



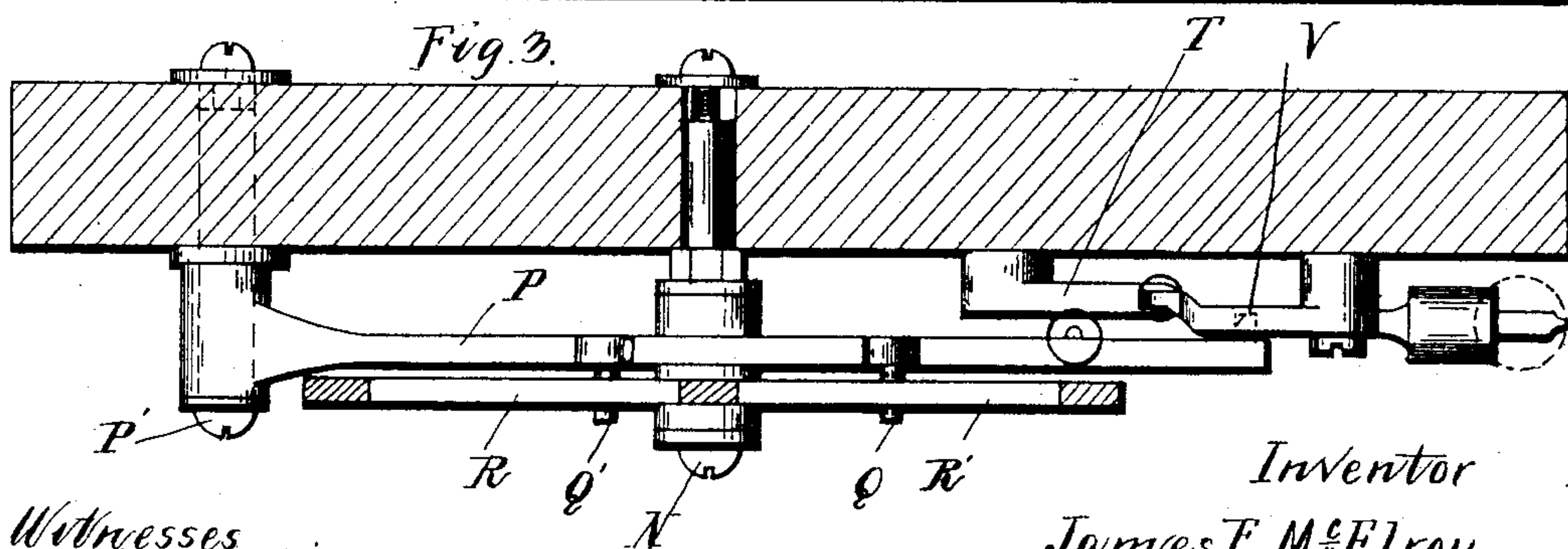
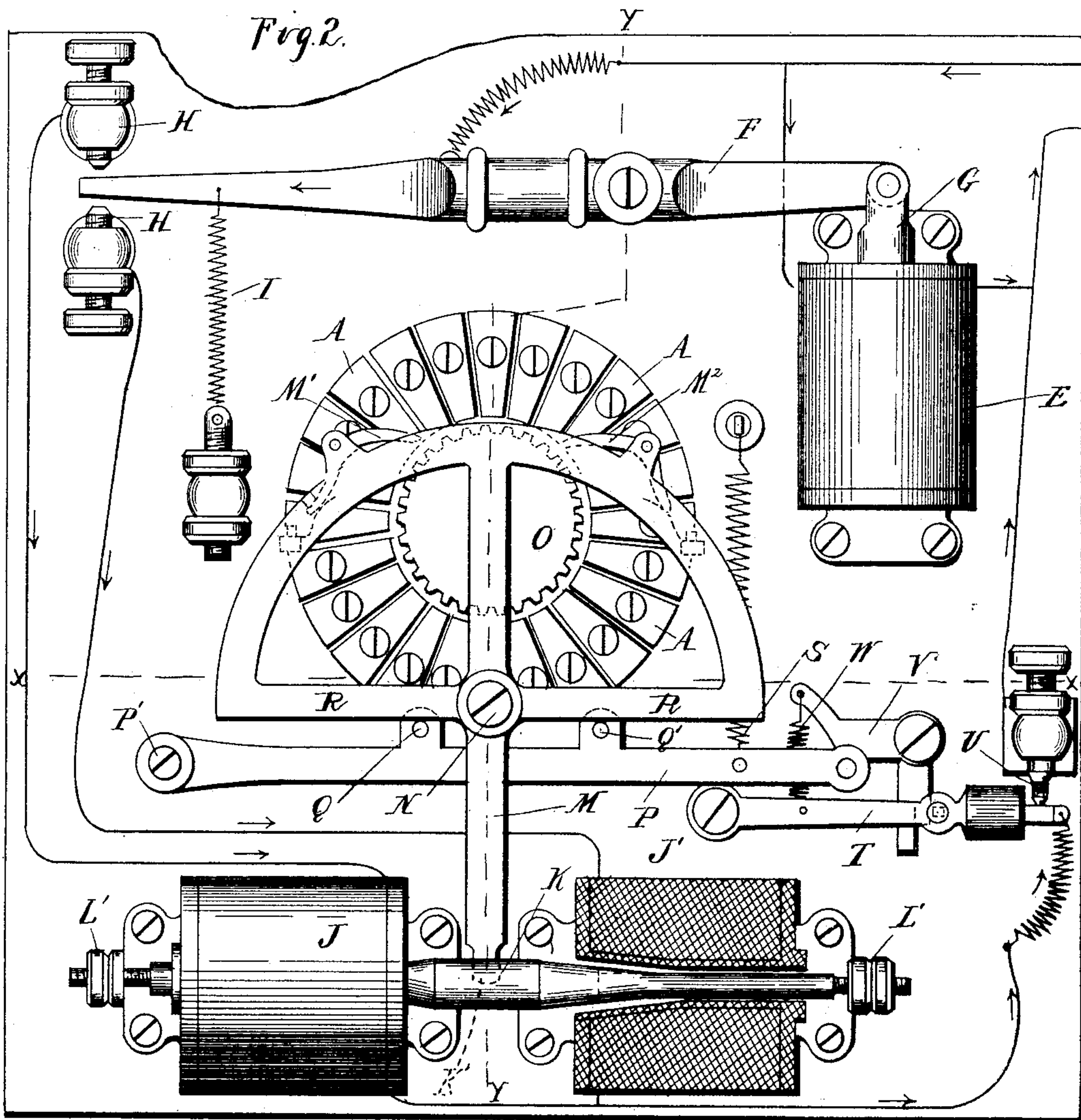
(No Model.)

2 Sheets—Sheet 2.

J. F. McELROY.  
ELECTRIC REGULATOR.

No. 460,059.

Patented Sept. 22, 1891.



Witnesses  
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# UNITED STATES PATENT OFFICE.

JAMES F. McELROY, OF ALBANY, NEW YORK, ASSIGNOR TO THE CONSOLIDATED CAR HEATING COMPANY, OF SAME PLACE.

## ELECTRIC REGULATOR.

**SPECIFICATION** forming part of Letters Patent No. 460,059, dated September 22, 1891.

Application filed February 11, 1891. Serial No. 381,104. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES F. McELROY, a citizen of the United States, residing at Albany, in the county of Albany and State of New York, have invented certain new and useful Improvements in Electric Regulators, of which the following is a specification, reference being had therein to the accompanying drawings.

10 This invention relates to new and useful improvements in electric regulators; and the invention consists, primarily, in the novel construction and arrangement of the motor devices, whereby the contact-hand is made to move quickly to prevent sparking in changing its position; and the invention consists, further, in the novel construction and arrangement of the parts, whereby the device is not only simple and readily adjusted, but also with the different parts so balanced that its operation will not be disturbed by the motion on board of a railway-train, thus adapting the device specifically for use in electric car-lighting.

25 In the drawings, Figure 1 is a diagram of my device, showing the different electric connections. Fig. 2 is an elevation of the same. Fig. 3 is a section on line *xx* in Fig. 2. Fig. 4 is a section on line *yy* in Fig. 2.

30 A A represent a circular series of stationary contacts, which are connected to a series of resistances B, and C is a contact-hand adapted to move over these contacts and thereby introduce more or less resistance into the circuit of the field-magnets of the dynamo D by turning to the right or left. Instead of introducing resistances, however, the contacts may be connected to the different cells of a storage-battery, so that the motion of the contact-hand will switch in a greater or lesser number of cells, and hence vary the potential of the currents exciting the field-magnets, and thereby regulate the lights in the working circuit of the dynamo, the latter arrangement being the one to which my device is especially well adapted, on account of its reducing the sparking to a minimum.

45 E represents the controlling-magnet, the terminals of its energizing-coil being in contact with the poles of the dynamo, so that the

current flowing through it depends on the electrical pressure in its working circuit.

F is the armature-lever of the controlling-magnet.

G is the movable core of the magnet E, secured to one end of the armature-lever. 55

H H' are two stationary contacts, and I is a spring, all so arranged that when the pull of the magnet E becomes greater or less than the resistance of the spring I the lever is drawn against the contacts H H', respectively. 60

J and J' are two opposing motor-magnets placed horizontally in axial line with each other and provided with hollow spools.

K is a movable armature placed between the two opposing motor-magnets and adapted to be drawn into either one. The inner ends of the spool of the opposing motor-magnets are preferably made conical, and the ends or cores project into and are made of corresponding shape and have secured to them the guide-bars L, which guide the movable armature in its horizontal movement and limit such movement by means of adjusting-nuts L', placed upon them. 65 70 75

M is a rocking lever pivotally suspended upon a fulcrum N above and between the motor-magnets and loosely engaging with its lower end into a slot K', preferably enlarged, in the movable core. The upper end of this lever is provided with two pawls M' and M<sup>2</sup>, which are on opposite sides of the center line. 80

In the center of the circular series of contacts is secured or revolves upon a suitable shaft or bearing a toothed wheel O, which carries the contact-hand C, and which is free to be revolved in either direction by its engagements with the pawls M' M<sup>2</sup>—that is, if the movable core K is drawn to the right the wheel O and contact-hand C will be revolved to the left the distance of one contact, and vice versa when the core is drawn in the opposite direction. 85 90

P is a retracting-lever, mounted transversely the rocking lever M upon a fulcrum P' and provided with two pins or offsets Q Q', adapted to bear against lateral offsets or arms R R', formed on the rocking lever, by the tension of a spring S, secured to the retracting-lever, all so arranged as to normally hold 95 100



thereby the rocking lever M in its middle or normal position between the motor-magnets, in which position the pawls M' M<sup>2</sup> are both out of engagement with the toothed wheel O. Below the free end of the retracting-lever is pivotally secured the contact-breaking lever T, which is adapted to make and break contact with the adjusting-screw U. The breaking of said contact is effected by the retracting-lever P, which when depressed to its limit, or nearly so, by the movement of the rocking lever to one side or the other presses said lever down.

V is a trip-dog adapted to hold the lever T out of contact with the screw U when it is pressed down by the lever P, and when the latter again returns to its normal position it trips the dog V and restores again the contact with the screw U by the tension of the spring W.

Electrical connections are further made as follows: One terminal of the controlling-circuit is connected to the lever F and the other to the contact-screw U, and the coils J and J' have their terminals connected with the contact-screws H H', respectively, and with the contact-lever T.

The operation of the device is intended to be as follows: When the pull of the controlling-magnet E becomes greater than that which the spring I is adjusted to resist, contact is made with the contact-screw H, and the regulating-circuit is thereby closed through the magnet J, which on becoming energized pulls the armature K to the left. This, on account of the lost motion which the rocking lever M has in the slot K' and the weight of the core K and rocking lever M, imparts a quick motion to the rocking lever, which, like a blow, strikes the toothed wheel and turns it to the right, moving thereby the contact-hand the distance of one contact to the right, and owing to this quick blow being given there will be but a minimum of sparking when the hand breaks contact. At the same time the movement of the rocking lever depresses the retracting-lever, which at or near the limit of its depression strikes the contact-lever T and breaks the contact at U, thus cutting out the magnet J. This allows the retracting-lever to be drawn back again by its spring S and restores the normal position of the armature K and rocking lever M, and by tripping the dog V also restores the contact of the lever T with the screw U. It will be noticed that the circuit thus remains open until the rocking lever and armature K have assumed their normal position; but while the rocking lever receives and delivers its blow the circuit remains closed, thus utilizing the full energy of the magnet. If the pressure should still continue too high, the same operation is repeated again and again until an equilibrium is established, and if the pressure sinks below contact will be made at the screw H', and the magnet J' now becomes the active motor-magnet and the contact-hand C will be moved

in the opposite direction. The lever F is free to respond to the slightest fluctuations in the electric circuit. At the same time it is balanced so that if placed on a railway-car it will not be affected by the jolting produced in the motion of the car. The upper portion of the rocking lever is made suitably weighty to balance, or nearly so, the lever portion thereof, including the armature K. In this way the lever is so balanced upon its point that the jolting of the car in the plane of the lever will have no tendency to disturb it. It will be noticed that the pins Q and Q' on the retracting-lever are at such relative distances from the fulcrum of the rocking lever as to produce a like degree of depression by the movement of the rocking lever to either side.

What I claim as my invention is—

1. The combination, with a dynamo-electric generator and its working circuit, of a loop in said circuit, two motor-magnets in normally-open branches of said loop, an armature adapted to be oppositely actuated by said motor-magnets and connected to the dynamo-regulating devices, means operated by changes of current in the working circuit of the dynamo for closing the circuit through either of the motor-magnets, a retracting mechanism for the armature of the motor-magnets, and a make-and-break mechanism in said loop actuated by said retracting mechanism, substantially as described.

2. In electric regulators, the combination, with the working circuit of an electric generator, of two opposite motor-magnets located in normally-open branches of a loop in said working circuit, a movable core or cores forming an armature adapted to be oppositely moved by said magnets, a rocking lever actuated by said armature, a contact-hand adapted to be moved by said rocking lever to regulate the flow of the current through the field-magnets of the dynamo, a retracting-lever for said rocking lever, a make-and-break mechanism in the circuit of the loop actuated by the movement of said retracting-lever, and means operated by changes of current in the working circuit of the dynamo for closing the circuit through either of the motor-magnets, substantially as described.

3. In electric regulators, the combination, with the working circuit of an electric generator, of two opposite motor-magnets located in normally-open branches of a loop in said working circuit, a movable core or cores forming an armature adapted to be oppositely moved by closing the circuit through one or the other of said magnets, a normally-open switch-lever adapted to close the circuit through one or the other of said motor-magnets, a controlling-magnet actuating said switch-lever upon changes of current in the working circuit, a rocking lever actuated by the armature of the motor-magnets, a contact-hand actuated by said rocking lever to regulate the magnetic intensity of the field-magnets of the dynamo, a retracting-lever applied



to return said rocking lever and armature to its normal position, and a make-and-break mechanism adapted to make and break the circuit through the loop by actuating the retracting-lever in its extreme period of movement, substantially as described.

4. The combination, with a concentrically-arranged series of contact-strips and a centrally-pivoted contact-hand of an electric regulating device, of a toothed wheel carrying such contact-hand, two solenoids placed opposite each other and provided with hollow spools, an armature slidingly supported between said spools in axial line therewith and provided at its opposite ends with cores extending into said spools to move said armature in opposite directions, a rocking lever engaged at one end with said armature, two pawls carried by the other end of said lever on opposite sides of the toothed wheel and normally out of engagement therewith, and a retracting-lever adapted to bear against said rocking lever at points on opposite sides of its fulcrum, substantially as described.

5. The combination, with the series of fixed contacts and the movable contact-hand of an electric regulating device, of a toothed wheel carrying said movable contact-hand, a rocking lever carrying two pawls on opposite sides of said wheel and adapted to turn said wheel in opposite directions, respectively, by the movement of said rocking lever, two motor-magnets provided with a movable core or cores engaging with said rocking lever and adapted to oppositely actuate the same, and a retracting-lever adapted to bear against said rocking lever at two points at opposite sides of its fulcrum, respectively, substantially as described.

6. The combination, with a concentrically-arranged series of contact-strips and a centrally-pivoted contact-hand of an electric regulating device, of a toothed wheel carrying said contact-hand, two opposite motor-magnets having a sliding armature adapted to be oppositely actuated by the same, and a rocking lever carrying at one end two pawls on opposite sides of the toothed wheel, normally out of contact with said wheel and adapted to actuate the same in opposite directions and having its other end engaging loosely into an enlarged slot in said armature, substantially as described.

7. The combination, with the rocking lever, of the motor-magnets having hollow spools, the movable armature engaging with one end of said rocking lever and having cores formed at its opposite ends projecting into the spools and adapted to move such armature in opposite directions, and the adjusting-nuts on said cores for regulating the amplitude of motion of said rocking lever, substantially as described.

8. The combination, with the motor-magnets having a sliding armature oppositely actuated by said magnets, of a rocking lever engaging with one end into said armature and provided at the other end with means for actuating the dynamo-regulating devices, said lever being arranged to balance with the armature, substantially as described.

9. The combination, with the motor-magnets having a movable armature, of the rocking lever oppositely actuated by the same and provided with the lateral offsets  $R R'$ , the retracting-lever  $P$ , provided with the projections  $Q Q'$ , adapted to bear against said offsets, and the spring  $S$ , substantially as described.

10. The combination, with the motor-magnets having a movable armature, of the rocking lever oppositely actuated by the same and connected to the dynamo-regulating device, the retracting-lever  $P$ , the spring  $S$ , and the make-and-break mechanism consisting of the make-and-break lever  $T$ , the stationary contact  $U$ , the trip-lever  $V$ , and the spring  $W$ , substantially as described.

11. The combination, with a concentrically-arranged series of contact-strips and a centrally-pivoted contact-hand, of an electric regulating device, a toothed wheel carrying such contact-hand, a rocking lever operated by the motor devices of the regulator and carrying at one end two pawls on opposite sides of said toothed wheel, and a retracting-lever arranged to normally engage on opposite sides of and hold said rocking lever with the pawls out of engagement with said wheel, substantially as described.

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

JAMES F. McELROY.

Witnesses:

EDWIN A. SMITH,  
JOHN B. BRAIDWOOD.