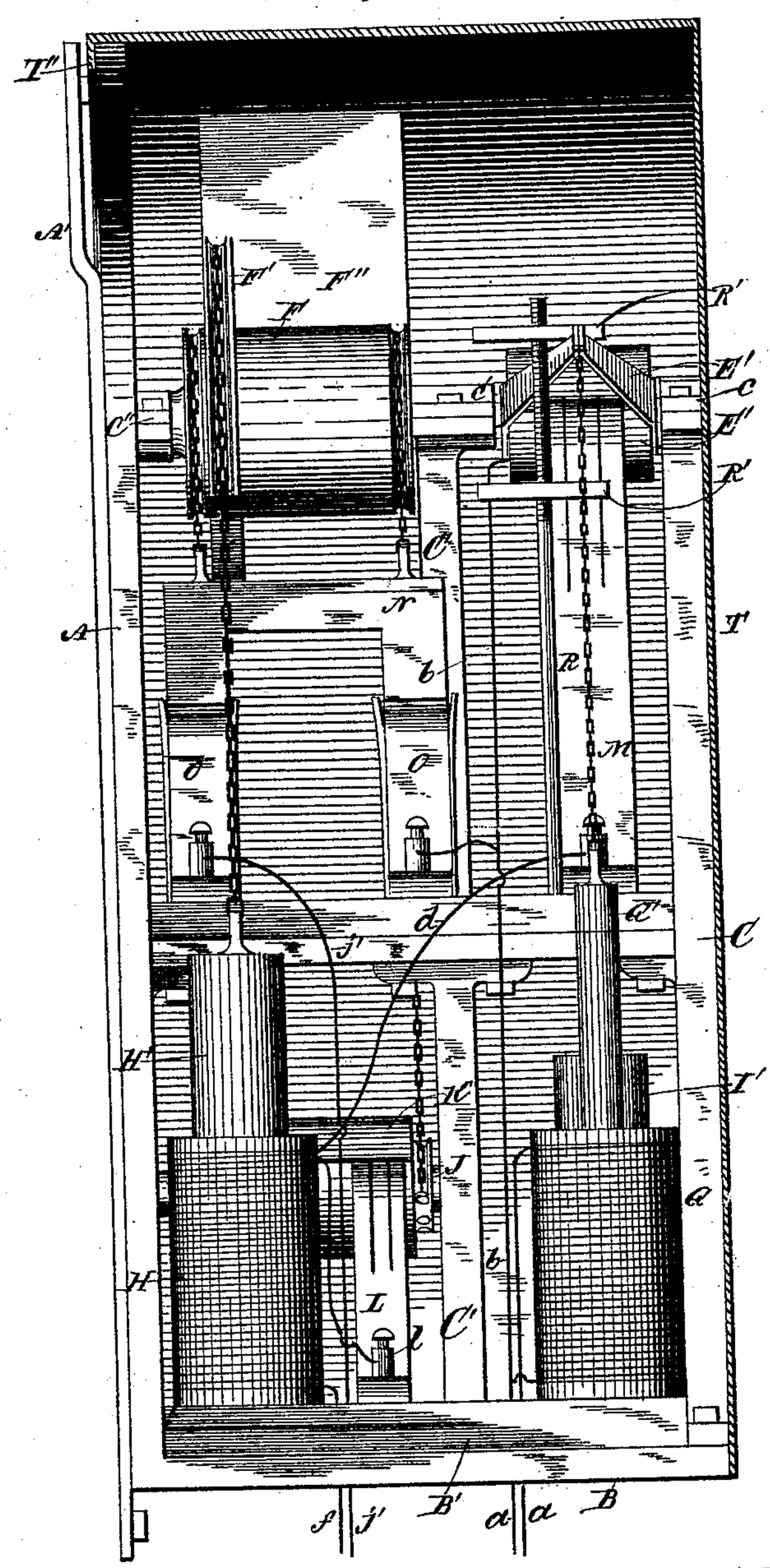

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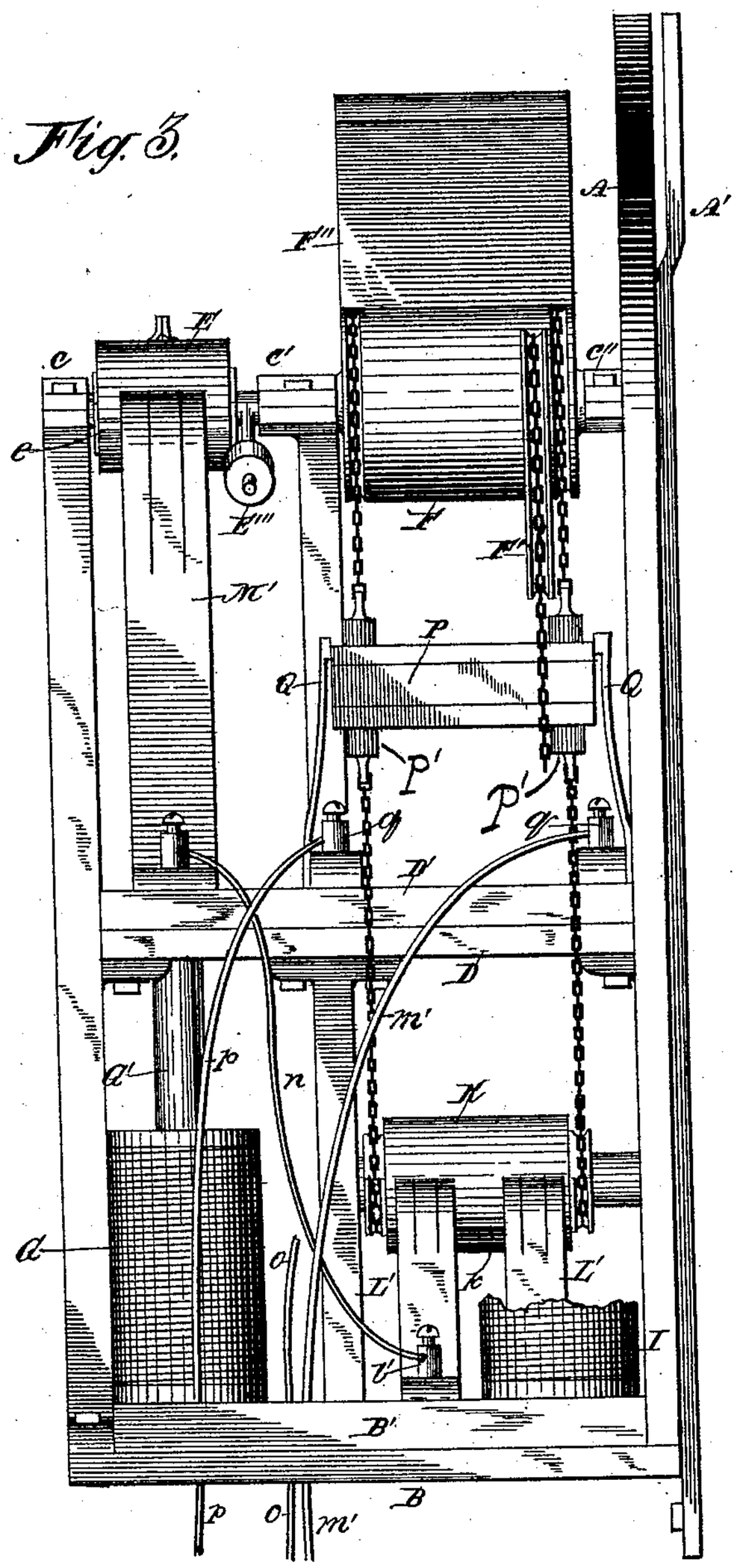
Fig. 3.



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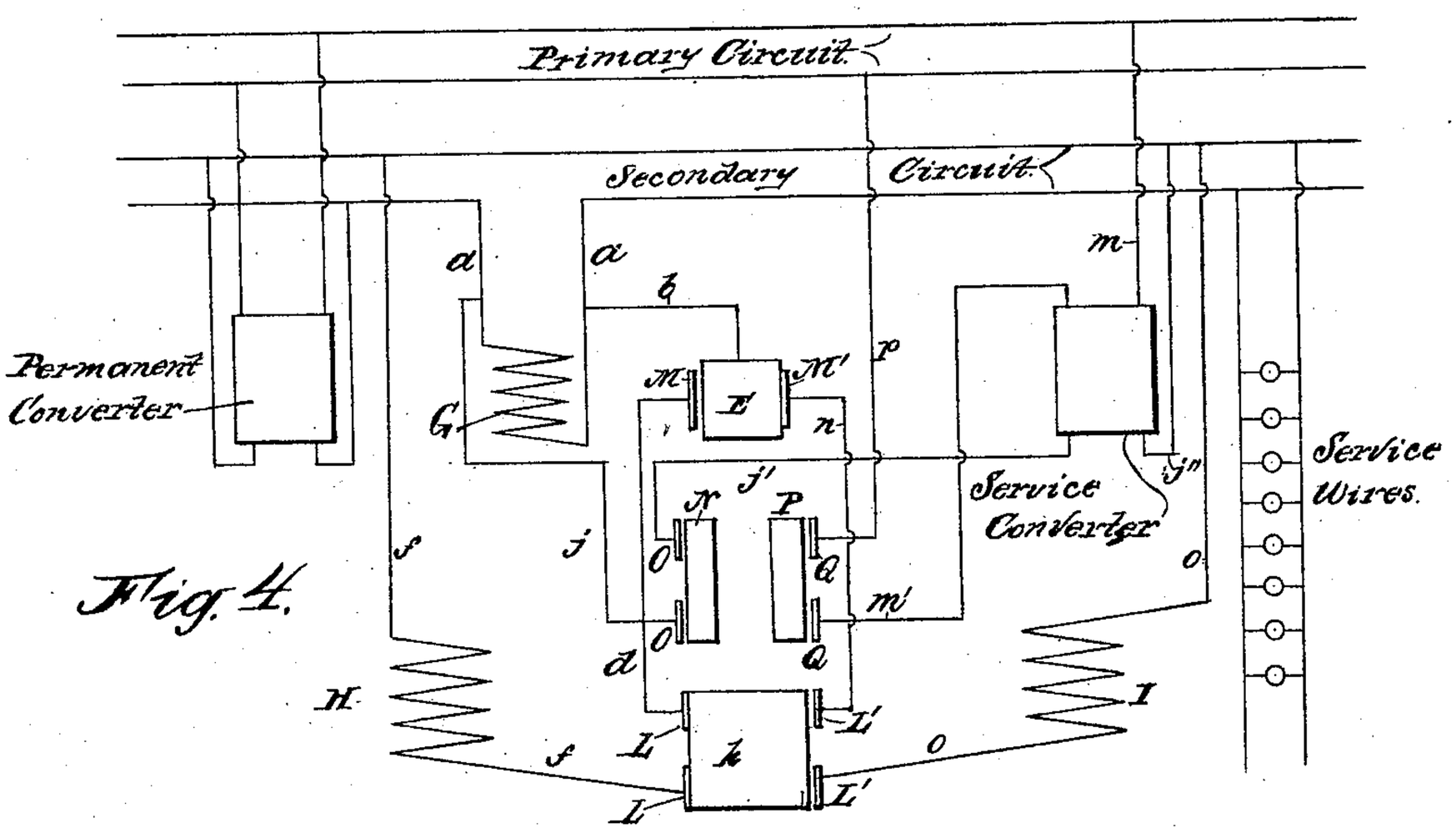

Fig. 4.

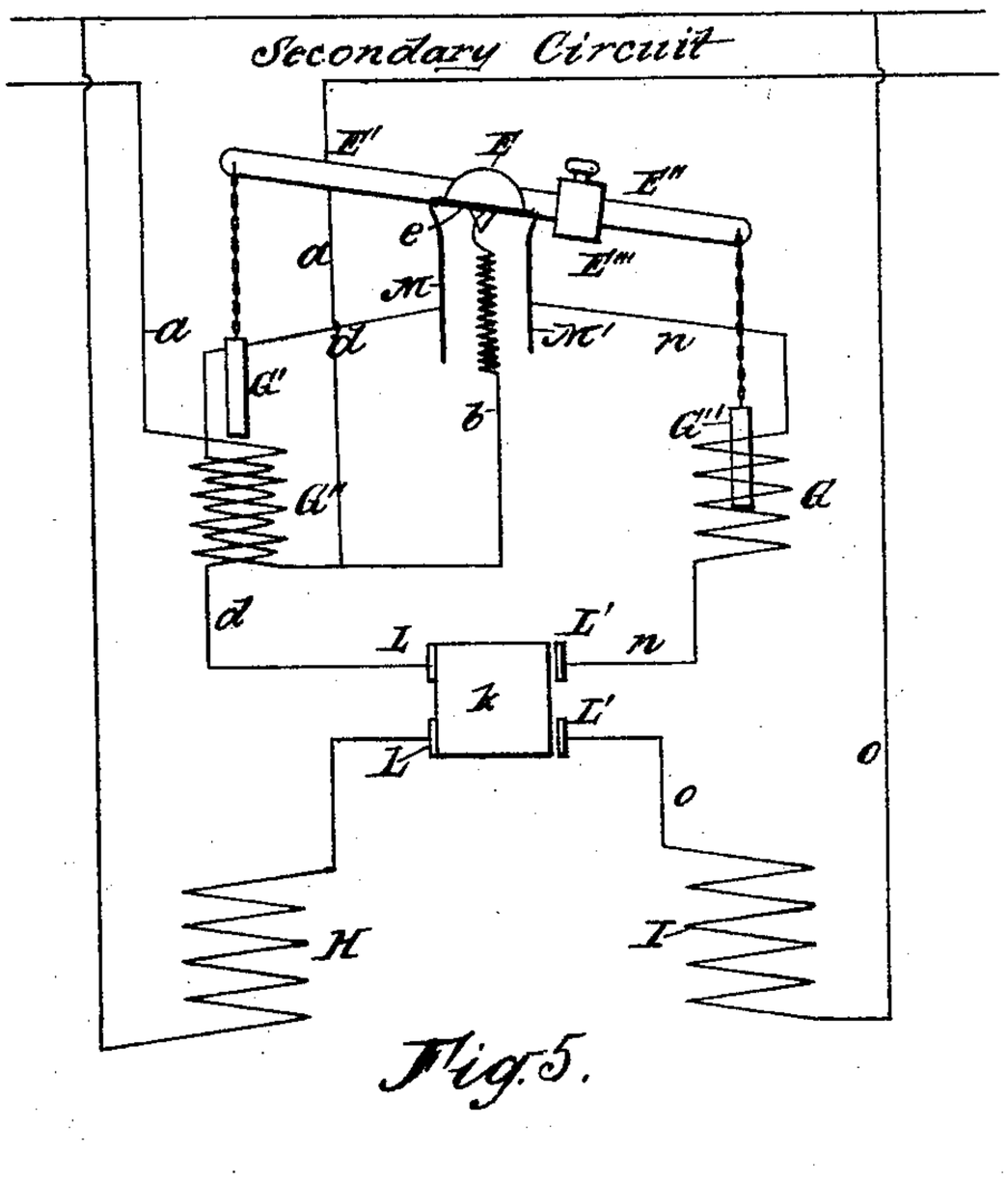

Fig. 5.

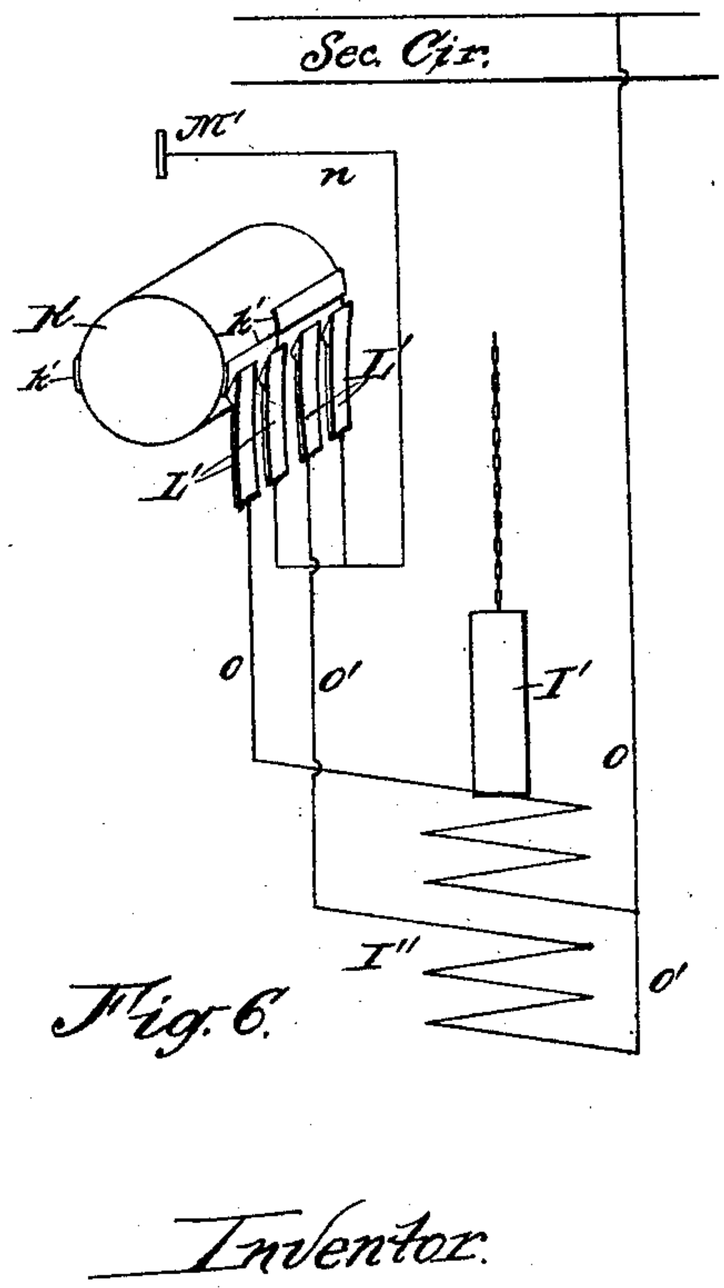

Fig. 6.

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UNITED STATES PATENT OFFICE.

WILLIAM J. GREENE, OF CEDAR RAPIDS, IOWA.

AUTOMATIC CUT-OUT FOR ELECTRICAL CONVERTERS.

SPECIFICATION forming part of Letters Patent No. 554,508, dated February 11, 1896.

Application filed September 30, 1895. Serial No. 564,062. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM J. GREENE, a citizen of the United States, residing at Cedar Rapids, in the county of Linn and State of Iowa, have invented certain new and useful Improvements in Automatic Cut-Outs for Electrical Converters; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a method of automatically cutting in and out electrical converters; and the object of this invention is to provide organized apparatus for that purpose adapted to be set up at any convenient point and readily connected in the proper electrical circuits.

A device embodying the invention will be hereinafter fully set forth and claimed, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a front elevation of the device without the protecting hood or casing. Fig. 2, Sheet 2, is a side elevation of the same as seen from the left side of Fig. 1, the hood being shown in central vertical section. Fig. 3, Sheet 3, is a side elevation as seen from the right side of Fig. 1, a part of one of the solenoids and its connections being broken away to show the switch behind. Fig. 4, Sheet 4, is an ideal diagram, showing the manner of connecting up the device with the electrical circuits. Fig. 5 is an ideal view of a modification in the construction of the device for initiating the cut-in or cut-out. Fig. 6 is an ideal representation of a modification in the construction of the main switches and the solenoids for opening and closing them.

Similar letters of reference indicate corresponding parts.

Referring to the drawings, A designates a wall-plate provided with suitable lugs A′ A′ for the attachment of the same to a post or wall. These lugs at the upper end should be offset, as shown in Figs. 2 and 3, to allow for the placing over the entire apparatus of a hood or cover T, having at the back an inwardly-projecting marginal flange T′. It will be understood that this cover is closed on the front, sides and top, and is slipped over the apparatus from above.

At the bottom of the wall-plate is a forwardly-projecting base-plate B, integral with or attached to the wall-plate. To this are secured posts C and C′, which at their upper ends have bearings *c* and *c′*, respectively, to take the pivots of an oscillating switch-closer E, which may hereinafter be designated as the "controller," its function being to initiate a series of electrical actions, as will be fully described. In line with these bearings is another bearing *c″*, to receive the journals of a switch-closer F, which will also be more particularly described hereinafter.

Some distance up from the base is a table D, suitably secured to the wall-plate and the posts. Both the base-plate and the table are provided with insulating bed-blocks B′ and D′, respectively, and on these are mounted the various switches and solenoids—that is to say, the fixed parts thereof.

The controller E is an oscillating switch-closer provided with suitable pivots *e′* for the bearings *c c′*. For great delicacy knife-edge bearings may be used, as shown in Fig. 5. The cylinder or semicylinder E is provided with a properly-insulated contact-plate *e* adapted to successively make contact with switch-terminals M and M′. To an arm E′ is connected, as by a chain *g*, the core G′ of a solenoid G mounted on the base-block B′. The other arm, E″, is provided with a counterpoise E‴, suitable provision being made for adjusting the same so as to throw the controller into the position shown in Fig. 1, when the solenoid G is demagnetized. This is the simpler form of the controller; but to give it a quick and positive motion in both directions and prevent any tendency to vibrate after making contact the form illustrated in Fig. 5 is preferred and will be more fully described hereinafter.

The switch-closer F consists of a cylinder grooved at each end to carry the switch-chains *r r* and journaled in the bearings *c′ c″*. The cylinder is provided with a pair of oppositely-extending grooved segment-arms F′ F′ to take the chains *h* and *i* for the cores of the solenoids H and I, also mounted on the base-block B′. A central arm F″ extends upwardly per-

pendicular to the arms F′ F′, and by its weight tends to carry the switch-closer in either direction as soon as its center of gravity passes a vertical line through its pivot. Below this switch-closer is mounted another, K, journaled in the post C′ and the wall-plate. To the cylinder K are attached contact-plates *k* *k*′, adapted to close with the terminals L and L′, respectively. At the ends of the cylinder are grooved segments J J, coinciding with the terminal grooves of the upper cylinder.

The switch-terminals M M′ L L′ may be of a simple and well-known form, consisting essentially of spring contact-strips attached to bases provided with suitable binding-posts. The other switches are of special construction and adaptation.

The switch N O, through which the whole current of the cut-in converter passes, should have large firm contacts, so as to avoid resistance. A form of switch well adapted to the purpose is that illustrated in Figs. 1 and 2. In this the contact plate or bridge N is in the form of a stirrup with parallel vertical arms, to insulated connections of which are attached the chains *s* *s*, which connect at their other ends with the cylinders F and K. Each leg of the bridge fits in a quadrangular terminal O, the connecting-chain passing through a suitable hole in the table D D′ and the base of the terminal, as indicated in Fig. 1. This fourfold contact makes a large non-resisting electrical connection and also serves to guide the bridge in its movement up and down. The opposite switch consists of a simple bar P having electrical contact at opposite ends with a pair of spring-terminals Q Q. The metal portion of the bar is of course insulated from the chain connections, which are two pairs of studs P′ P′ P′ P′. The connection of this switch is broken in one final position of the switch-closer, as indicated in Fig. 3, the contact-plate being moved a little past the terminals.

The oscillation of the controller E is regulated by stops R′ R′, adjustable, as by screwing, on a post or rod R set in the table D.

The chain-and-cylinder connection of the switches N O and P Q is such as to give concurrent but opposite movement to them, and at the same time a corresponding movement of the switch-cylinder K alternately opens and closes the switches L L′. By virtue of this and the action of the controller the apparatus operates to automatically cut in or out a converter, as will clearly appear by reference to the diagrams showing the electrical connections. These connections are substantially the same as that shown in my patent above referred to, and are fully illustrated in Figs. 4, 5 and 6.

A permanent source of electrical energy is provided, such as a permanent converter. This connects with the primary and secondary circuits in the usual way. One wire of the secondary circuit is connected by wires *a* *a* with the coil of the solenoid G, whereby the solenoid is energized whenever the secondary circuit is closed, as by the turning in of a lamp in the connected lamp-circuit. From one of the wires *a* a wire *b* leads to the contact-plate *e* of the controller. One of the controller-terminals M connects with one of the terminals of the switch L by a wire *d*. The other terminal of this switch connects with the other wire of the secondary circuit through the coil of the solenoid H. The other controller-terminal M′ connects by a wire *n* with one terminal of the switch L′. The other terminal of this switch connects with one wire of the secondary circuit through the coil of the solenoid I in the same manner as does the coil of H. This completes a circuit through this solenoid, and so reverses the position of the switch-closer F.

The switches N O and P Q are simultaneously opened when the switch-closer F swings in one direction and closed when it swings in the other direction. Electrical connection is made with the secondary circuit and the temporary converter through the wire *j* leading from *a* to one terminal of the switch O, from the other terminal to the converter, and from the converter to the other wire of the secondary circuit. The connection with the primary circuit is made through the wire *p* leading from one wire of said circuit to one terminal of the switch Q, from the other terminal through the wire *m*′ to the converter, and from it, through the wire *m*, to the other wire of said primary circuit.

The operation of the apparatus is as follows: In Figs. 1, 2 and 3 the apparatus is shown in the positions the parts occupy when the converter is cut out, as by the turning out of all the lamps in the circuit fed by it. The diagram Fig. 4 indicates the same condition. It is now but necessary to bring the apparatus into circuit with the permanent converter to re-establish connection with the temporary converter. By turning in a lamp this action takes place, as will be readily seen. On closing the circuit the coil of the solenoid G is energized, causing the controller to reverse its position. This opens the switch M′ and closes M. A portion of the current then energizes the solenoid H through the closed switch L, causing the switch-closer F to reverse its position. This closes the switches N O and P Q, bringing the temporary converter completely into circuit. It is to be noted that in assuming this changed position the switch L is opened, the momentum of the heavy arm F″ being utilized for this purpose, and the switch L′ L′ is closed. It is then in position for cutting out by turning out all of the lights, when the controller reverses its position by gravity, making contact at M′, when the current from the permanent converter passes through the coil of the solenoid I and the parts are restored to the original position. To prevent vibration of the controller on making

contact, I prefer in practice to connect each of its arms with a solenoid, the coil for the gravity-arm E″ being in series with the coil of the solenoid I, as shown in Fig. 5. The other solenoid, G″, is made more powerful by a double winding—an outer coil of comparatively large wire and an inner coil of fine wire—connected up in series with the coil of the solenoid H, as will be readily seen by reference to Fig. 5. The arm E′ is thus started downward by a weak current passing through the outer coil. As soon as the switch *e* M makes contact the current is thrown into the inner coil, and the combined energy of both pulls the core down sharply and holds it firmly in position. Provision is also made for pulling the cores of the solenoids H and I positively to near the bottom of their stroke. It will be understood that these have a considerable range of movement vertically, and in order that magnetism may act strongly on them to near the limit of their downward stroke I prefer to make the solenoids with two or more coils in vertical order and connected with the wire *o*. These are successively energized through the medium of successively-acting switches *k′* L′ L′ and suitable connections *o o′*. By this means the lower end of the solenoid is made practically as strong as the upper portion, and the core is sucked down strongly until the switch through which the current passes is opened by the momentum of the oscillating switch-closer.

The device, as will be understood, is designed to prevent much of the leakage and loss incident to the maintaining of converter-circuits in alternating electrical-current systems. This is effected by entirely cutting out the converter from the primary circuit when it is not needed, as in case of a lamp-circuit by day or an exclusively power-circuit during the night or a considerable part thereof.

Having thus described my invention, I claim—

1. In an organized cut-out for electrical converters, the combination with a wall plate or bracket having means for attaching the same to a wall or post, and suitable supports for the fixed and moving parts, substantially as described, of an oscillating controller, a solenoid adapted to move it electrically in one direction, means substantially as specified for moving it in the opposite direction, switches adapted to be alternately closed by the movement of said controller, an oscillating switch-closer, a pair of solenoids to actuate the same, alternately-operating switches adapted to close the solenoid-circuits, and a pair of switches to close both the primary and secondary circuits through the temporary converter, and operating in connection with said switch-closer, substantially as described.

2. The combination with a suitable retaining-frame adapted to be attached to a wall or post, and having supports for the fixed parts and bearings for the moving apparatus, of an oscillating controller in permanent electrical connection with a permanent source of electrical energy, switches alternately closed by the movement of said controller, a solenoid adapted to move said controller in one direction, suitable means for moving it in the opposite direction, an oscillating switch-closer adapted to close the primary and secondary circuits of a converter and solenoid-circuits through suitable switches, solenoids adapted to oscillate said switch-closer to close or open said switches, switches to close said primary, secondary and solenoid circuits, and a permanent source of electrical energy with suitable electrical connections, whereby the controller is moved one way by the opening of the service-circuit and in the other direction by its closing, the movement of said controller switching in one or other of the switch-closer solenoids and thereby cutting a converter in or out, as specified.

3. In an automatic cut-out for electrical converters, the combination of a switch-closer substantially as described, switches adapted to close the primary and secondary circuits of a converter and the circuits of the switch-closer solenoids, a pair of solenoids to oscillate said switch-closer, a controller adapted to be operated by an independent source of electrical energy, switches alternately closed by said controller, a counterpoise and low-resistance solenoid in series with one of the switch-closer solenoids acting on one arm of the controller, and a doubly-wound solenoid acting on the other arm, first through an outer coil in series with the permanently-energized circuit, and finally through the inner coil in series with the other switch-closer solenoid, on the closing of one switch of the controller.

4. In an automatic cut-out for electrical converters, the combination with a suitable frame and bearings, of a switch-closer having a cylindrical body, a pair of opposite, lateral arms and a vertical gravity-arm, solenoids adapted to act alternately on said lateral arms, a cylindrical switch-closer coupled to and moving concurrently with said first-named switch-closer, and adapted to close the solenoid-circuits alternately, and switches between said cylinders having contact-plates attached to the coupling of said cylinders, and adapted to open and close the main and secondary converter circuits, substantially as and for the purpose set forth.

5. In a cut-out for electrical converters, the combination of a pair of cylindrical switch-closers having a chain-belt connection, a pair of opposing terminals, and a contact-plate attached to said chain belt, and moving between said terminals whereby the terminals act as a guide for the contact-plate, substantially as described.

6. In a cut-out for electrical converters, the combination of a pair of cylindrical switch-closers coupled by chain belt, a stirrup-shaped contact plate or bridge attached there-

to, and a pair of quadrangular terminals surrounding each leg of the stirrup, and through which the chain belts pass, whereby the switch acts as its own guide, as described.

7. In an organized automatic cut-out device for electrical converters, the combination of an oscillating switch-closer, a pair of solenoids to move the same oppositely and alternately, a pair of switches therefor closed by said switch-closer alternately, switches to close the main and secondary converter circuits, also closed by said switch-closer, an oscillating controller adapted to switch a current from a permanent source of energy into said solenoids alternately, one or more solenoids to actuate the same, suitable electrical connections for all said parts, a frame adapted to be attached to a post or wall and support said parts, with suitable bearings for the moving parts, and a cover therefor to protect the same from the elements.

In testimony whereof I affix my siguature in presence of two witnesses.

WILLIAM J. GREENE.

Witnesses:
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J. M. ST. JOHN.