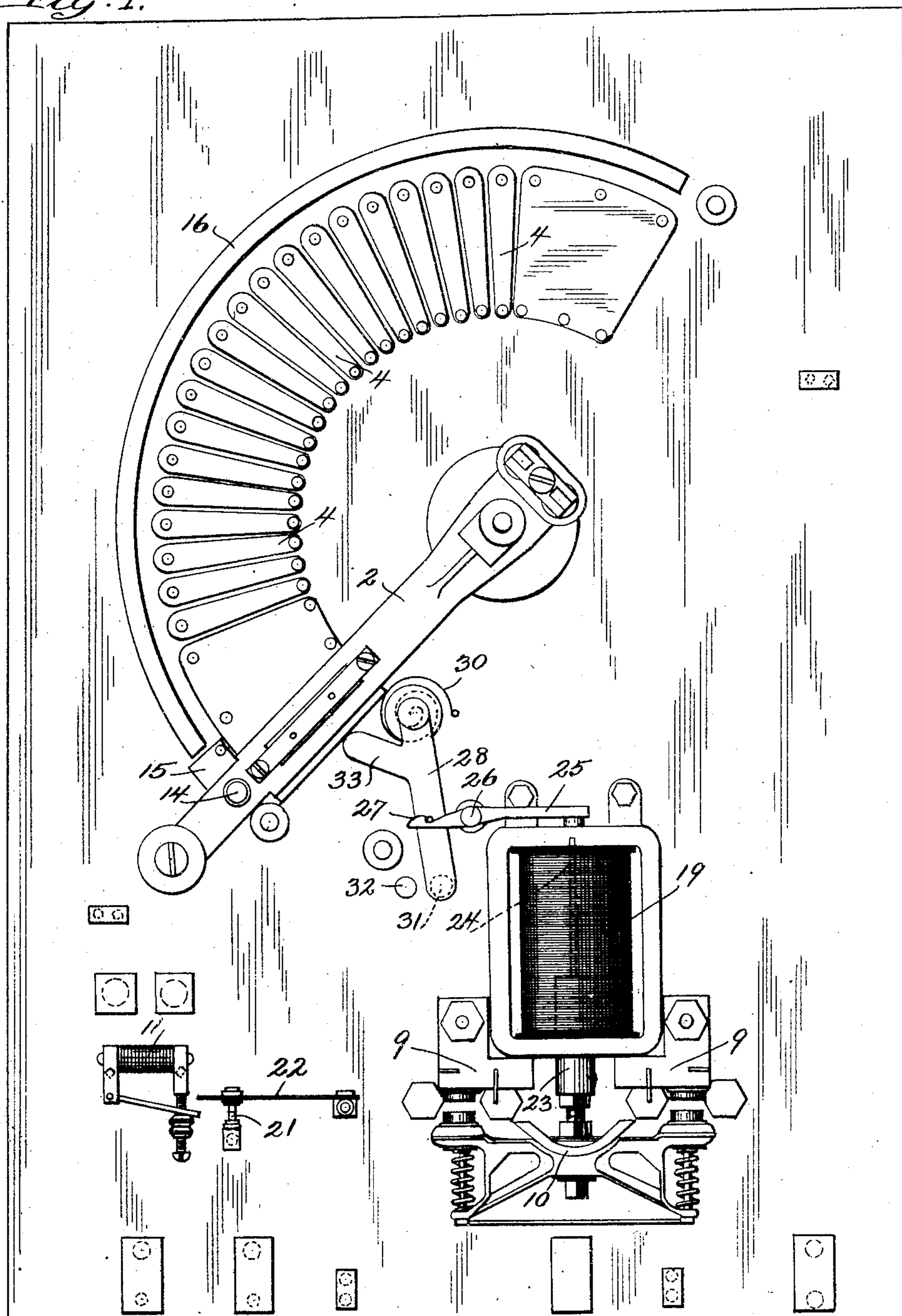


T. E. BARNUM.
CONTROLLER FOR ELECTRIC MOTORS.

APPLICATION FILED JAN. 31, 1902.

2 SHEETS—SHEET 1.

Fig. 1.



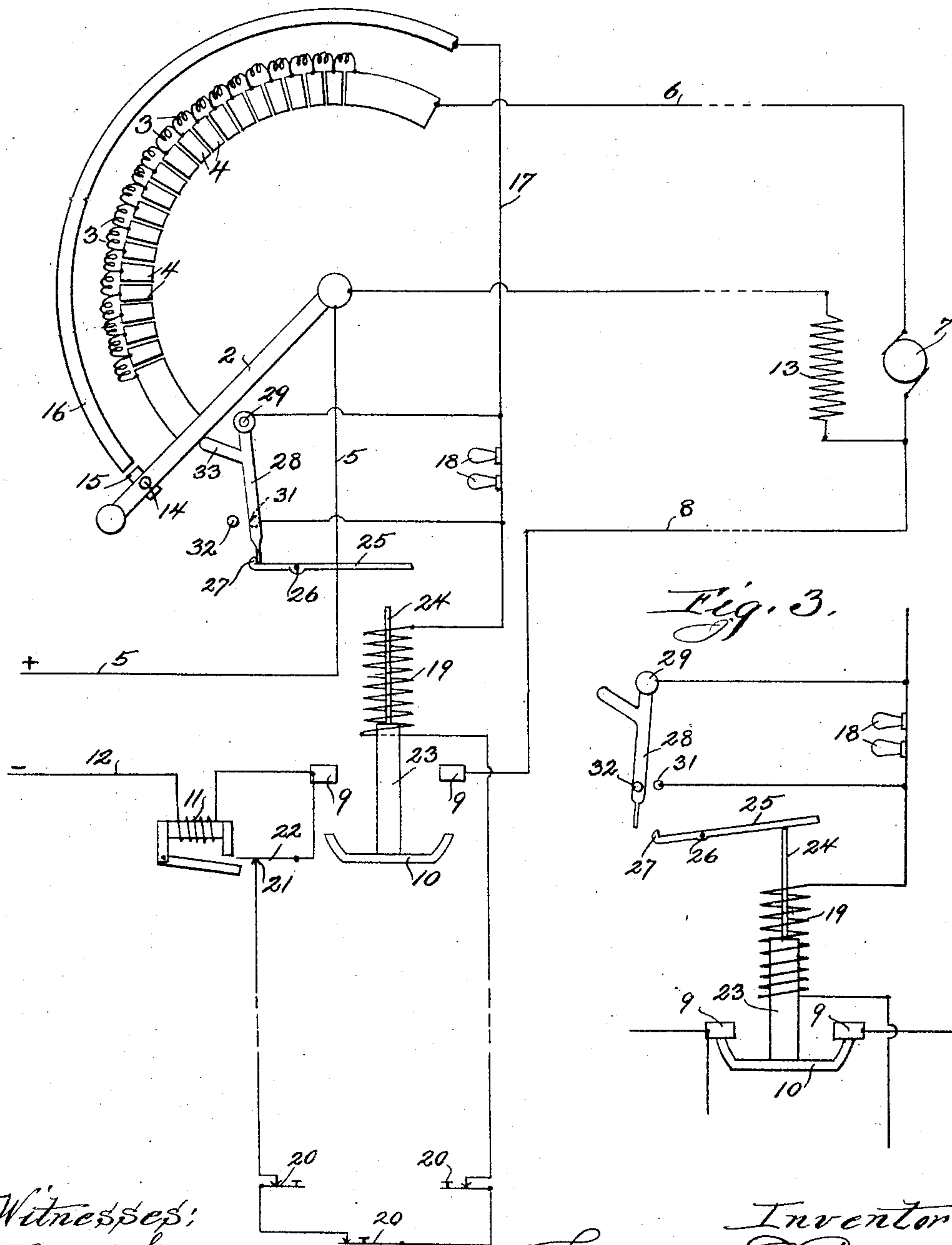
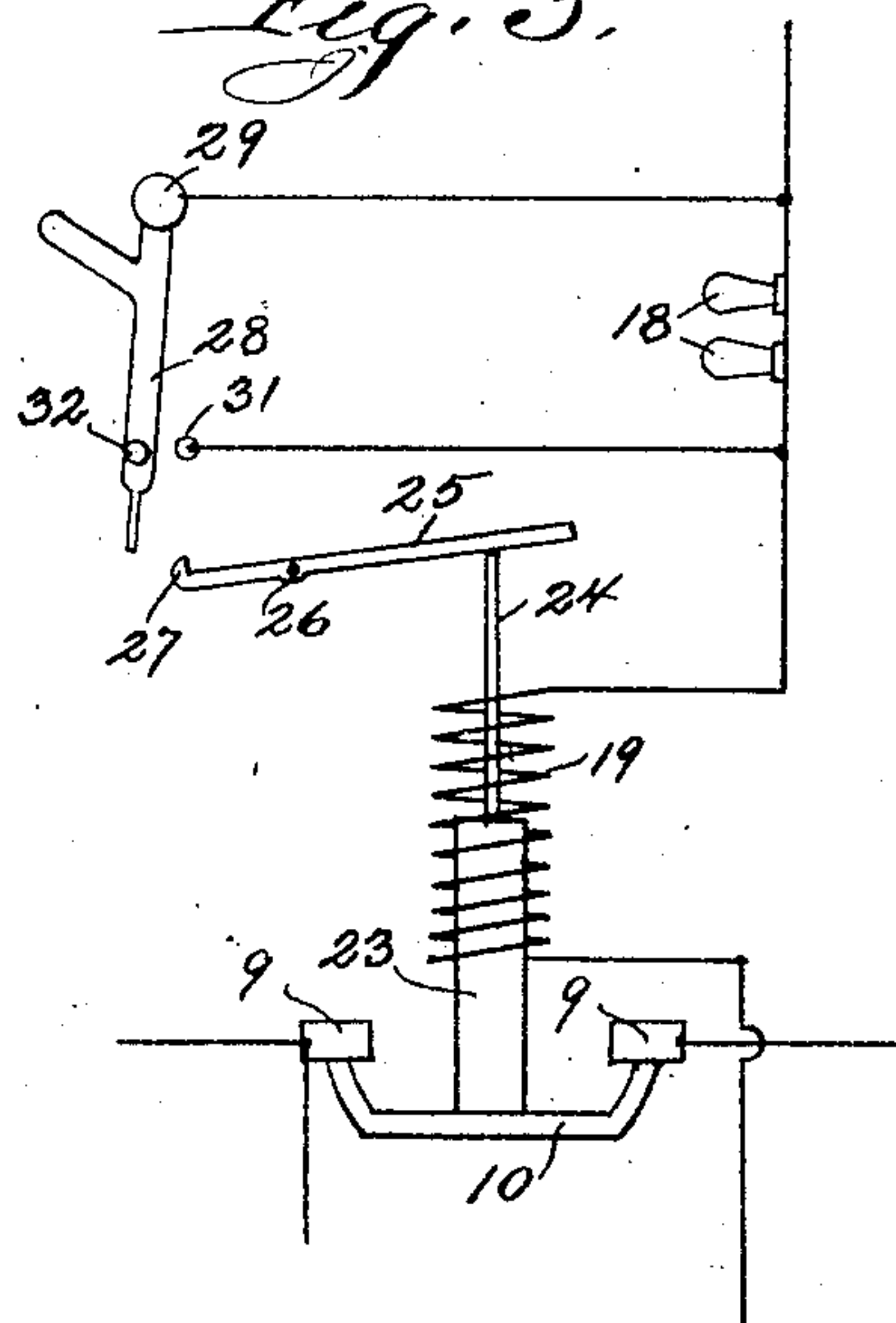
Witnesses:
W. J. Jacker
Robert Lewis Ames.

Inventor:
Thomas E. Barnum
By Jones & Addington
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2 SHEETS—SHEET 2.

Fig. 2.*Fig. 3.*

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UNITED STATES PATENT OFFICE.

THOMAS E. BARNUM, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO THE CUTLER-HAMMER MANUFACTURING COMPANY, OF MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN.

CONTROLLER FOR ELECTRIC MOTORS.

SPECIFICATION forming part of Letters Patent No. 786,401, dated April 4, 1905.

Application filed January 31, 1902. Serial No. 92,009.

To all whom it may concern:

Be it known that I, THOMAS E. BARNUM, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a certain new and useful Improvement in Controllers for Electric Motors, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to a controller for electric motors, and has for its main object the provision of means to prevent closing the circuit of the motor after it has been once opened until after the resistance of the motor-rheostat has been again cut into the circuit.

Other objects are the provision of simple and effective devices for accomplishing the desired results.

In the operation of machinery it often becomes necessary or desirable to stop the same from points about the machinery or other places distant from the motor-rheostat; but the motor should not be again started except from the said rheostat and when all its resistance is in the motor-circuit to prevent injury and damage. I accordingly provide means by which the motors may be stopped from desired points, but which will prevent the starting of the same until the movable element of the motor-rheostat is returned to starting position, whereby all danger of burning out the armature of the motor before it can develop sufficient counter electromotive force to protect it is avoided.

In the preferred embodiment of the invention I provide a solenoid adapted when energized to close the motor-circuit and which also automatically cuts a resistance into the circuit in series with itself, so that if the circuit through the solenoid-coil is thereafter opened it will not upon being again closed receive sufficient current to cause it to close the motor-circuit. When, however, the movable element of the motor-rheostat is returned to starting position, it automatically closes the shunt about the said resistance in the solenoid-

circuit, whereby when the current is turned on the switch operates as in the first instance.

In the accompanying drawings, in which the same reference characters designate like parts throughout the several views, Figure 1 is a view of the base-plate of the motor-controller, showing the several parts mounted thereon. Fig. 2 is a diagram showing the circuit connections, and Fig. 3 is a detail view showing the actuated position of the solenoid which controls the motor-circuit, together with the shunt-switch and latching device operated by said solenoid.

The contact-arm 2 of the motor resistance 3 is adapted to move over the segments or terminals 4 4. The contact-arm 2 is connected with one side 5 of the supply-circuit, the end of the resistance 3 being connected by conductor 6 through the armature 7 of the motor, thence by conductor 8 to the contacts 9 9, adapted to be bridged together by the contact-plate 10. The overload-magnet 11 is included in series with the supply-conductor 12, connected with the other side of the supply-circuit. The shunt-coil 13 of the motor is connected between the contact-arm 2 and the conductor 8.

The contact-arm 2 carries a brush 14, adapted to initially rest upon a dead contact 15 and adapted to be moved over a curved contact 16, the end of which is connected by conductor 17 through the lamps 18 and the solenoid or magnet 19. The circuit then extends from the winding of the solenoid 19 through the push-buttons 20 20 and the contacts 21 22 of the overload-magnet to the contact 9. The core 23 of the solenoid 19 carries at the lower end the contact-plate 10 and carries at the upper end a pin 24, adapted when the core is attracted to engage and unlock the latching-lever 25, which is pivoted at 26 and which carries upon the end a hook 27, adapted to engage the end of a lever 28, pivoted at 29 and provided with a spring 30, which tends to move the end of said lever 28 from the contact-terminals 31 to the dead contact 32. The contact 31 is connected with the conductor 17

upon one side of the lamps 18, and the lever 28 is connected with said conductor upon the opposite sides of said lamps, so that the lever 28 when resting upon the contact-terminal 31 shunts or short-circuits the lamps 18. The latching-lever 25 serves to initially maintain the lever 25 in contact with the terminal 31. When the latch-lever 25 is rocked by the pin 24, carried on the core 23, the lever 28 is released and the spring 30 moves the same out of contact with terminal 31 and into contact with terminal 32, thereby opening the shunt around the lamps and including said lamps operatively in circuit. The lever 28 carries a lateral arm 33, adapted to be engaged by the contact-arm 2 when moved to the initial position, whereby the movement of the contact-arm to the necessary position to cut in all of the said resistance serves to short-circuit the lamps 18, the lever 28 being held in this short-circuiting position by means of the latching-lever 25.

I will now describe the operation of the mechanism. Initially the parts occupy the positions shown in Figs. 1 and 2. When it is desired to start the motor, contact-arm 2 is moved in clockwise direction, and circuit is closed from the supply-main 5 through contact-arm 2, contact-plate 16, conductor 17, contact-lever 28, and terminal 31, thence through solenoid 19, push-buttons 20, contacts 21 and 22, overload-magnet 11, to the opposite side of the supply-circuit. Solenoid 19 is thus energized and attracts its core, thereby bridging together contacts 9 9 through the plate 10. The circuit through the armature of the motor is thus closed, and this circuit may be traced from the main 5 through contact-lever 2, starting resistance 3, conductor 6, armature 7, conductor 8, contacts 9 9, and plate 10 to the opposite side of the supply-circuit. Circuit through the shunt-field 13 is closed from contact-arm 2 through the shunt-field of the conductor 8. The attraction of the core 23 of solenoid 19 causes pin 24 to engage and unlock lever 25, thereby releasing lever 28 and permitting the spring 30 to move said lever to the left, thereby opening the shunt around the lamps 18. The lamps are thus inserted in series with the solenoid 19 and serve to cut down the strength of the current to a value only sufficient to maintain the core in its raised position.

Should it be desired to stop the motor, any one of the push-buttons 20 may be depressed, thereby opening the circuit through the solenoid 19 and deenergizing said solenoid, whereby the motor-circuit is opened at the contacts 9 9. The circuit will be similarly opened by an overload-current, which will actuate the magnet 11, thereby separating the contacts 21 22 to open the circuit of solenoid 19. The circuit having been once opened at the contacts 9 9, the subsequent closing of the

circuit through the contacts of the push-buttons 20 or the contacts of the overload-magnet will not effect the closing of the motor-circuit through contacts 9 9; since the presence of the lamps 18 in series with the solenoid 19 diminishes the lifting power of the solenoid to such an extent that it cannot raise the core. This fact necessitates the return of the contact-lever 2 to its initial position in order to again start the motor, and this return of the contact-arm 2 moves the lever 28 to carry the same into contact with terminal 31, to thereby short-circuit the lamps 18. The lamps 18 having been removed from the circuit of solenoid 19, the same may be energized by the subsequent movement of the contact-arm.

Fig. 3 shows the solenoid in its attracted position, in which the latch 25 is released from the shunting-lever 28, the resistance-lamps 18 thus being connected in series in the circuit with the solenoid-coil.

It will be understood that while I have described one method of normally excluding the resistance-lamps from the magnet-circuit and for abnormally including it any other of the well-known methods of accomplishing the same results may be employed and still come within the purview of my invention.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a motor, of a controlling mechanism therefor, a magnetically-operated switch controlling the continuity of the motor-circuit, means for preventing the operation of said switch when the movable element of said mechanism is in certain predetermined positions, said means being rendered effective independently of said movable element to prevent the operation of said switch.

2. The combination with a motor, of a controlling mechanism therefor, a magnetically-operated switch controlling the continuity of the motor-circuit, means for preventing the operation of said switch when the movable element of said controlling mechanism is in certain predetermined positions, and a switching device for placing the first-mentioned means out of operative relation with said switch when said movable element is in its initial position and operated independently of said movable element to place said means in operative relation with said switch when said movable element is moved from its initial position.

3. The combination with a motor, of a controlling mechanism therefor, a magnetically-operated switch controlling the continuity of the motor-circuit, means for preventing the operation of said switch when the movable element of said mechanism is in certain predetermined positions, a switching device op-

erated independently of said movable element to place said means in operative relation with the operating-magnet of said switch, and a mechanical connection by which said switching device is operated to place said means out of operative relation with the operating-magnet of said switch when said movable element is moved from said predetermined positions.

4. The combination with a motor, of a controlling mechanism therefor, a magnetically-operated switch controlling the continuity of the motor-circuit, means for preventing the operation of said switch when the movable element of said mechanism is in certain predetermined positions, said means being rendered effective independently of said movable element to prevent the operation of said switch, and means for actuating said switch from a distant point to open the motor-circuit.

5. The combination with a motor, of a controlling mechanism therefor, a switch controlling the continuity of the motor-circuit and having a suitable operating-magnet, means for preventing the operation of said switch when the movable element of said mechanism is in certain predetermined positions, said means being rendered effective by said magnet independently of said movable element to prevent the operation of said switch, and a switch for opening the circuit of said motor from a distant point.

6. The combination with a motor, of a rheostat therefor, a switch controlling the continuity of the motor-circuit and having an operating-magnet arranged in a circuit which is closed when the resistance-varying element of said rheostat is moved from its initial position, means for preventing the operation of said switch, and a switching device controlled by the resistance-varying element to place said means out of operative relation with said switch and operated independently of said resistance-varying element when said resistance-varying element is moved from its initial position to place said means in operative relation with said switch.

7. The combination with a motor, of a rheostat therefor, a switch controlling the continuity of the motor-circuit, and having an operating-magnet arranged in a circuit which is closed when the resistance-varying element of said rheostat is moved from its initial position, means for preventing the operation of said switch, a switching device controlled by the resistance-varying element to place said means out of operative relation with said switch and operated independently of said resistance-varying element when said resistance-varying element is moved from its initial position to place said means in operative relation with said switch, and a switch for opening the circuit of said magnet from a distant point.

8. The combination with a motor, of a rheo-

stat therefor, a magnetically-operated switch controlling the continuity of the motor-circuit, means for reducing the current traversing the operating-magnet of said switch, a switching device operated by the closure of said switch to render said means effective while the movable element of said rheostat is removed from the initial position thereof.

9. In combination with a motor, of a rheostat therefor, a magnetically-operated switch, a resistance arranged in the circuit of the operating-magnet of said switch, a shunt extending around said resistance, a switch closing said shunt while the movable element of the rheostat remains in the initial position thereof and operated by the closure of the motor-switch to open said shunt while said movable element is removed from the initial position thereof.

10. In combination, a motor, a rheostat therefor, a magnetically-operated switch controlling the continuity of the motor-circuit and having the circuit of the operating-magnet therefor closed when the movable element of said rheostat is moved from the initial position thereof, a resistance arranged in series with said operating-magnet, a shunt extending around said resistance, a switch controlling said shunt, a mechanical connection between said shunt-switch and the movable element of said rheostat to close said switch while said movable element remains in the initial position thereof, and means actuated by said motor-switch to open said shunt-switch when said movable element is moved from the initial position thereof.

11. In combination, a motor, a rheostat therefor, a magnetically-operated switch controlling the continuity of the motor-circuit and having the circuit of the operating-magnet therefor closed when the movable element of the rheostat is moved from the initial position thereof, a resistance in series with said operating-magnet, a shunt extending around said resistance, a switch controlling said shunt, a latch retaining said shunt-switch in the closed position thereof, means for operating said latch to release said shunt-switch when the motor-switch closes, means for opening said shunt-switch, and a mechanical connection between said shunt-switch and said movable element for closing said shunt-switch when the movable element of the rheostat is returned to the initial position thereof.

12. The combination with a motor, of a rheostat therefor having a movable arm, a magnet controlling the motor-circuit, a resistance adapted to be thrown into the circuit of said magnet when it is energized, and a switch for said resistance controlled by said arm in its initial position, substantially as described.

13. The combination with a motor, of a rheostat therefor having a movable arm, a magnet controlling the circuit of said motor,

a resistance adapted to be connected in circuit of said magnet, and a lever normally excluding said resistance from the magnet-circuit, the said magnet being adapted, when energized, to shift the said lever and to include resistance in the circuit, substantially as described.

14. The combination with a motor, of a rheostat therefor having a movable arm, a magnet controlling the circuit of the motor, a resistance adapted to be connected in the circuit of said magnet, a lever normally excluding said resistance from said circuit, said magnet being adapted when energized to shift said lever to include the same in the circuit, and the movable arm being adapted when returned to the initial position to return said lever to its normal position, substantially as described.

15. The combination with a motor, of a rheostat therefor having a movable arm, a solenoid controlling the circuit of the motor, a resistance adapted to be connected in the circuit of said solenoid, a lever normally excluding the said resistance from the said circuit, a latch holding the lever in its normal position, and a part carried by the core of the solenoid to release said latch when the solenoid is energized, and a part carried by the said lever with which the movable arm of said

starting rheostat engaged when in initial position to return the lever to its normal position, substantially as described.

16. The combination with a motor, of a rheostat therefor having a movable arm, a magnet controlling the motor-circuit, a resistance adapted to be thrown into the circuit of said magnet when it is energized, a switch for said resistance controlled by said arm in its initial position, and a switch for opening said motor-circuit from a distant point independently of said rheostat.

17. The combination with a motor, of a rheostat therefor having a movable arm, a magnet controlling the motor-circuit, a resistance adapted to be thrown into the circuit of said magnet when it is energized, a switch for said resistance controlled by said arm in its initial position, a device for automatically controlling the continuity of the circuit of said motor, and a switch for opening the circuit of said motor from a distant point independently of said rheostat.

In witness whereof I have hereunto subscribed my name in the presence of two witnesses.

THOMAS E. BARNUM.

Witnesses:

NICK. EWENS,
J. H. WIERSMER.