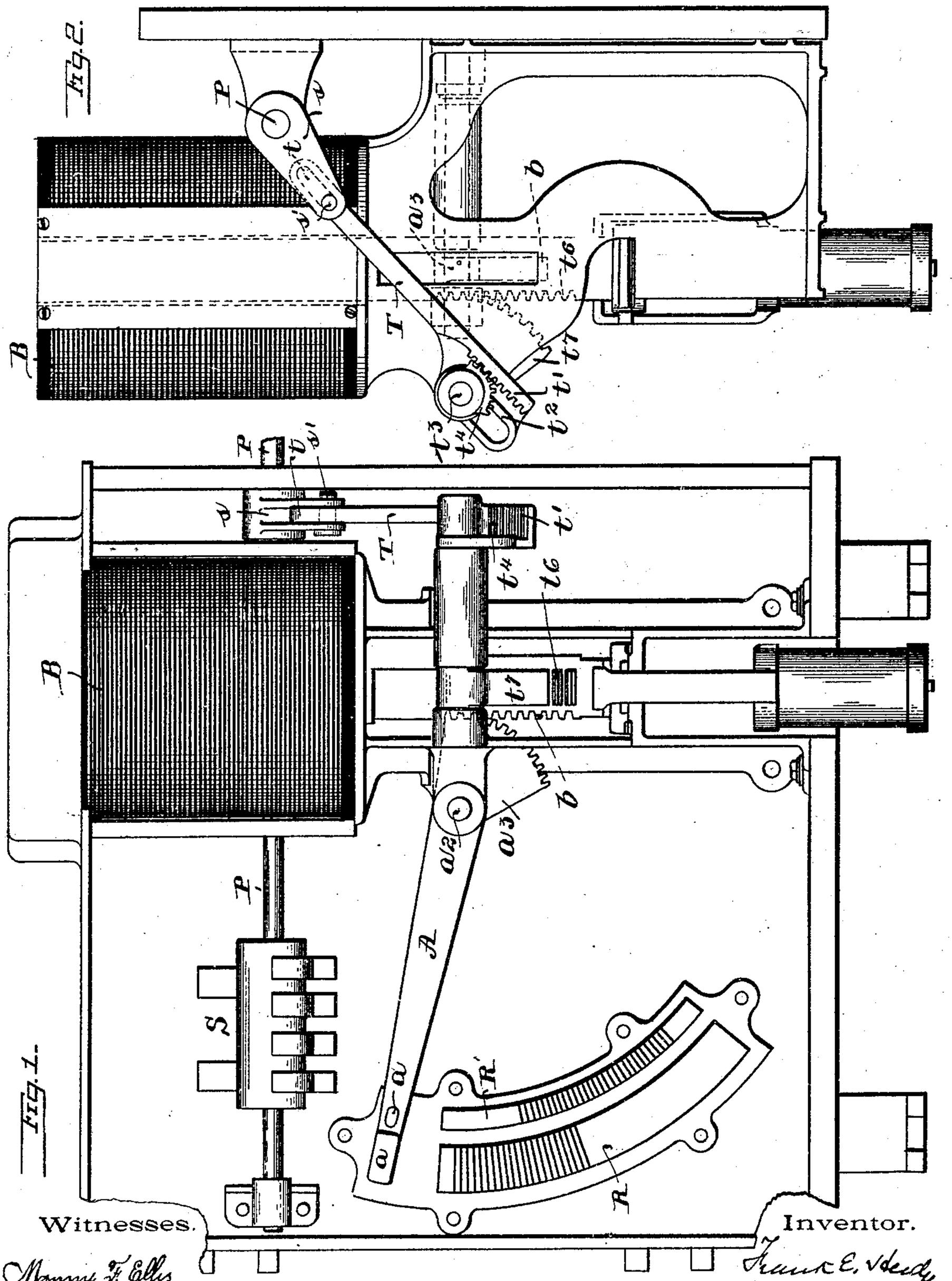
(No Model.) 2 Sheets—Sheet 1.

F. E. HERDMAN.

MECHANISM FOR ADMISSION AND REGULATION OF CURRENTS TO MOTORS.

No. 551,634. Patented Dec. 17, 1895.



Witnesses.

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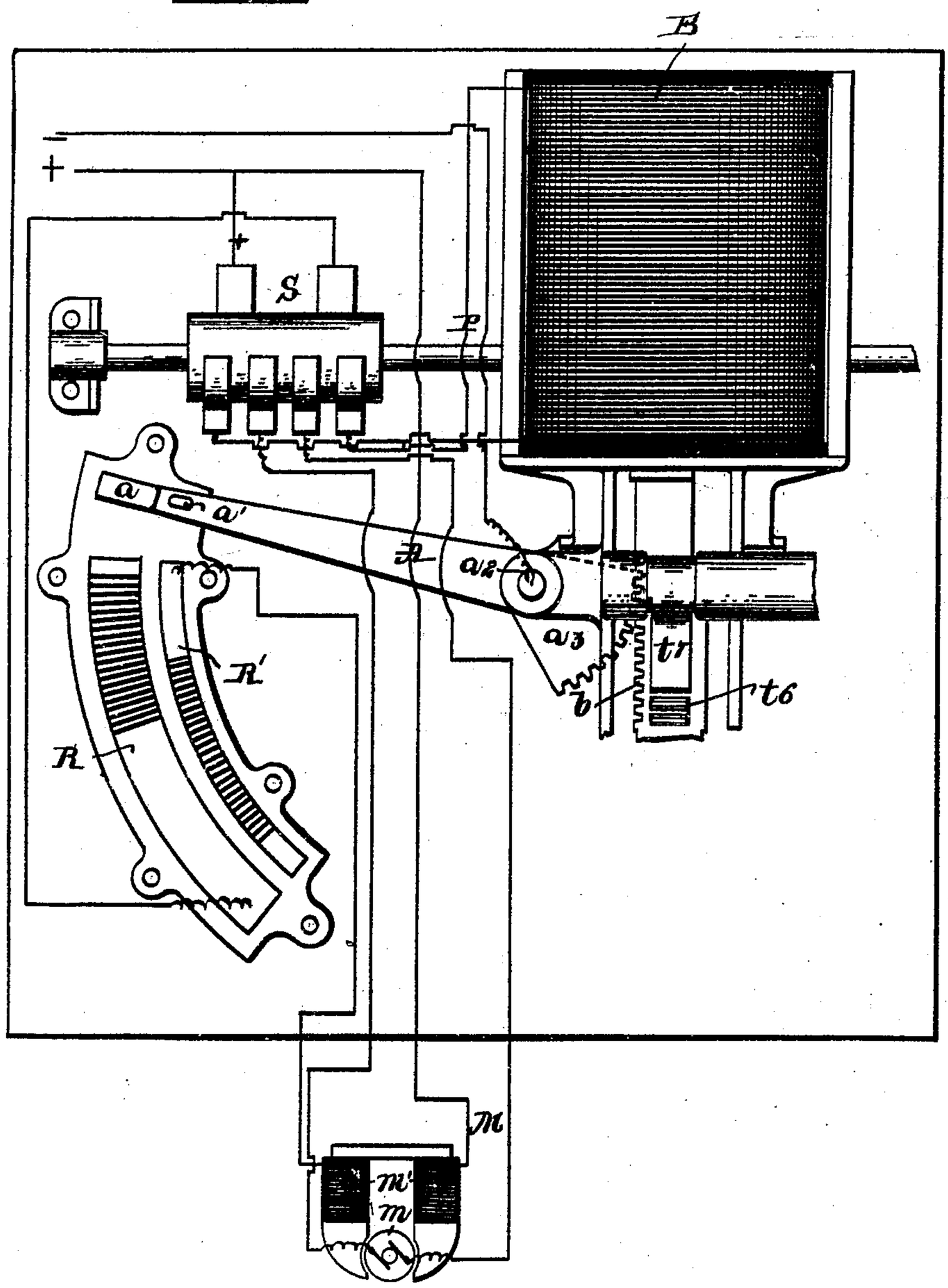
Fig. 3.



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UNITED STATES PATENT OFFICE.

FRANK E. HERDMAN, OF WINNETKA, ILLINOIS.

MECHANISM FOR ADMISSION AND REGULATION OF CURRENTS TO MOTORS.

SPECIFICATION forming part of Letters Patent No. 551,634, dated December 17, 1895.

Application filed March 29, 1895. Serial No. 543,638. (No model.)

To all whom it may concern:

Be it known that I, FRANK E. HERDMAN, a citizen of the United States, residing at Winnetka, county of Cook, and State of Illinois, have invented a new and useful Improvement in Mechanism for Admission of Currents to Motors and Regulation of Currents in Same, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

I will first describe the embodiment of my invention illustrated in the drawings, and then specifically point out the invention in the claims.

In the drawings, Figure 1 is a front elevation. Fig. 2 is an end view. Fig. 3 is a diagram of the wiring.

M is a motor, of which m is the armature and m' the field, S the reversing-switch, R resistances in the armature-circuit, and R′ resistances in the field-circuit.

A is an arm pivoted at a^2 and carrying brushes a and a', the brush a controlling the current to the armature, and brush a' the current to the field.

B is a solenoid, the core or extension of the core of which has the rack b, which works in segmental gear a^3 on the end of arm A, and when the solenoid is energized the arm A is caused to travel over the resistances R R′.

P is the operating-bar for controlling the switch S. Connected to the operating-bar is the crank s provided with the pins s'.

T is an arm, having at one end the slotted end t, in which slotted end the pin s' rests. The other end of this rod is secured to or forms part of the slotted frame t^2, which surrounds the shaft t^3. Sleeved upon this shaft t^3 is the segmental gear t^4, which works in the rack t'. Connected to the shaft t^3 is the segmental gear t^7, which works in the gear or rack t^6, connected to the core of the solenoid B, or an extension thereof, on the side opposite to that of the rack b.

The wiring is as shown in Fig. 3, and the length of the slot t is greater than the throw of the operating-bar from its central position in either direction necessary to operate the switch S. When the operating-bar is thrown from the center in either direction to operate the switch S, the crank-arm s is also moved in that direction, causing the pin s' to move in the slot t from the lower to the upper end. This admits current to the solenoid B, energizing it and causing its core to be drawn up, which, through the medium of the rack b working in the segmental gear a^3, causes the arm A to pass over the resistances R and R′, the first action being to cut out resistances in the armature-circuit, and the further movement being to cut in resistances into the field-circuit, so that initially the strength of the current to the armature is increased, and then the strength to the field decreased. This movement, through the medium of the rack t^6, acting upon the segmental gear t^7, rocking the shaft t^3, causes the segmental gear t^4 to act upon the rack t' and move the rack, and with it the arm, so that the slotted end of the arm is moved upward, so that the pin s' is brought from a position at the upper end of the slot to the position at the lower end of the slot, the crank-arm not being moved. The length of this slot t is also sufficiently large to enable the arm A to pass over the desired length of the resistances R and R′.

As shown in the drawings, the wiring is such that in the movement of the arm the brush a passes over the resistances R, and beyond them to a point where the full effect of the current is admitted to the armature, while in the case of the brush a' the full effect of the current is initially admitted to the field, and then gradually the arm passes over the resistances, throwing the resistances into the circuit in the field. Now, after the arm has passed over the resistances R and R′ and it is desired to change the condition of the quantity of current passing to the field of the armature of the motor without cutting off the current at the switch the operator can move the operating-bar, and at that point, as hereinbefore described, the pin being at the lower end of the slot t, the movement of the bar and its crank-arm toward the center will, through the medium of the rack t' operating upon segmental gear t^4, rock the shaft t^3 in a direction reverse to that in which it was rocked by the movement of the rack t^6, and, through the medium of the segmental gear t^7, force the solenoid-core downward, and thus move the arm A backward, thus cutting out resistances in the field-circuit, and, if moved far enough,

cutting out resistances in the armature-circuit. By stopping the throw of the operating-bar in any position the limit of the movement of the arm A by the solenoid will be determined. By this construction I am enabled to regulate the quantity of current passing to the field and to the armature, independent of the solenoid or other arm-controlling device, while, on the other hand, it is impossible for the operator to change the speed with which the quantity of current is increased in the armature-circuit or decreased in the field-circuit. By this construction, therefore, I am enabled to regulate the speed of the motor, and thus the speed of the device driven by the motor, and yet at the same time the initial admission of current to the motor is regulated automatically and cannot be varied by the operator, it being dependent upon the speed with which the solenoid B acts.

Having now fully described my invention, what I claim, and desire to protect by Letters Patent, is—

1. In combination with a source of current supply, a translating device, circuit connections to said translating device, a switch for controlling the admission of current to the translating device and operating mechanism for controlling said switch, of a device adapted in its movement to vary the current strength in the circuit to the translating device, actuating mechanism adapted to move said device in one direction, and mechanism connected with the operating mechanism adapted by the movement of the operating mechanism to move said actuating mechanism and said current varying device in the other direction.

2. In combination with a source of current supply, a translating device, circuit connections to said translating device, a switch for controlling the admission of current to the translating device and operating mechanism for controlling said switch, of a device adapted in its movement to vary the current strength in the circuit to the translating device, a solenoid adapted when energized to move said current regulating device in one direcion, and mechanism connected with the operating mechanism, and adapted by the movement of the operating mechanism to move the core of the solenoid and said last mentioned current varying device in the opposite direction.

3. In combination with a source of current supply, a translating device, circuit connections to said translating device, a switch for controlling the admission of current to the translating device and operating mechanism for controlling said switch, of a device adapted in its movement to vary the current strength in the circuit to the translating device, a solenoid adapted when energized to move said current regulating device in one direction, and connection between said solenoid and the operating mechanism, whereby the extent of movement of the operating mechanism from the center limits the movement of the solenoid when energized, and the movement of the operating mechanism toward the center moves the core of the solenoid and said last mentioned current varying device in the direction opposite to that in which they are moved by the solenoid.

4. In combination with a source of current supply, a translating device, circuit connections to said translating device, a switch for controlling the admission of current to the translating device and operating mechanism for controlling said switch, of a device adapted in its movement to vary the current strength in the circuit to the translating device, actuating mechanism adapted to move said device in one direction, and connection between said operating mechanism and the actuating mechanism whereby the extent of movement of the operating mechanism from the center limits the movement of the actuating mechanism, and the movement of the operating mechanism toward the center moves the actuating mechanism and the current varying device in a direction opposite to that in which they are moved by the actuating mechanism.

5. In combination with a source of current supply, a motor, and circuit connections to the field and armature of said motor, resistances in both circuits, a device adapted in its movement in one direction to increase the current in the armature circuit and decrease the current in the field circuit, actuating mechanism adapted to move said device to increase the current in the armature circuit and decrease the current to the field, and mechanism adapted to act against said actuating mechanism and move the said device in the opposite direction.

6. In combination with a source of current supply, a motor, and circuit connections to the field and armature of said motor, resistances in both circuits, a device adapted in its movement in one direction to increase the current in the armature circuit and decrease the current in the field circuit, a solenoid adapted when energized to move said current regulating device in one direction, and mechanism adapted to act against said solenoid when energized and move said last mentioned device in the direction opposite to that in which it is moved by the solenoid.

7. In combination with a source of current supply, a translating device and circuit connections to said translating device, of a device adapted in its movement to vary the current strength in the circuit to the translating device, a solenoid adapted when energized to move said current regulating device in one direction, an operating bar, a crank upon said bar, an arm, a slot and pin, or equivalent connection, between said arm and crank, and connection between said arm and the solenoid core.

8. In combination with a source of current supply, a translating device and circuit connections to said translating device, of a device adapted in its movement to vary the current

strength in the circuit to the translating device, a solenoid, connection between the current regulating device and core of the solenoid, an operating bar, a crank upon said bar, an arm, a slot and pin, or equivalent connection, between said arm and crank, and connection between said arm and the solenoid core.

9. In combination with a source of current supply, a motor, and circuit connections to the field and armature of said motor, resistances in both circuits, a device adapted to control the resistances in said circuits, the arrangement of resistances being such that the movement of the device in one direction cuts out the resistance in the armature circuit, and brings resistance in the field circuit, a solenoid adapted when energized to move said current regulating device in one direction, an operating bar, a crank upon said bar, an arm, a slot and pin, or equivalent connection between said arm and crank, and connection between said arm and the solenoid core.

10. In combination with a source of current supply, a motor, and circuit connections to the field and armature of said motor, resistances in both circuits, a device adapted to control the resistances in said circuits, the arrangement of resistances being such that the movement of the device in one direction cuts out the resistance in the armature circuit and brings resistance in the field circuit, a solenoid, connection between the current regulating device and core of solenoid, an operating bar, a crank upon said bar, an arm, a slot and pin, or equivalent connection between said arm and crank, and connection between said arm and the solenoid core.

11. In combination with a source of current supply, a motor, and circuit connections to the field and armature of said motor, resistances in both circuits, a device adapted in its movement in one direction to increase the current in the armature circuit and decrease the current in the field circuit, a solenoid adapted when energized to move said current regulating device in one direction, an operating bar, a crank upon said bar, an arm, a slot and pin, or equivalent connection between said arm and crank, and connection between said arm and the solenoid core.

12. In combination with a source of current supply, a motor, and circuit connections to the field and armature of said motor, resistances in both circuits, a device adapted in its movement in one direction to increase the current in the armature circuit and decrease the current in the field circuit, actuating mechanism adapted to move said device to increase the current in the armature circuit and decrease the current to the field, a solenoid, connection between the current regulating device and core of the solenoid, an operating bar, a crank upon said bar, an arm, a slot and pin or equivalent connection between said arm and crank, and connection between said arm and the solenoid core.

In testimony of which invention I have hereunto set my hand.

FRANK E. HERDMAN.

Witnesses:

FRANK J. HOWELL,

M. SCHNEIDER.