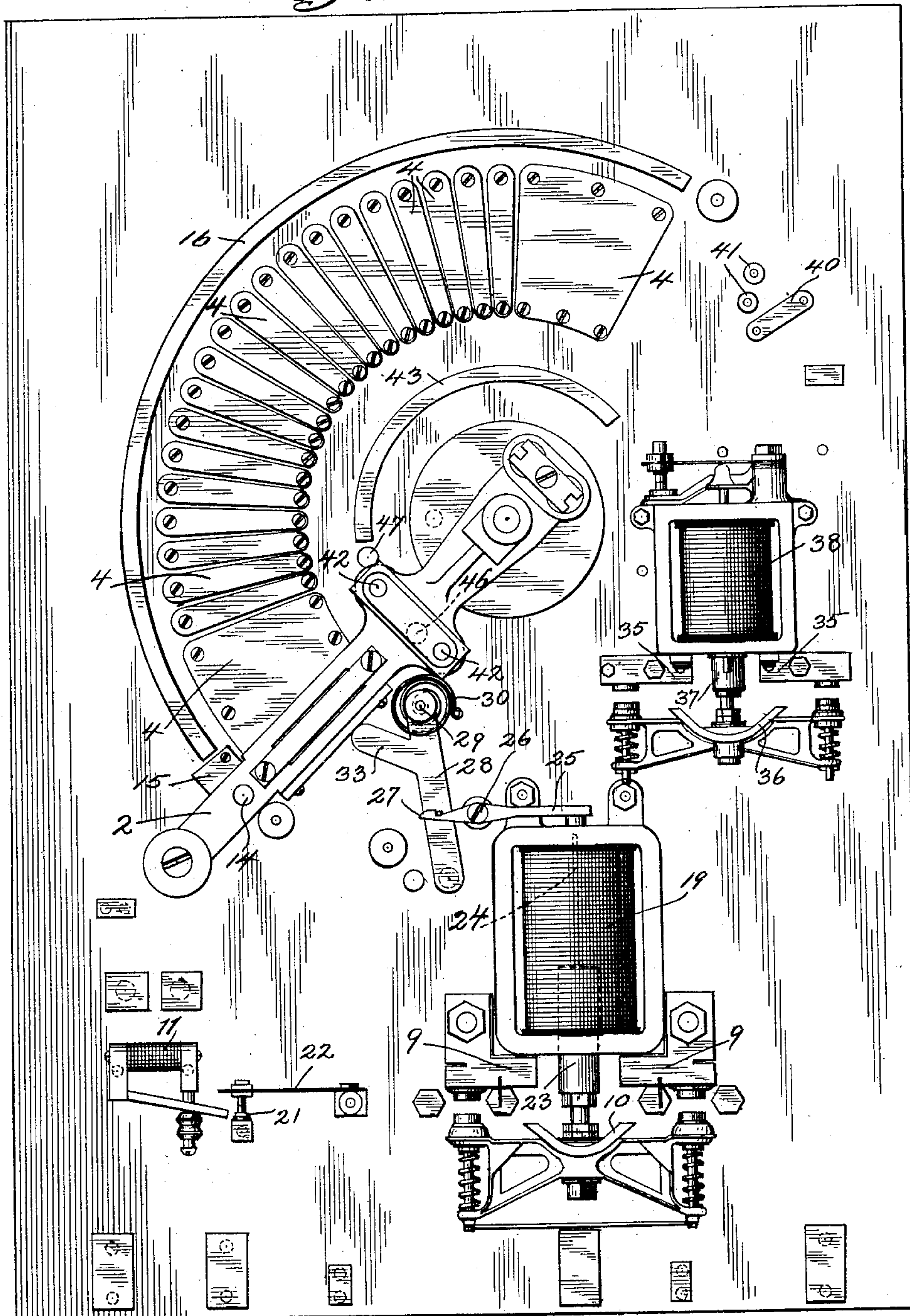


H. H. CUTLER.
CONTROLLER FOR ELECTRIC MOTORS.

APPLICATION FILED DEC. 30, 1901.

NO MODEL.

2 SHEETS—SHEET 1.

Fig. 1.

Witnesses:
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Robert Lewis Ames.

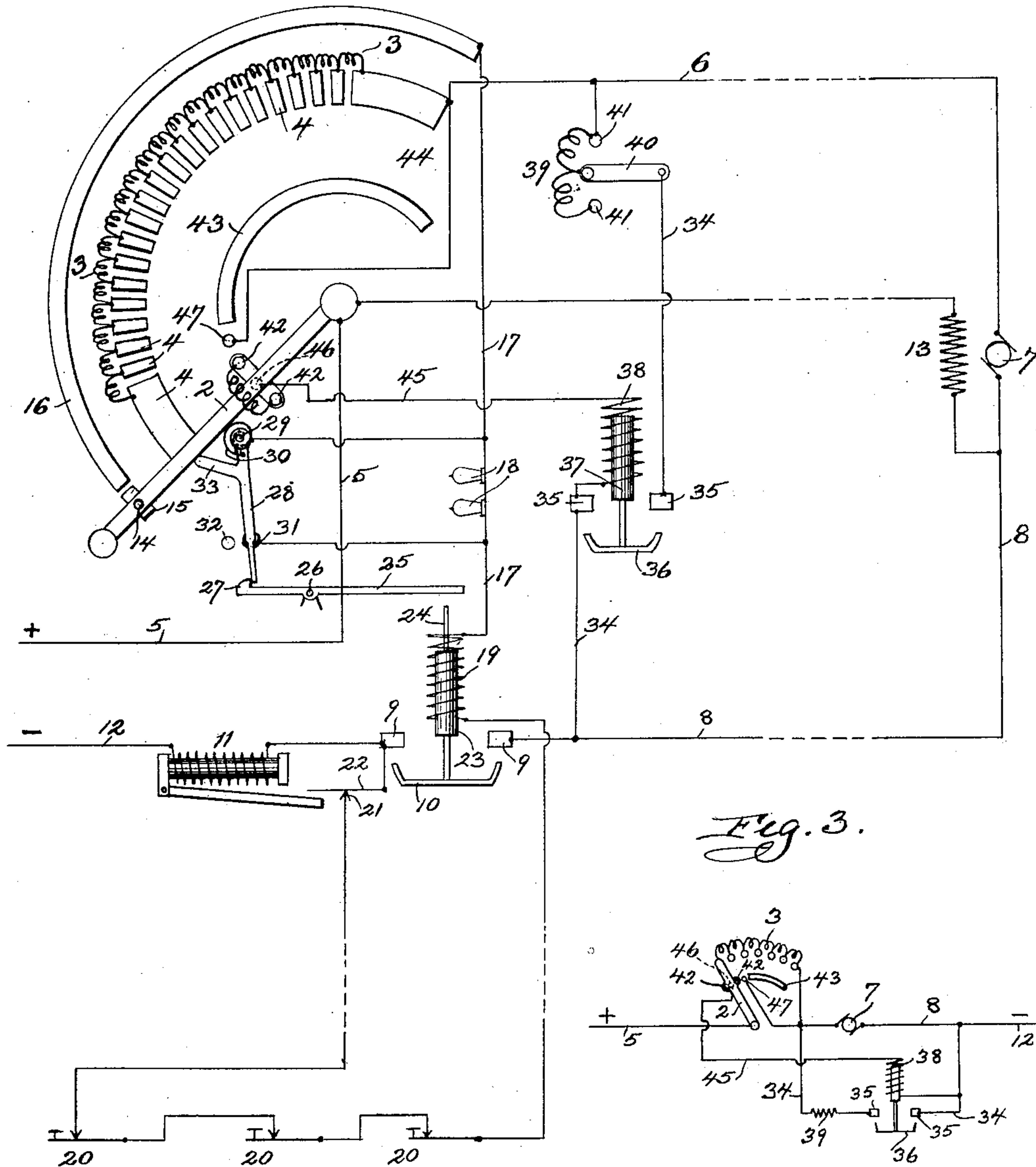
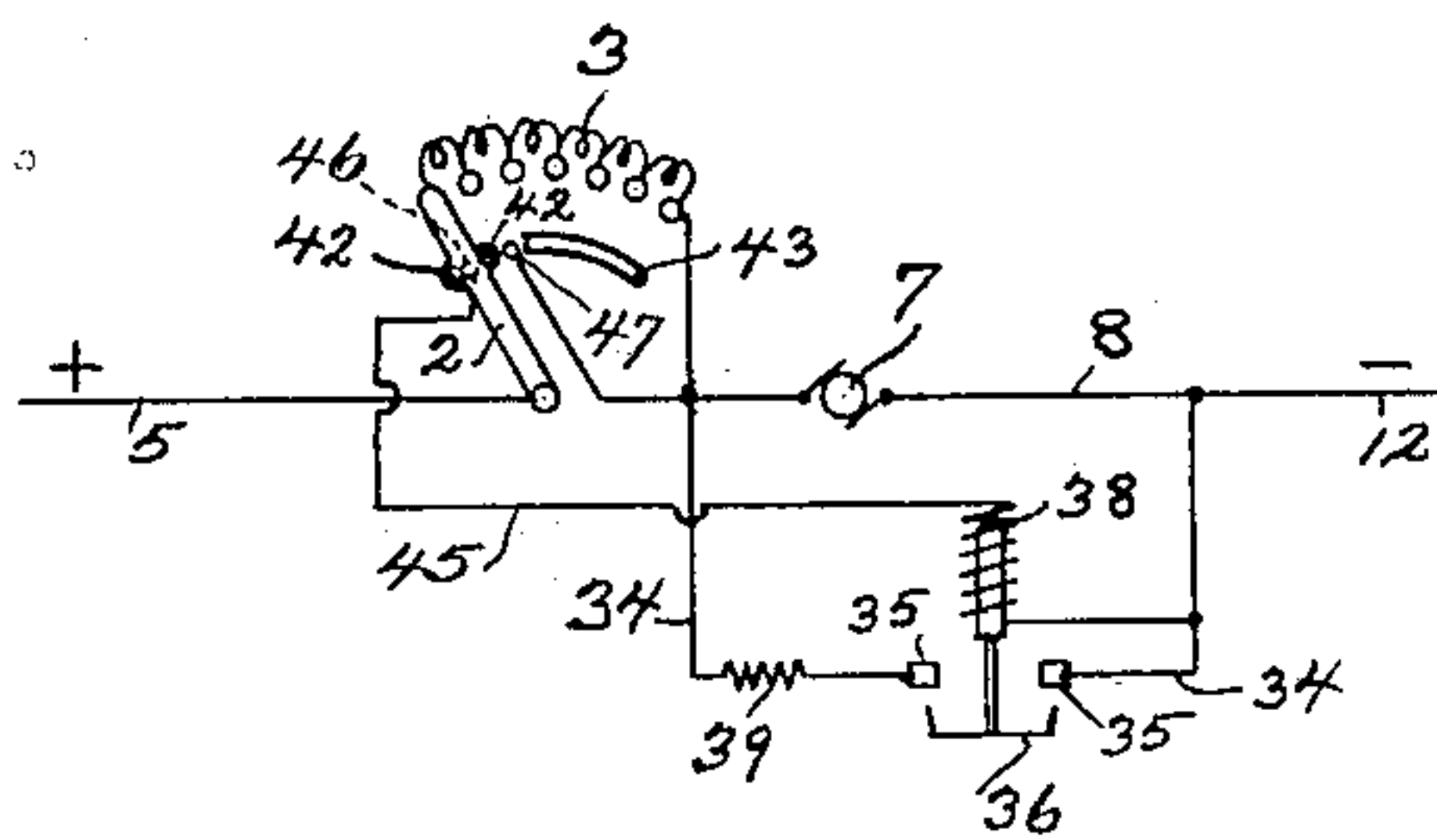
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H. H. CUTLER.
CONTROLLER FOR ELECTRIC MOTORS.

APPLICATION FILED DEC. 30, 1901.

NO MODEL.

2 SHEETS—SHEET 2.

Fig. 2.*Fig. 3.*

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UNITED STATES PATENT OFFICE.

HENRY H. CUTLER, 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. 743,463, dated November 10, 1903.

Application filed December 30, 1901. Serial No. 87,696. (No model.)

To all whom it may concern:

Be it known that I, HENRY H. CUTLER, 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, my object being to provide automatic means for limiting the speed of an electric motor.

It frequently happens in the operation of printing-presses and the like that it is desired to have one or two very slow speeds and then a very wide range of speed for printing; and it is the object of the present invention to provide means which will check the speed of the motor when it reaches or exceeds a prearranged value.

A further object is to arrange such an apparatus in connection with a regulating resistance so that the motor may be so controlled during one or more slow speeds and is not so controlled at other speeds than those of prearranged value.

My invention will be readily understood by reference to the accompanying drawings, in which—

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. Fig. 3 is a diagram showing the scheme of my invention.

Like numerals refer to like parts in the several figures.

The contact-arm 2 of the regulating 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-terminal 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 side 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 28 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.

The mechanism thus far described does not constitute in its individual capacity any part of my invention, and I therefore disclaim the same.

I will now describe the operation of the mechanism thus far described.

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, regulating 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 to 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 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 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.

I shall now describe the features of the structure which constitute my invention and which form the subject-matter of the present application.

In parallel with the armature 7 of the motor a conductor 34 is provided, the circuit through said conductor being normally opened at the contacts 35 35, which are adapted to be bridged together by the contact-plate 36, carried upon the core 37 of the mag-

net or solenoid 38. A resistance 39 is provided in circuit with the conductor 34, the same being associated with a contact-arm 40 and terminals 41, whereby the amount of the resistance may be adjusted as desired. Upon the contact-arm 2 two brushes 42 42 are mounted, said brushes being electrically connected together, but insulated from arm 2. Button 46 is connected with one end of solenoid 38, the other end of said solenoid being connected with contact 35. Button 47 is connected by conductor 44 with conductor 6. Buttons 46 and 47 are relatively insulated. When, however, the contact-arm is moved, the brushes 42 42 engage the buttons 46 47, respectively, and electrically connect the same.

The operation is as follows: Assuming that the arm 2 has been moved so that the buttons 42 rest upon buttons 46 and 47, the motor is then running at the prearranged slow speed and the solenoid-core 37 occupies the position shown in Figs. 1 and 2. In this position the shunt around the armature of the motor is open. It will be noted likewise that the circuit through the solenoid 38, which was open when the contact-arm 2 was in its initial position, is now closed, and the solenoid 38 is thus connected in a circuit across the terminals of the motor—that is, in a parallel or shunt circuit around the motor-armature. The solenoid 38 is so adjusted that when the motor is running at the desired slow speed and below the prearranged maximum limit the current traversing said solenoid 38 will be insufficient to raise the core 37 and close the circuit through the contacts 35 35. When, however, the speed of the motor rises above the prearranged value, the counter electromotive force developed by the armature will be increased to such an extent as to force an increased current through the parallel path containing the solenoid 38. This increased current flowing through solenoid 38 energizes the same and the core thereof is attracted, thereby closing together the contacts 35 35 by means of contact-plate 36. The shunt-circuit around the armature robs it to an extent of the current previously flowing there-through, and the current through the motor being thus diminished the speed of the motor will immediately fall. By means of the adjustable resistance 39 the resistance of the parallel path 34 may be adjusted to the desired extent. As soon as the speed of the motor falls sufficiently to cause the solenoid 38 to release its core the said core drops by gravity, and contact-plate 36 is thus moved out of contact with the contacts 35 35 and the parallel path 34 is thereby opened. In this manner during this period of the operation of the motor the solenoid 38 automatically closes and opens the parallel path 34 to control the operation of the motor and to prevent the same from rising above the prearranged speed. It will be understood that while I have shown one means of connecting

the solenoid 38 in circuit to respond to the counter electromotive force of the armature other ways of connecting said solenoid in circuit may be adopted without departing from the spirit of my invention, the essential feature of which is the employment of a solenoid, magnet, or similar electrical means responding to an increase of speed of the motor-armature to control a parallel path about the armature, and thereby limit the speed of the motor.

By the term "normally open parallel path" as employed in the appended claims I contemplate a path through which an operative or effective current does not normally flow, whether the prevention of the flow of such operative current is accomplished by an absolute break in the circuit or by any of the well-known equivalent means for limiting the strength of the current.

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 parallel path about the armature of said motor, and means responsive to the speed of said armature for controlling the continuity of said parallel path, substantially as described.

2. The combination with a motor, of a normally open parallel path about the armature thereof, and means responding to the speed of the armature of said motor and adapted to close said parallel path when the speed rises above a prearranged value, substantially as described.

3. The combination with a motor, of a normally open parallel path about the armature of said motor, and an electromagnetic device responsive to the speed of said armature and adapted to close said parallel path when the speed rises above a prearranged value, substantially as described.

4. The combination with an electric motor, of a normally open parallel path about the armature thereof, an electromagnetic device adapted to be included in a parallel path about said armature and to close said first-mentioned parallel path when the speed of the armature rises above a prearranged value, substantially as described.

5. The combination with an electric motor, of a parallel path about the armature thereof, and means responsive to a change of the counter electromotive force of the armature for controlling said parallel path, substantially as described.

6. The combination with an electric motor, of a pair of parallel paths extending about the

armature thereof, a pair of switch-contacts in one of said paths and an electrically-operated device in the other path for controlling said switch-contacts, substantially as described.

7. The combination with an electric motor, of a pair of parallel paths extending about the armature thereof, switch-contacts in one of said parallel paths and an electromagnetic device in the other path for controlling said switch-contacts, substantially as described.

8. The combination with an electric motor, of a pair of parallel paths extending about the same, switch-contacts in one of said paths and an electromagnetic device and a switch in the other path, substantially as described.

9. The combination with an electric motor, of a resistance and a movable element therefor, a pair of parallel paths extending around the armature of said motor, switch-contacts contained in one of said paths, an electromagnetic device for controlling said switch-contacts contained in the other path and a switch for controlling the circuit through said electromagnetic device and controlled by the movable element of said rheostat, substantially as described.

10. The combination with an electric motor, of a resistance therefor having a movable element, a pair of parallel paths extending around the armature of the motor, switch-contacts in one of said paths, an electromagnetic device for controlling the same situated in the other path, and a switch contained in the circuit of the said electromagnetic device, controlled by the movable element of said rheostat, and adapted to open the circuit through said electromagnetic device when said movable element is in its initial position, substantially as described.

11. The combination with an electric motor, of a pair of parallel paths extending around the armature thereof, switch-contacts in one of said parallel paths, an electromagnetic device in the other path, a resistance and the movable element thereof, a pair of brushes carried upon said movable element, and contacts with which said brushes are adapted to engage upon the movement of said movable element to thereby close circuit through said electromagnetic device, substantially as described.

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

HENRY H. CUTLER.

Witnesses:

F. R. BACON,

A. W. BERRESFORD.