No. 665,903. Patented Jan. 15, 1901.

E. M. HEWLETT.

RHEOSTAT.

(Application filed Nov. 13, 1900.)

(No Model.) 2 Sheets—Sheet 1.

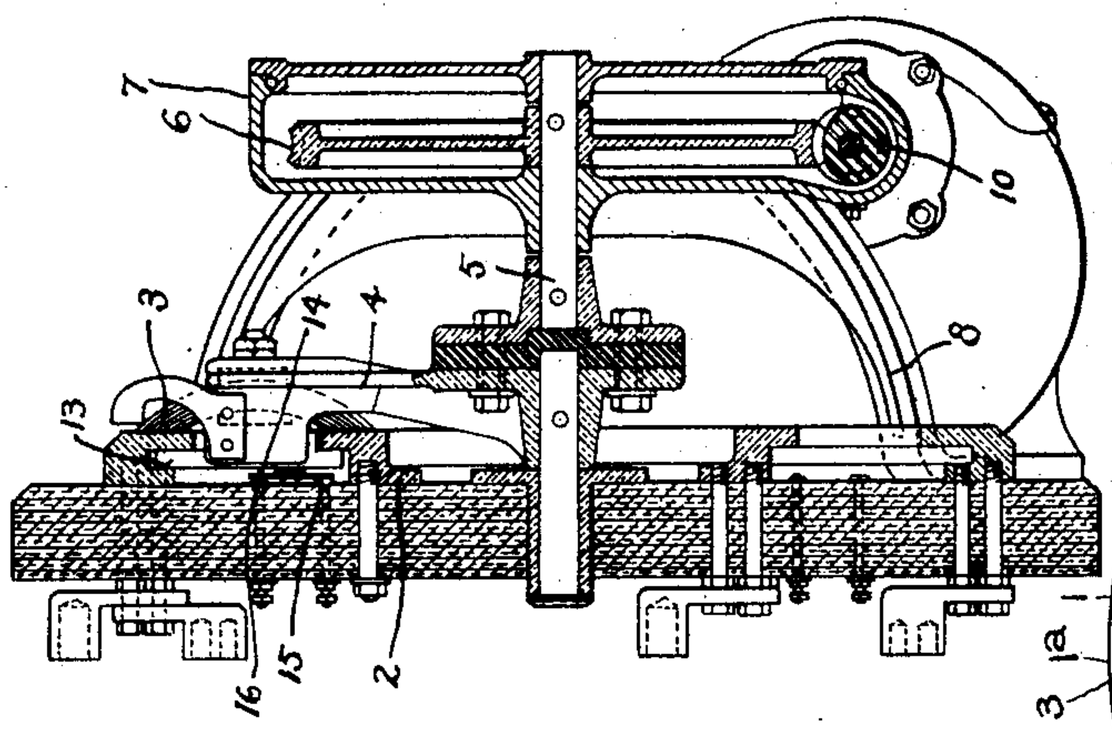

Fig. 2.

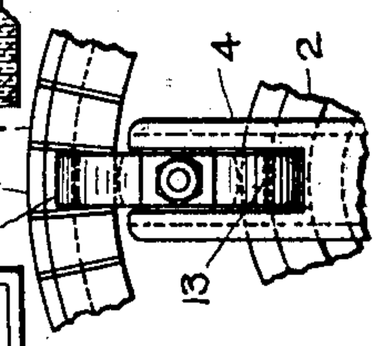

Fig. 4.

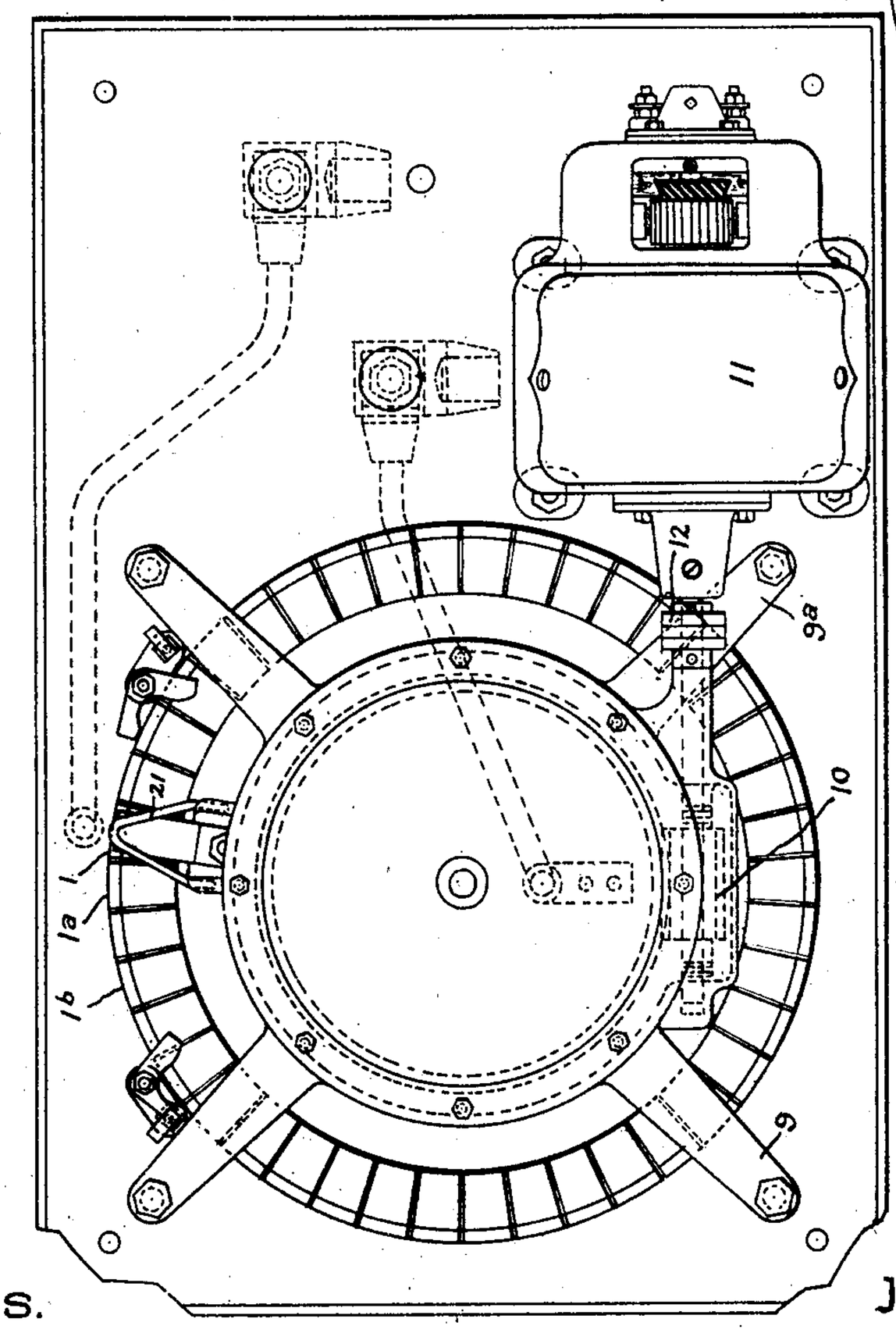

Fig. 1.

Witnesses.

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Inventor:

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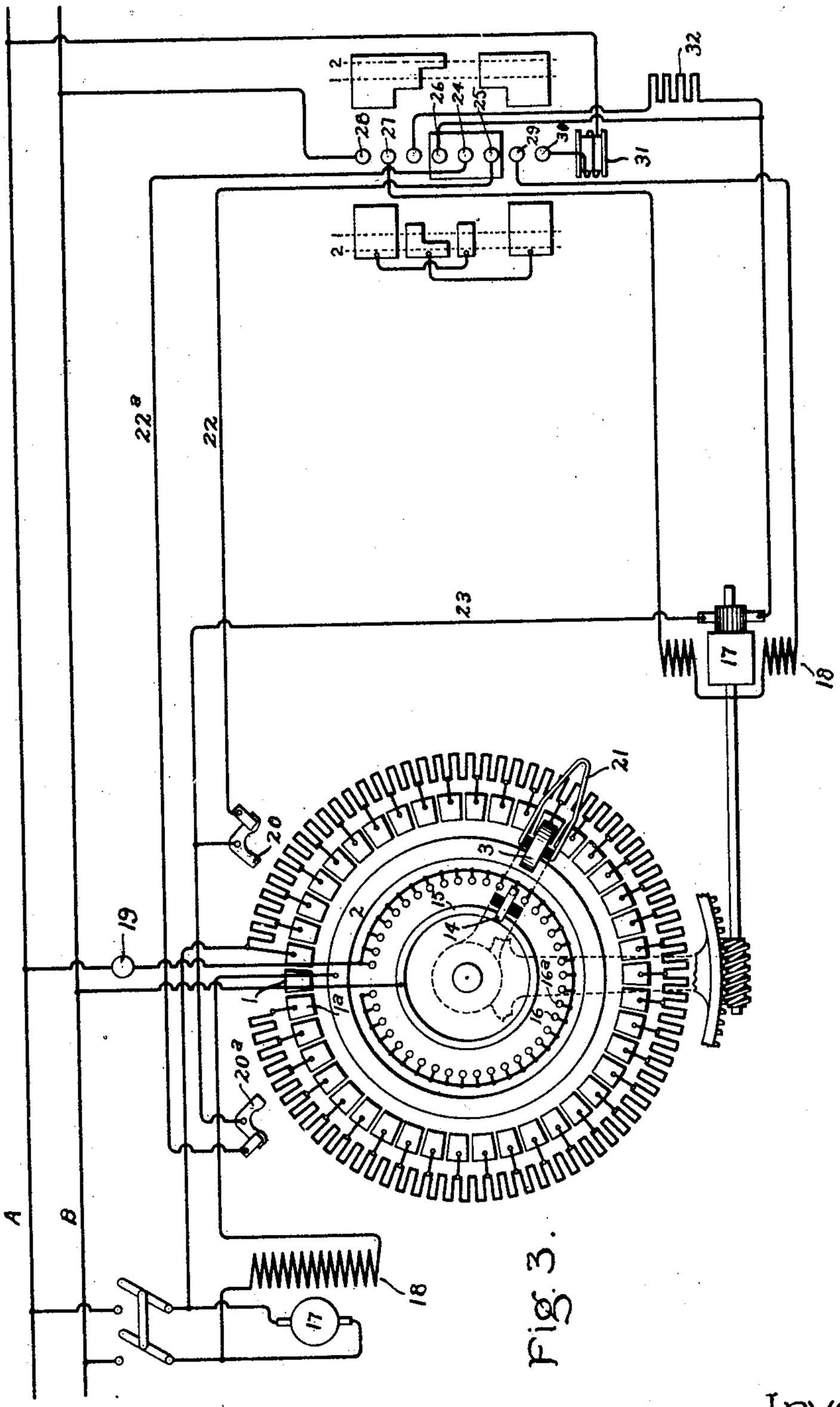

Fig. 3.

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UNITED STATES PATENT OFFICE.

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RHEOSTAT.

SPECIFICATION forming part of Letters Patent No. 665,903, dated January 15, 1901.

Application filed November 13, 1900. Serial No. 36,362. (No model.)

To all whom it may concern:

Be it known that I, EDWARD M. HEWLETT, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Rheostats, (Case No. 1,444,) of which the following is a specification.

This invention relates to power-controlled rheostats, the object being to permit the introduction or withdrawal from the circuit to be governed of a desired variable amount of resistance, the resistance-switch being governed by a source of power controlled by an operator.

One particular use of the invention is the regulation of resistance in the field-circuit of a dynamo-electric machine for varying the voltage of the machine, it being desirable to be able to manipulate a device of this character by means of a control-switch at a distance from the rheostat.

In carrying out my invention I provide a range of contacts electrically connected with different resistance sections or spools of the rheostat, in coöperative relation to which I provide a brush-contact operated by an electric motor connected with a speed-varying and current-reversing controller. I provide also an automatic switch for opening the motor-circuit independently of the controller as the limit of travel over the range of contacts is approached at either end, these limit-switches being so arranged that the motor-circuit will always be in proper condition to start the rheostat into action. I provide also means for indicating to the operator whether the rheostat is in working order, employing for this purpose a telltale device which gives a visual or other indication when the rheostat-contacts are in proper engagement for a stable condition of the circuit, thereby preventing the rheostat being left in a position where these contacts do not have a good current-carrying capacity, and thus avoiding damage to the apparatus.

My invention embodies also features of the motor-controller by which the movements of the power-governed rheostat are quickly arrested when the circuit is opened.

The novel features will be more particularly hereinafter described and will be definitely indicated in the claims appended to this specification.

In the accompanying drawings, which illustrate my invention, Figure 1 is a front elevation of a motor-driven rheostat employing my improvements. Fig. 2 is a sectional elevation on a plane at right angles to that of Fig. 1. Fig. 3 is a diagram showing the plan of construction of the rheostat and its relation to the governed and controller circuits, and Fig. 4 is a detail view of the rheostat-brush.

Referring first to Figs. 1 and 2, the rheostat is composed of a range of copper or phosphor-bronze contacts 1 1^a 1^b, &c., solidly mounted on a slate base and separated by an air-space or otherwise insulated one from another. I preferably arrange these in the form of a circle, mounting within the circle an annulus of conductive metal 2, between which and the several contacts cross-connection may be made by means of a laminated phosphor-bronze brush 3, spanned by a yoke on the end of a cast-metal arm 4, journaled in a bushing mounted in the base. Bolted to this brush-arm and insulated therefrom is a shaft 5, carrying a worm-gear 6, inclosed within a cast-metal casing 7, supported by and forming a part of a spider 8, bolted to the base by arms 9 9^a, &c. The worm-gear engages a worm 10, mounted on a shaft jointed to the shaft of an electric motor 11 by a flexible joint, as indicated at 12. Between the several contacts 1^a 1^b, &c., are interposed sections of a continuous resistance in the usual manner, the segment 1 being disconnected so as to form a dead-point upon which the brush may rest when the circuit is open. Secured to the brush 3 is a plate or bar 13, bridging the under side of the contacts and the ring-contact 2 and holding the brush or bridging contact 3 down into firm engagement with the face of the rheostat. Thus the brush is independent of the arm 4, but may be pushed by it in either direction, as is evident from Fig. 4. This construction permits the brush to make a good contact at all times whether the arm is in true parallelism to the contact or not. An auxiliary insulated brush or bridging contact 14 is mounted on bar 13 and cross-connects a ring 15 (more clearly seen in Fig. 3) and any one of the range of

contacts governing a telltale or indicator, as will be presently set forth. As thus organized, the rheostat and its operating-motor may be mounted near the machine to be governed or at any other suitable point, connections being led therefrom to the circuit to be governed—as, for example, the field-magnet of a dynamo-electric machine—and to the controller by which the movements of the rheostat are governed, which latter may be mounted on a switchboard with suitable indicating instruments.

In the diagram, 17 represents the armature, and 18 the field-magnet, of a generator the potential of which it may be desired to regulate, and A B represent the bus-bar or mains, with which the generator may connect. 19 represents the telltale, the type shown being a visual indicator—as, for example, an incandescent lamp—in a branch circuit from the bus-bar, the closure of which is determined by the auxiliary brush 14, which spans the ring-contact 15 and the contacts 16 16^a, &c. These telltale-contacts are arranged in an annular group and are the same angular distance apart as the main contacts 1 1^a, &c., of the rheostat. They subtend, however, a smaller angle, serving thus to indicate by means of the lamp 19 when the brush 3 is squarely upon one of the contacts of the rheostat. If the latter bears upon one edge only of one of the contacts, the telltale-contact will not be bridged, and the lamp will therefore not be lighted. One terminal of the circuit to be governed—for example, the field-magnet coil 18—may be connected with the ring-contact 2 of the rheostat and one end of the resistance with the main A, the other end of the field-coil being connected with the main B. At or near the limits of movement of the rheostat-brush I place limit-switches 20 20^a, being pivoted switches provided with projections lying in the path of an insulated projection 21, mounted on the end of the brush-arm. These are set in a short distance from the end of travel of the brush-arm, so that the momentum of the motor after it is cut out may be absorbed in carrying the brush to the open-circuit position, and when one limit-switch is open the other is closed and adapted to reverse the direction of operation of the rheostat. In the return movement of the brush the projection 21 strikes the pivoted switch-lever 20 or 20^a (according to the direction of movement) and recloses the limit-switch. These limit-switches are interposed in the armature-circuit of the motor which drives the rheostat and in such relation, as indicated in Fig. 3, to two wires 22 22^a, leading to the controller, as to give opposite directions of movement to the armature. The controller is provided with a fixed range of contacts and a movable drum adapted to reverse the motor-circuit or cut in or out resistance to vary its speed. The controller is so designed that after the armature is disconnected from the line it is short-circuited for a moment before the field-circuit is opened. In starting the motor the first movement of the controller in either direction closes the field-magnet circuit, then opens the short circuit for the armature, and cuts the armature into line with resistance. The second movement cuts out the resistance, thus permitting the motor to speed up. Thus in the position indicated in the diagram the field-magnet circuit of the driving-motor is open and the armature-circuit is closed by way of conductor 23, contacts 20 20^a, wires 22 22^a, controller-contacts 24 25, bridging-contact of the controller to contact 26 to the other brush of the armature. By moving the controller in either direction this short circuit is opened and the field-magnet circuit closed by way of contacts 27 28 and 29 30, this circuit including a blow-out magnet 31, as usual in the construction of controllers. The next position of the controller closes the armature-circuit, as indicated in the position marked 1 in the diagram, in which case the armature-circuit is closed through the resistance 32. The final position of the controller is indicated by the dotted lines 2 2 in the diagram, in which the resistance has been cut out and the motor is at maximum speed. The operator recognizes by the blinking of the lamp 19 that the rheostat is in good working order and also knows when a sufficient amount of resistance is cut in exactly at what point to leave the rheostat, since if the lamp 19 is not lighted the motor must be started ahead a trifle until the lamp burns, when the best relation of contact engagement between the rheostat-brush and its contacts is maintained.

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

1. A power-driven rheostat comprising a motor, and a limit device for cutting out the motor, automatically operated when the rheostat-contact nears its limit of movement.

2. A motor-driven rheostat comprising an electric motor, a rheostat-contact driven thereby, a circuit-controller for the motor, and limit-switches to automatically interrupt the motor-circuit near the limits of travel of the contact.

3. A power-driven rheostat comprising a motor, a movable rheostat-contact driven thereby to vary the resistance, and a limit device to cut in or out the motor as the contact passes or returns to a definite point of its travel.

4. A motor-driven rheostat comprising a range of resistance-varying contacts, a contact-brush sweeping the same, an electric motor in gear with the brush, a limit-switch in the motor-circuit, and a projection moving with the brush to engage said switch at a definite point of its travel.

5. A power-driven rheostat comprising a range of resistance-varying contacts, a motor-driven brush adapted to successively engage the same, and a telltale or indicator to show when the contacts are in good conductive relation.

6. A power-driven rheostat comprising a range of resistance-varying contacts, a motor-driven brush adapted to progressively engage the same, and an indicator operated when the contacts are engaged.

7. A power-driven rheostat comprising a range of resistance-varying contacts, a motor-driven brush adapted to progressively engage the same, and an incandescent lamp cut into circuit when the brush bears squarely on a contact.

8. A rheostat comprising a circular range of resistance-varying contacts, a movable brush to progressively engage the contacts, an arm carrying the brush, and a guide at the outer end of the arm to hold the brush in firm engagement with the contacts.

9. In a rheostat, a base-plate, a range of resistance-varying contacts mounted thereon, a brush-arm, a spider mounted on the base-plate, a gear-wheel attached to the arm and mounted on the spider, and a motor in gear with the wheel.

10. A power-driven rheostat comprising a range of resistance-varying contacts, a movable brush to progressively engage the same, an electric motor to drive the brush, and a controller provided with contacts to put the motor-armature on short circuit when the motor is cut out.

11. A power-driven rheostat comprising a range of resistance-varying contacts, a movable brush to progressively engage the same, an electric motor to drive the brush, a controller to close the armature on short circuit when the motor is cut out, and a limit-switch on the rheostat to cut out the motor at a definite point of movement of the brush.

12. The combination with a plurality of contacts, a brush movable thereon and held in engagement therewith, and a lever or arm loosely engaging the brush but mechanically disconnected therefrom.

13. A power-driven rheostat comprising a range of resistance-varying contacts, a movable brush to progressively engage the same, a motor to drive the brush, a circuit-controller and limit-switch at different points of the brush travel to automatically open the motor-circuit when the brush reaches a determinate position, said switches being connected to effect opposite directions of movement of the armature.

In witness whereof I have hereunto set my hand this 12th day of November, 1900.

EDWARD M. HEWLETT.

Witnesses:
BENJAMIN B. HULL,
MABEL H. EMERSON.