

No. 841,215.

PATENTED JAN. 15, 1907.

W. S. ANDREWS.
ELECTRIC REGULATOR.
APPLICATION FILED JUNE 5, 1902.

FIG. 1.

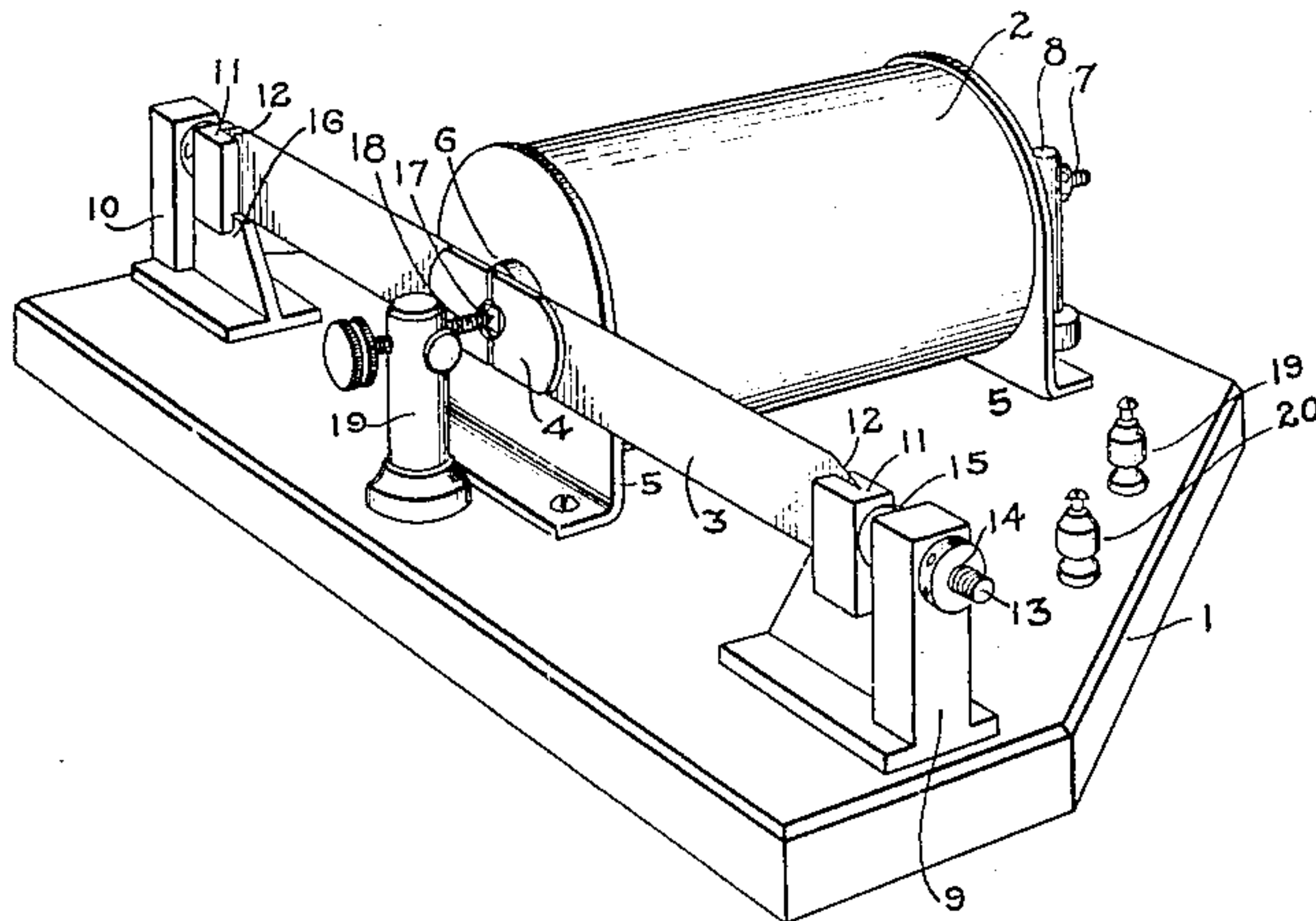
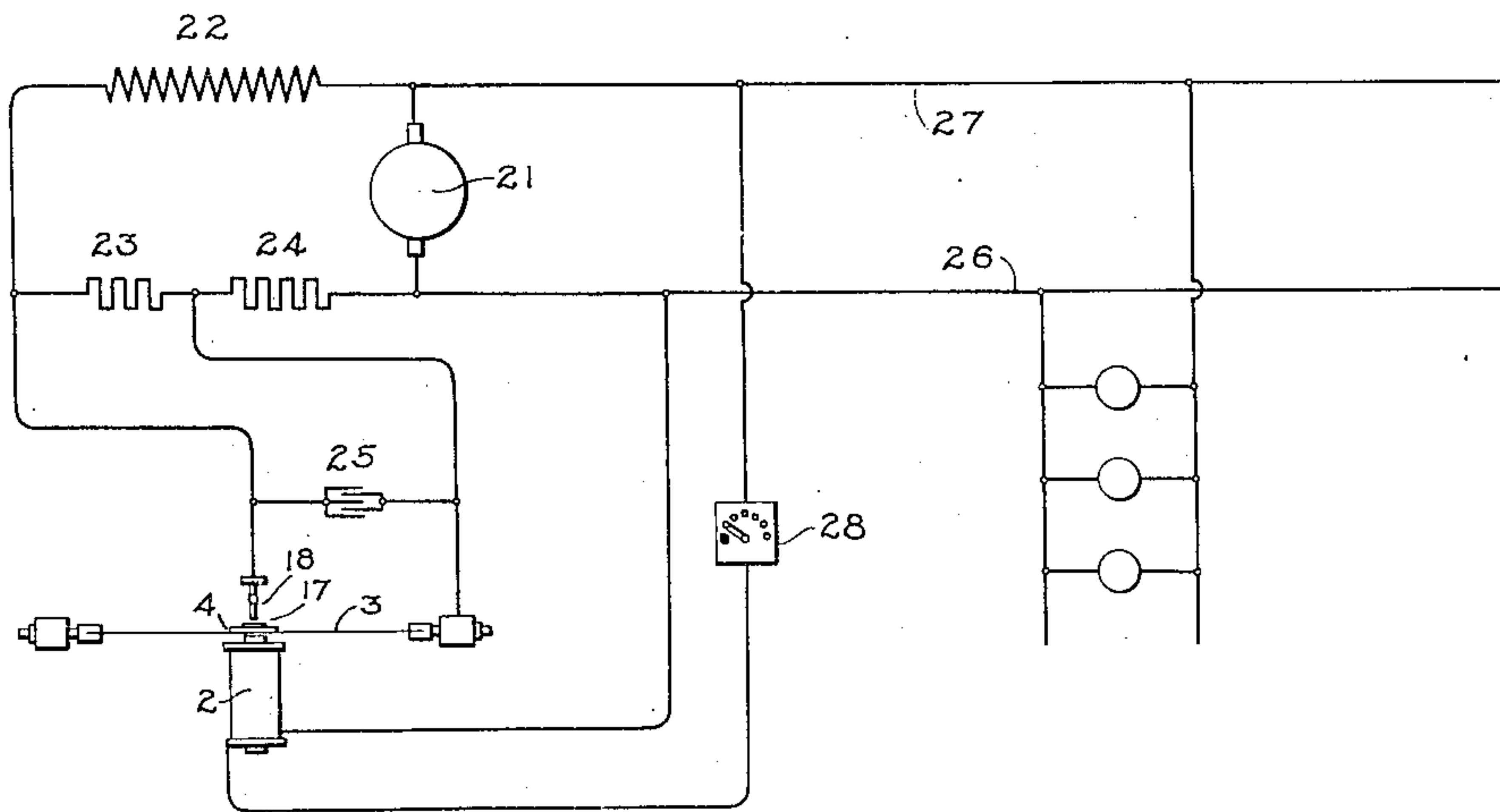


FIG. 2.



WITNESSES:

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UNITED STATES PATENT OFFICE.

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GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTRIC REGULATOR.

No. 841,215.

Specification of Letters Patent.

Patented Jan. 15, 1907.

Application filed June 5, 1902. Serial No. 110,273.

To all whom it may concern:

Be it known that I, WILLIAM S. ANDREWS, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Electric Regulators, of which the following is a specification.

My present invention relates to electric regulators, and more especially to that type in which a resistance in the field-circuit of a dynamo-electric machine is alternately cut into and out of circuit with such rapidity and at such varying time intervals as to produce a resulting mean current of the value necessary to secure the desired regulation of the machine.

The novel features of my invention are embodied more particularly in the regulating-magnet for such a system and are pointed out with particularity in the appended claims.

The invention itself as to its details of construction and mode of operation will be best understood by reference to the following description, taken in connection with the accompanying drawings, in which—

Figure 1 is a perspective view of an apparatus embodying my invention, and Fig. 2 a diagram of circuits in connection with which the regulating apparatus may be employed.

The regulator shown in Fig. 1 has a base 1, of slate, marble, or other suitable material, upon which the working parts of the regulator are mounted. These working parts consist principally of the regulating-magnet 2 and a stretched metallic strip or ribbon 3, carrying an armature 4 within the influence of the magnetic field produced by the magnet. The metallic strip may be of magnetic material, thus doing away with the necessity for a separate armature. The latter construction, however, permits the strip to be made thin, and therefore flexible. The regulating-magnet is mounted upon the base 1 by means of the angle-pieces 5, which constitute heads for the spool upon which the wire of the magnet is wound. Within the magnet-coil is a core 6, formed of a bundle of iron wires. The extent to which the core 6 projects from the coil may be adjusted by means of an adjusting-screw and nut 7, working through a standard 8, fixed to the base 1. The stretched strip 3, carrying an armature 4, is held in place between two standards 9 and 10, fixed, respectively, to the base 1.

Each of these standards carries a sliding block 11, having a narrow cut within which an end of the strip 3 is placed, as at 12, and the strip and the block then riveted or otherwise firmly held together. Each block 11 carries a screw-threaded rod 13, passing through a hole in the top of the corresponding standard. Adjusting-nuts, such as 14, on the outer ends of the rod 13 enable the tension of the strip 3 to be adjusted at will, and when the desired adjustment has been secured the parts are permanently locked against disengagement by jarring or otherwise by means of locking-nuts, such as 15, clamping against the inside of each standard, as will be evident. In setting the adjusting and locking nuts a tendency to rotation of the strip 3 exists, to counteract which the blocks 11 are grooved on their bottom portions, and these grooves engage slideways 16, which permit the blocks 11 a certain amount of longitudinal motion, but prevent any rotary movement. The armature 4, instead of being formed of a single piece of magnetic material secured to the strip 3, is divided along the central wire core 6. Inasmuch as this armature is so thick as not to be readily flexible this cut across its central portion permits the strip 3 to bend at its middle portion when subjected to the influence of the magnetic field of the coil acting upon the armature. A contact-point 17, of platinum or some other suitable non-oxidizable material, is fixed to the strip at a point about opposite the end of the core 6, and this contact is adapted to engage an adjustable fixed contact 18, carried by a standard 19, secured to the plate 1. In connecting up the regulator thus described two pairs of binding-posts are employed, one pair only being visible in the drawings at 19 and 20. One pair of binding-posts is connected to the terminals of the magnet-coil, the other to the contacts 17 and 18.

In Fig. 2 the machine to be regulated is represented diagrammatically and includes the armature 21 and the field-magnet winding 22, having in series therewith two adjustable resistances 23 and 24. The fixed and movable contacts 17 18 of the regulating device (shown in Fig. 1) are shunted across one of these resistances—as, for example, across the resistance 23—as indicated. A condenser 25 is shunted across these contact-points, so as to reduce the sparking at the

points, and thereby prolong the life of the same. The regulating-magnet 2 is connected in circuit across the mains, such as 26 and 27, the voltage of which is to be maintained constant. In series with this regulating-magnet I may place an adjustable resistance 28 as a convenient means for adjusting the pull of the magnet 2 upon the armature carried by the cooperating stretched strip 3.

The resistances 23 and 24 are chosen so that when the resistance 23 is short-circuited the current in the field of the machine will rise above normal, thereby causing the voltage of the machine to rise correspondingly, while when the short circuit is broken the combined resistance 23 and 24 will so far reduce the current flowing in the field as to bring the voltage of the machine below the normal amount. Upon starting up the apparatus the contacts 17 and 18 are in engagement with each other, thereby short-circuiting the resistance 23. The voltage of the machine as it builds up will tend to rise above the normal amount. As soon, however, as the normal voltage is exceeded the magnet 2, which is responsive to this voltage, by acting upon its armature 4 overcomes the elasticity of the stretched strip 3 and separates the contacts 17 and 18, thereby opening the short circuit about the resistance 23, thus cutting the resistance into circuit, and so tending to reduce the voltage of the machine below normal. Before the voltage can drop, however, to any appreciable extent the elasticity of the stretched strip or ribbon overcomes the pull of the magnet 2 as the strength of the same decreases with the drop in voltage of the mains, thus closing the contact-points 17 and 18 and reestablishing the condition under which the machine tends to build up in voltage. In practice this make-and-break action goes on continuously and with such rapidity that due to the sluggish action of the field-magnet of the machine a practically uniform normal voltage is maintained at any point on the system to which the regulating-magnet may be connected.

The stretched strip or ribbon forming part of the regulating mechanism possesses so

very little inertia and has such a high natural period of vibration of its own that it responds instantly to any change in strength of the regulating-magnet.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination of a dynamo-electric machine having resistance in its field-circuit, a magnet, a piece of sheet metal stretched in cooperative relation to said magnet, means for placing said piece of sheet metal under tension, and cooperating contacts shunted about a portion of said resistance and adapted to be opened and closed by vibration of said metal.

2. The combination of a dynamo-electric machine, resistance in the field-circuit of said dynamo-electric machine, and a circuit making and breaking device shunted about a portion of said resistance, said device consisting of a magnet, an armature, and a support therefor arranged to be placed under tension.

3. A circuit making and breaking device consisting of a magnet, a divided or two-part armature therefor carried by a piece of sheet metal under tension, and cooperating contacts, one fixed and the other secured to said piece of sheet metal at a point between the divisions or parts of said armature, the latter contact being movable in response to movement of the armature.

4. The combination of a regulating-magnet, a stretched strip or ribbon, a two-part armature carried by said ribbon and located within the influence of said magnet, a contact carried by said strip or ribbon, and a cooperating fixed contact.

5. In an interrupter, the combination of an electromagnet, a vibratory strip carrying a contact-point, and a two-part armature mounted on said strip at opposite sides of the contact-point, substantially as specified.

In witness whereof I have hereunto set my hand this 2d day of June, 1902.

WILLIAM S. ANDREWS.

Witnesses:

BENJAMIN B. HULL,
HELEN ORFORD.