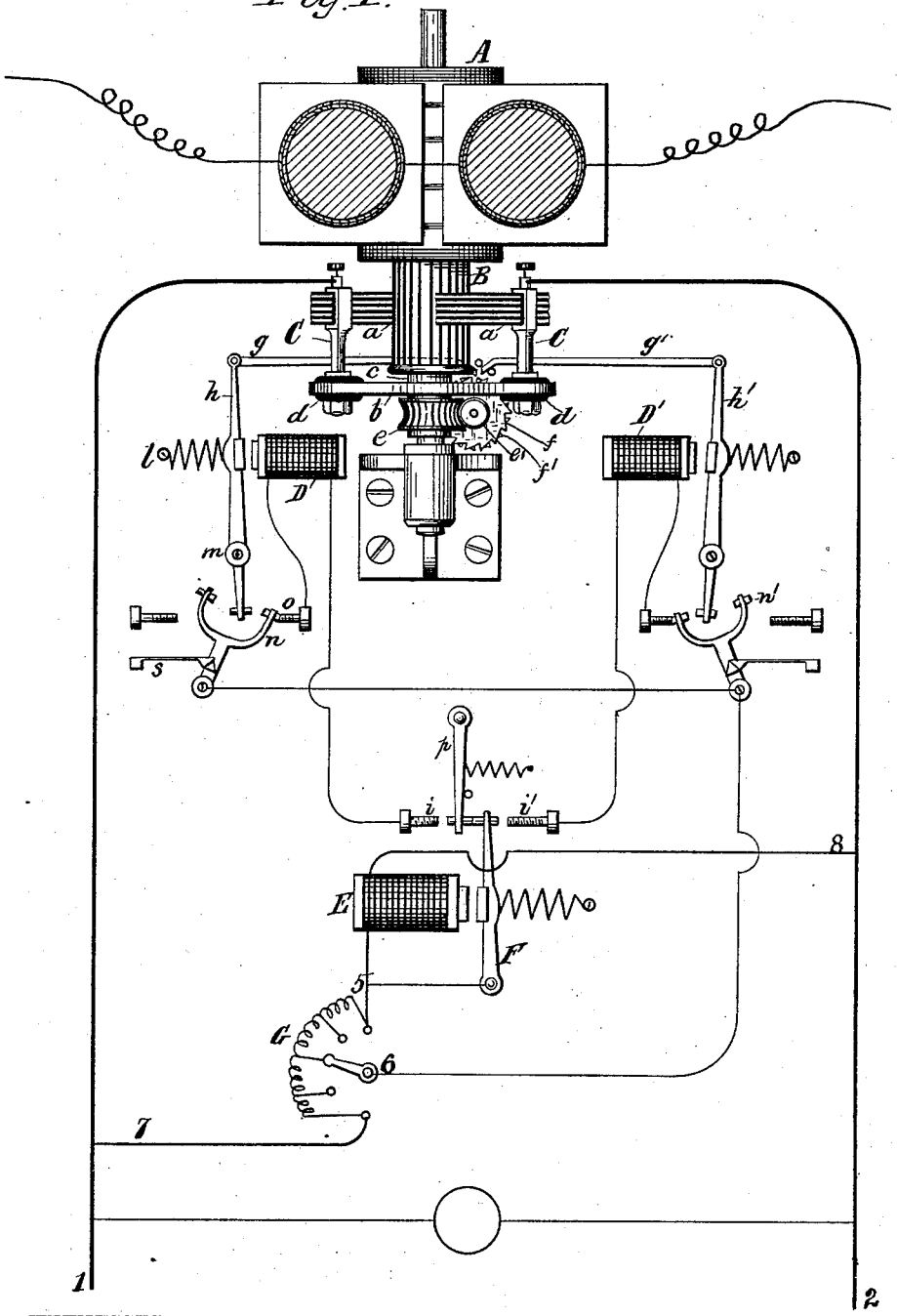
(No Model.) 2 Sheets—Sheet 1.

T. A. EDISON.

REGULATOR FOR DYNAMO ELECTRIC MACHINES.

No. 265,779. Patented Oct. 10, 1882.

Fig. 1.



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(No Model.) 2 Sheets—Sheet 2.

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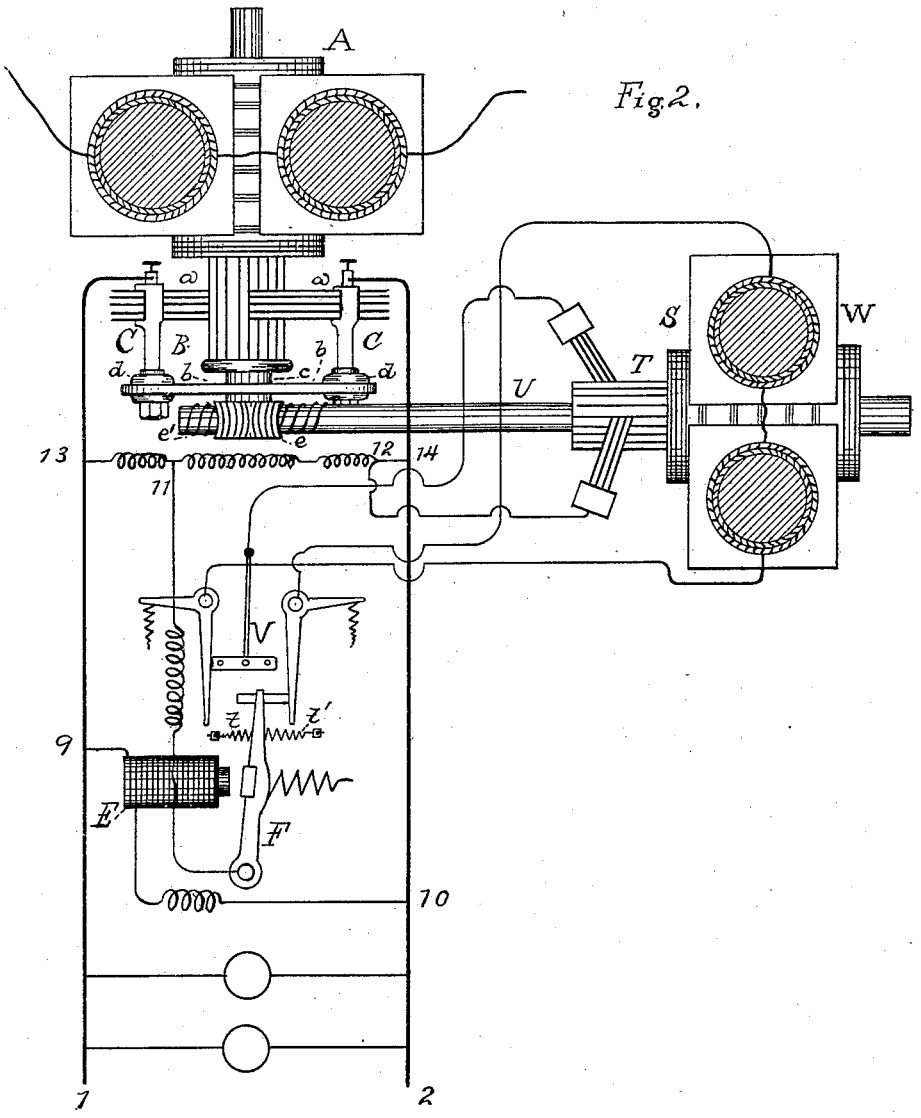
Fig. 2.



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UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF MENLO PARK, NEW JERSEY.

REGULATOR FOR DYNAMO-ELECTRIC MACHINES.

SPECIFICATION forming part of Letters Patent No. 265,779, dated October 10, 1882.

Application filed August 7, 1882. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Menlo Park, in the county of Middlesex and State of New Jersey, have invented a new and useful Improvement in Means for Regulating the Generative Capacity of Dynamo or Magneto Electric Machines, (Case No. 391;) and I do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

The object of my invention is to produce mechanism for automatically shifting the position (relative to the neutral line) of the commutator-brushes upon the commutator-cylinder of a magneto or dynamo electric machine, supplying current to a multiple-arc system of distribution, so as to vary the current generated in such machine, such mechanism being operated entirely and continuously by the variations of resistance in the external circuit of the machine which contains the lamps or other translating devices. Such mechanism also is to have a continuous operation—that is to say, one not dependent upon and limited by the play of an armature-lever, but accomplished by a continuous revolution, and not by a single impulse. By this means any extent of movement may be given to the brushes, while in devices of this kind heretofore in use the brushes can be moved only a short distance in either direction—that is, only as far as the pivoted armature of an electro-magnet can move. In accomplishing this object I place in a multiple-arc or derived circuit from the main circuit of the dynamo or magneto electric generator an electro-magnet provided with a pivoted armature-lever, which lever forms a part of a shunt-circuit from the multiple-arc circuit and has its free end placed between contact-points. A pivoted spring-arm is also placed between these contact-points in such manner that the forward movement of the armature forces it against one of them and completes a branch or division of the shunt-circuit, while the armature, when drawn back a sufficient distance, strikes the other contact-point and completes the other division. Normally, however, the armature and spring-arm are held by the resilience of their springs and by a properly-placed stop midway between the contact-points, and either division of the circuit is completed only by an increase or decrease in the force of the electro-magnet. This spring-arm serves to determine the central position of the armature-lever, so that such lever will not be affected by slight magnetic changes. Each of these divisions of the shunt-circuit contains an electro-magnet provided with a vibrating armature and a circuit-reverser operating a pawl-arm.

The commutator-brush holders are connected mechanically (but insulated electrically from each other) by a pivoted yoke, which, when turned upon its axis, moves the brushes around upon the cylinder. The yoke may be turned by means of a worm and worm-wheel actuated by a ratchet-wheel. Two ratchet-wheels are used adapted to turn in opposite directions, and each operated by one of the pawl-arms above spoken of. When the electro-motive force of the circuit is too great it is desirable to decrease the electro-motive force of the machine by moving the commutator-brushes farther away from the neutral line of the cylinder. The magnet in the multiple-arc circuit of course has its energy increased by the excessive quantity of current passing through it from the main line and attracts its armature, which pushes the spring-arm against a contact-point, thus closing a division of the shunt including one or the other of the electro-magnets, whose vibrating armature is set in motion, moving the pawl and turning the ratchet-wheel, worm-gearing, and pivoted yoke in such a direction as to move the commutator-brushes away from the neutral line. The electro-motive force in the main circuit then decreases and the magnet in the multiple-arc circuit weakens in power until the armature is drawn away by the spring and the circuit of the electro-magnet which actuates the pawl-arm is broken; but if the electro-motive force is very much decreased, so that it becomes necessary to move the brushes back again, the first armature-lever is drawn back by its spring and closes the other division of the shunt-circuit through the other electro-magnet, whose pawl-arm, acting on the other ratchet-wheel, moves the brushes in the opposite direction.

Instead of using the two vibrating motors moving the commutator-brushes in opposite directions, the circuit to one or the other being completed, as required, by a controlling electro-magnet in multiple arc having a cen-

tered armature-lever, I may employ a single revolving electromotor connected with a current-reverser which is operated by said controlling electro-magnet, which causes the motor to turn in one direction or the other. The armature-lever of this controlling electro-magnet is centered, as before described, and in its central position opens the motor-circuit entirely.

In the drawings, Figure 1 is a view, partly diagrammatic, of the arrangement employing two vibrating motors; and Fig. 2, a similar view of the arrangement employing the single revolving motor.

A is the armature; B, the commutator-cylinder, and *a a* the brushes, held in brush-holders C C.

To a sleeve, *c*, on the armature-shaft is attached the yoke *b*, on each end of which is placed one of the brush-holders C C, which, however, are insulated from the yoke by non-conducting material *d*. Attached also to the sleeve *c* is the worm-wheel *e*, which is moved by the worm *e'*, this being turned in one direction or the other, according to which of the ratchet-wheels *f f'* is in operation. The ratchet-wheel *f* is turned by means of the pawl *g*, which is attached to the vibrating armature *h* of the electro-magnet D, which is placed in the division *i* of the shunt-circuit 5 6, which is a shunt from the multiple-arc circuit 7 8, derived from the main conductors 1 2 of the system. The armature *h* is provided with a spring, *l*, and is pivoted at *m*. Its lower end is placed between the branches of the pivoted U-shaped piece *n*, which forms a circuit-breaker. When the magnet D is energized by the completion of the circuit 6 *i* it draws forward its armature, which then throws back the piece *n* and breaks the circuit at *o*. The spring *l* then draws back the armature and throws *n* against *o* again completing the circuit through the magnet. The piece *n* is provided with a spring, *s*, to assist its motion. The vibration of the armature which actuates the pawl-arm is thus produced. On the opposite side of the drawings the magnet B', armature *h'*, and circuit-breaker *n'* operate the pawl *g'* and ratchet *f'*, the magnet D' being in the other division, 6 *i'*, of the shunt 5 6.

The electro-magnet E is placed directly in the multiple-arc circuit 7 8. Its spring-armature F is a part of the shunt-circuit 5 6. The free end of this armature, with the spring-arm *p*, is between the contact-points *i i'*, and as it is attracted by its magnet or drawn back by its spring, according to the variations in the energy of the magnet, it makes and breaks the circuits 6 *i* and 6 *i'*. An adjustable resistance, G, is used to regulate the amount of current passing into the shunt.

Instead of the above-described arrangement, that shown in Fig. 2 may be employed. Here the magnet E is in multiple-arc circuit 9 10, and its armature F forms part of a shunt, 11 12, around resistance in a multiple-arc circuit, 13 14. In the shunt 11 12 is placed a revolving electromotor, W, of which S is the armature and T the commutator-cylinder. The worm *e'* is on the end of the commutator-shaft U, so that the worm-wheel *e*, and consequently the brushes *a a*, are moved by the revolution of the armature S, but of course at a much lower speed than said armature.

V is a current-reverser, operated by the movement of the armature-lever F to reverse the current energizing the motor W. Thus when the armature F is drawn forward the motor W runs in the proper direction to move the commutator-brushes *a a* away from the neutral line, and when armature F is retracted by its spring the current through the motor is reversed, whereby the commutator-brushes are moved toward the neutral line. The armature-lever F is centered between springs *t t'*, and in its central position breaks completely the motor-circuit.

What I claim is—

1. The combination, with the commutator-brushes of a dynamo or magneto electric machine, of one or two electromotors capable of continuous operation and adapted to move such brushes in either of two directions, and an electro-magnet located in a multiple-arc circuit and controlling such motor or motors, substantially as set forth.

2. The combination, with the commutator-brushes of a dynamo or magneto electric machine, of one or two electromotors capable of continuous operation and adapted to move said brushes in either of two directions, an electro-magnet located in a multiple-arc circuit, the armature-lever of said electro-magnet controlling such motor or motors, and means for determining the central position of said armature-lever, substantially as set forth.

3. The combination, with an electro-magnet energized by the current generated by a dynamo or magneto electric machine, of an armature-lever, a divided shunt closed by the forward and backward movements of said armature-lever, and mechanism, included in the branches of said divided shunt, for changing the position of the commutator-brushes of the machine, substantially as set forth.

4. The combination, with a multiple-arc circuit, of a divided shunt therefrom, each division containing an electro-magnet provided with a vibrating armature, and mechanism operated by said vibrating armature for shifting the position of the commutator-brushes of the machine, substantially as set forth.

This specification signed and witnessed this 17th day of January, 1882.

THOMAS A. EDISON.

Witnesses:
H. W. SEELY,
PHIL. S. DYER.