

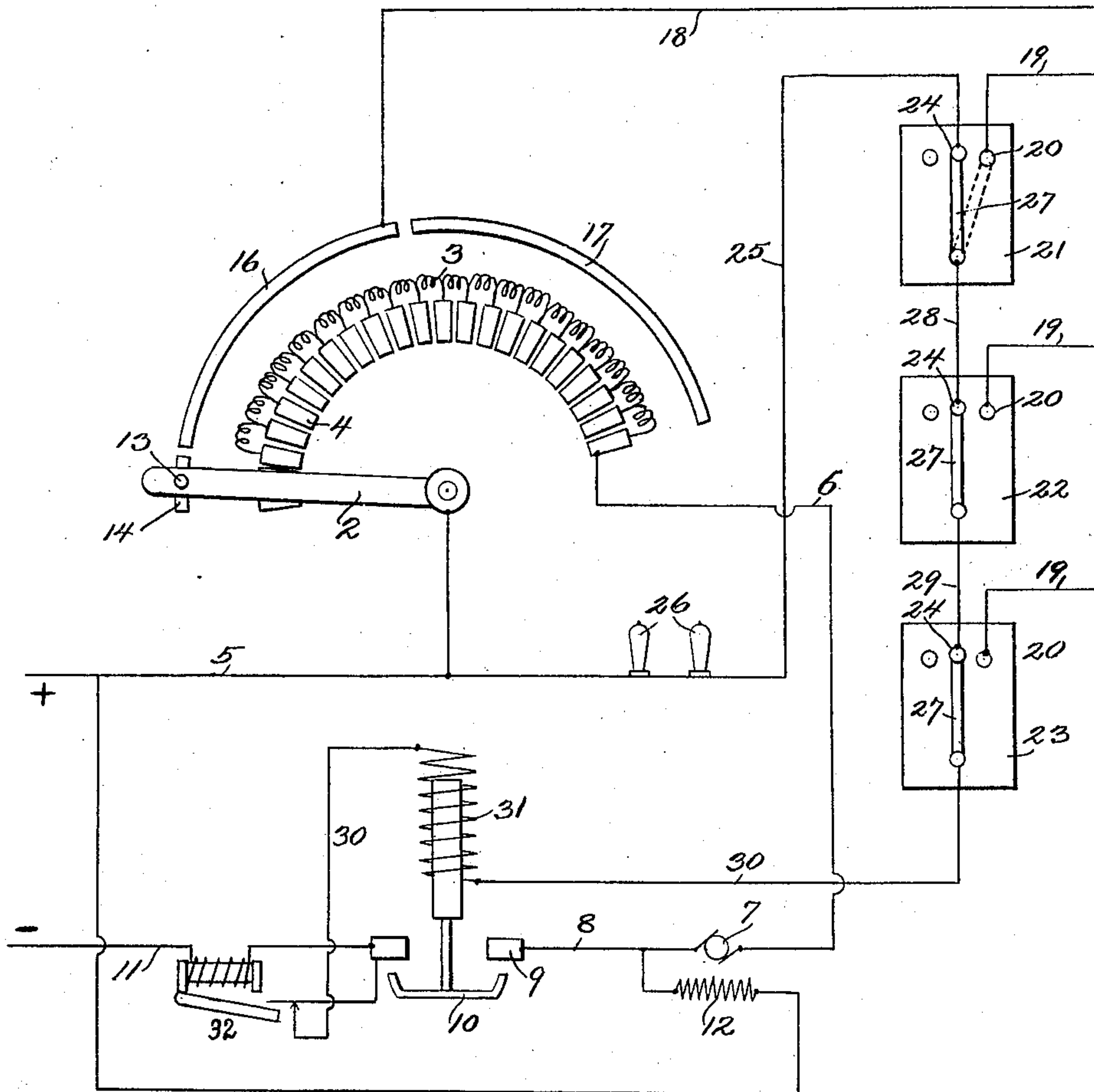
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T. E. BARNUM.
CONTROLLER FOR ELECTRIC MOTORS.

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NO MODEL.



Witnesses:

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CONTROLLER FOR ELECTRIC MOTORS.

SPECIFICATION forming part of Letters Patent No. 758,610, dated May 3, 1904.

Application filed February 7, 1902. Serial No. 93,046. (No model.)

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 drawing, forming a part of this specification.

My invention relates to a controller for electric motors, the object being to provide means for operating the motor at a slow speed and stopping and starting the same from a distant point or points.

It is frequently desirable with certain classes of machinery, as with printing-presses, to operate the same at a slow speed and to stop and start the same from points about the press or other machinery. Such an operation of a printing-press is termed "inching." For this purpose I accordingly place switches at any desired points about the machine which are adapted when suitably actuated to stop and start the motor, providing the same is operating at a slow speed and a large part of the motor resistance is still in the motor-circuit; but when the motor is operating at the normal speed or near the normal speed and the resistance is nearly or all cut out of the circuit the arrangement is such that the switches can then be used only for stopping the press, whereby there is no liability of damage to the motor or other parts by the attempt to start the motor when the resistance of the motor-rheostat is all cut out.

My invention will be readily understood from the accompanying drawing, in which the figure is a diagram showing the circuit connections.

The contact-arm 2 of the motor resistance 3 is adapted to be moved over the segments or terminals 4, the said arm being connected with one side 5 of the supply-circuit. The end of the resistance 3 is connected by conductor 6 through the armature of the motor 7 and thence by conductor 8 with the contacts 9 9, which are adapted to be bridged by the

contact 10 to the other side of the supply-circuit 11. The shunt-coil 12 of the motor is connected between the conductor 8 and the supply-conductor 5.

The contact-arm 2 carries a brush 13, initially resting upon a dead-contact 14, adapted to travel over a contact 16, the latter encircling only a portion of the resistance, while the remainder 17 of the contact is not in connection with the wiring of the circuit. The contact 16 is connected, through the medium of a conductor 18 and parallel branch terminals 19 19 19, with contacts 20 20 20, mounted upon switches 21, 22, and 23. These switches are each provided with two additional contacts, the contact on the other side of the switch being entirely disconnected, and therefore dead, while the center contact 24 of switch 21 is connected, by means of a conductor 25, through the resistance-lamps 26 to the supply-conductor 5. The switch-arm 27 of switch 21 is connected, through conductor 28, with the contact 24 of switch 22, and the arm of the latter switch is connected by a similar conductor 29 with the like contact 24 of the switch 23, the arm 27 of the latter being connected through conductor 30, through solenoid-magnet 31, to the contacts of the overload-switches 32, to the contact 9, and the side 11 of the supply-circuit. The solenoid 31 acts to bridge the contacts 9 9 together by means of the contact 10, and the overload-switch 32 prevents injury to the parts by an abnormal current on the main.

Normally the parts are in the position shown in the drawing. When it is desired to operate the machinery driven by the motor at a slow speed for inspection, repair, or other purposes, and to stop and start the same from a distant point or points in the neighborhood of the machinery, as at the switches 21, 22, and 23, the contact-arm 2 is first moved clockwise, so that the brush 13 contacts with the curved contact-strip 16 and is set in such a position that the amount of resistance left in circuit will allow the motor to start the mechanism promptly and readily. To start the motor from any of the switches 21, 22, or 23,

the contact-arm 27 of any of said switches is moved clockwise, so as to contact with contact 20, as shown in dotted lines at switch 21. The circuit is then completed from the conductor 5 through the contact-arm 2, brush 13, contact-bar 16, conductors 18 and 19, contact 20, and arm 27 of switch 21, thence through the conductor 28, contact 24, and arm 27 of switch 22, and so on through switch 23 to the conductor 30 and through the solenoid-coil 31, through conductor 30 and the contacts of the overload-switch 32 to contact 9 of the solenoid 31, thence through the magnet of the overload-switch 32 to the other conductor 11 of the switch-circuit. The solenoid is thus energized and lifts the contact 10 to bridge contacts 9 9 together and complete circuit through the shunt-coil 12 of the motor, as well as through the armature 7 thereof, the latter circuit including the resistance 3, between the contact-arm 2 and the end thereof. The speed of the motor 7 and the machinery operated thereby is thus determined by the amount of the resistance 3 in its armature-circuit. The switch-arm 27 of switch 21 may now be placed upon contact 24, but may be returned thereto by suitable automatic means, which I consider preferable, this being the normal position of arm 27. When the switch-arm 27 is on contact 24, the circuit is closed from the supply-conductor 5 through the resistance-lamps 26 and conductor 25 through the several switches and the solenoid-coil, the resistance of the lamps being such as to cut down the consumption of the current in the solenoid-coil and at the same time permitting the same to retain its core in attracted position. When the motor is thus operating at the desired slow speed, the same may be started and stopped at any of the switches 21, 22, and 23, which may be conveniently placed about the press or other machinery by merely moving the arms off the contacts 24 in the direction of the dead-contacts. This of course will open the circuit through the coil 31, when the contact 10 will drop and open the circuit through the motor, thus causing it to stop. The motor may again be started at the switch by moving the contact-arm 27 into engagement with contact 20, which will serve to complete the circuit from the curved contact-bar 16 through conductors 18 and 19, conductor 30, and through the coil 31, thus causing it to close the circuit through contacts 9 9 and 10. It will thus be seen that the motor may be operated at any desired slow speed and started or stopped from any of the switches without returning to the motor resistance 3 and without changing the arm 2 thereof.

When it is desired to operate the motor at its normal speed, the contact-arm 2 is moved to its limit, thus cutting out all of the resistance 3, and the switch-arm 27 of the switch

21 is placed upon the center contact 24. Under this condition the motor will operate at its normal speed, and while it may be stopped from any of the switches 21 22 23 it cannot be again started without returning the arm 2 of the motor resistance to its initial position, for the reason that the conductor 19, parallel branches 19, and the contacts 20 of the several switches are entirely out of circuit. It will be understood that this normal speed of the motor may be attained at once by moving the contact-arm into engagement with the contact-bar 16, then changing the arm 27 of the switch 21 to the contact 24, and then continuing the movement of the arm to its limit.

The number of switches 21 22, &c., may be varied as desired, and they may be located at convenient points. Other arrangements and modifications may also be made, and I therefore do not wish to be limited to the exact construction shown.

What I claim, and desire to secure by Letters Patent, is—

1. The combination with a motor, of a rheostat therefor, and a plurality of switches connected in series and situated at a distance from said rheostat for stopping and starting the motor independent of the rheostat, substantially as described.

2. The combination with a motor, of a rheostat therefor, and a plurality of switches connected in series and situated at a distant point for stopping and starting the motor independent of the rheostat while it is running at less than normal speed, substantially as described.

3. The combination with a motor, of a rheostat therefor, and a plurality of switches connected in series and situated at a distance from said rheostat for stopping and starting the motor when it is running at a speed below the normal, said starting and stopping being independent of the rheostat, substantially as described.

4. The combination with a motor, of a rheostat therefor, a plurality of switches connected in series and located at a distance from the rheostat, and means for stopping and starting the motor from any of said switches, said means being independent of the rheostat, substantially as described.

5. The combination with a motor, of a rheostat therefor, a plurality of switches connected in series and located at distant points, and means for stopping and starting the motor from any of said switches when it is operating at less than the normal speed, said means being independent of the rheostat, substantially as described.

6. The combination with a motor, of a rheostat therefor, a plurality of switches connected in series and situated at a distance from said rheostat for stopping and starting the motor from a distant point when a portion of the resistance of the rheostat is in circuit, and means for preventing the starting of the mo-

tor from such point, when all or a greater portion of resistance is cut out of circuit, substantially as described.

7. The combination with a motor, of a rheostat therefor having a contact adapted to be engaged by the rheostat-arm during the first part of its movement, a plurality of switches connected in series and placed at a distant point and connected with said rheostat-contact, and means for starting and stopping the motor from said switch while the rheostat-arm engages said contact, substantially as described.

8. The combination with a motor, of a rheostat therefor having an auxiliary contact adapted to be connected with the rheostat-circuit while a portion only of the resistance of the rheostat is in the motor-circuit, a plurality of switches connected in series placed at a distant point, and means for starting and stopping the motor from said switches while the said auxiliary contact is in circuit, substantially as described.

9. The combination with a motor, of a rheostat therefor, a circuit controlling the said motor, a switch located at a distant point in said circuit, parallel branches of said circuit controlled by said switch, one of said branches being controlled through the said rheostat and the other being independent of the rheostat, substantially as described.

10. The combination with a motor, of a starting-rheostat therefor, a circuit controlling the continuity of the motor-circuit, a switch located at a distant point in said first-named circuit, said first-named circuit having parallel branches controlled by said switch, one branch being independent of the rheostat and of high resistance, the other branch being operated through contacts of the rheostat and of low resistance, substantially as described.

11. The combination with a motor, of a rheostat therefor, an electrically-operated switch controlling the motor-circuit, a switch remote from the rheostat, and means for causing the energization or deenergization of the magnet of the electrically-operated switch from said remote switch, said means being in series with the switch remote from the rheostat, substantially as described.

12. The combination with a motor, of a rheostat therefor, an electrically-operated switch controlling the motor-circuit, a switch remote from the rheostat, and means for opening and closing the said controlling-switch from the remote switch, said means being in series with the switch remote from the rheostat, substantially as described.

13. The combination with a motor, of a rheostat therefor, a switch independent of the rheostat for controlling the motor-circuit, and means for opening and closing said switch from a remote point, said means being in se-

ries with the switch independent of the rheostat, substantially as described.

14. The combination with a motor, of an electrically-operated switch for controlling the circuit of the motor, and a switch for sending an energizing-current or a retaining-current through the magnet-coil of said controlling-switch, or for depriving the same of operating-current, substantially as described.

15. The combination with a motor, of a rheostat therefor, an electrically-operated switch for controlling the circuit of the motor, a switch remote from the above-named devices and adapted to send operating-current or retaining-current through the coil of said controlling-switch or for depriving the same of current, substantially as described.

16. The combination with a motor, of a rheostat therefor, and a plurality of switches connected in series and situated at a distance from said rheostat for stopping and starting the motor independent of the rheostat-arm when said arm is in certain positions, substantially as described.

17. The combination with a motor, of a rheostat therefor, and a plurality of switches connected in series and situated at a distant point for stopping and starting the motor while it is running at less than normal speed and when the arm of said rheostat is in certain positions, substantially as described.

18. The combination with a motor, of a rheostat therefor, and a plurality of switches connected in series and situated at a distance from said rheostat for stopping and starting the motor independent of the rheostat-arm when it is in certain positions, substantially as described.

19. The combination with a motor, of a rheostat therefor, and a plurality of switches connected in series and situated at a distance from said rheostat for stopping and starting the motor when it is running at a speed below the normal, said starting and stopping being independent of the rheostat-arm when it is in certain positions, substantially as described.

20. The combination with a motor, of a rheostat therefor, a plurality of switches connected in series and located at a distance from the motor, and means for stopping and starting the motor from any of said switches, said means being independent of the rheostat when said arm is in certain positions, substantially as described.

21. The combination with a motor, of a rheostat therefor, a plurality of switches connected in series and located at a distant point, and means for stopping and starting the motor from any of said switches when it is operating at less than normal speed, said means being independent of the rheostat-arm when it is in certain positions, substantially as described.

22. The combination with a motor, of an

electrically-operated switch for controlling the circuit of the motor, and a plurality of switches connected in series for sending an energizing-current or a retaining-current through the magnet-coil of said controlling-switch, substantially as described.

23. The combination with a motor, of a rheostat therefor, an electrically-operated switch for controlling the circuit of the motor, parallel branch circuits, a resistance arranged in one of said branch circuits and a switch located at a distant point for connecting the solenoid of the electrically-operated switch in either of said branch circuits.

24. The combination with a motor, of a rheostat therefor, an electrically-operated switch for controlling the circuit of the motor, parallel branch circuits, a resistance arranged in one of said branch circuits, and a plurality of switches located at distant points for connecting the solenoid of said electrically-operated switch in either of said branch circuits.

25. The combination with a motor, of a rheostat therefor, an electrically-operated switch for controlling the circuit of the motor, parallel branch circuits, a resistance arranged in one of said branch circuits, means connecting one side of the other branch circuit with the supply-circuit when the rheostat is operated to start the motor and a switch located at a distant point for connecting the solenoid of the electrically-operated switch with either of said branch circuits.

26. The combination with a motor, of a rheostat therefor, an electrically-operated switch for controlling the circuit of the motor, parallel branch circuits, a resistance arranged in one of said branch circuits, a contact carried by the rheostat-arm connecting one side of the other branch circuit with the supply-circuit when the rheostat is operated to start the motor, and a plurality of switches located at distant points for connecting the solenoid of the electrically-operated switch in either of said branch circuits.

27. The combination with a supply-circuit, of a motor connected therein, a rheostat for

said motor, branch circuits leading from said supply-circuit to a magnetically-operated switch for controlling the continuity of the motor-circuit, resistance arranged in one of said branch circuits, a contact carried by the rheostat-arm for connecting one side of the other branch circuit with the supply-circuits when the rheostat is operated to start the motor and a switch located at a distant point for connecting the winding of said magnetically-operated switch in either of said branch circuits.

28. The combination with a motor, of a rheostat therefor, having a supplemental contact adapted to be engaged by the rheostat-arm during the first part of its movement, a plurality of switches connected in series and located at distant points, each switch having a contact connected with said rheostat-contact, a second contact connected through a suitable resistance with one side of the main circuit, and a contact-arm connected through a solenoid-switch with the opposite side of the main circuit.

29. The combination with a motor, of a rheostat therefor, having a supplemental contact adapted to be engaged by the rheostat-arm during the first part of its movement, a plurality of switches located at distant points, each switch having a contact connected with said rheostat-contact, one of said switches having a second contact connected through a suitable resistance with one side of the main circuit and an arm connected with a second contact on a second switch, said switch being in like manner connected with the next switch, and the arm of the last switch being connected through a solenoid-switch with the opposite side of the circuits.

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

THOMAS E. BARNUM.

Witnesses:

NICK. EWENS,
J. H. WIERSUM