(No Model.) 2 Sheets—Sheet 1.

F. E. HERDMAN.

MECHANISM FOR ADMISSION OF CURRENTS TO MOTORS AND REGULATION OF CURRENTS IN SAME.

No. 551,635. Patented Dec. 17, 1895.

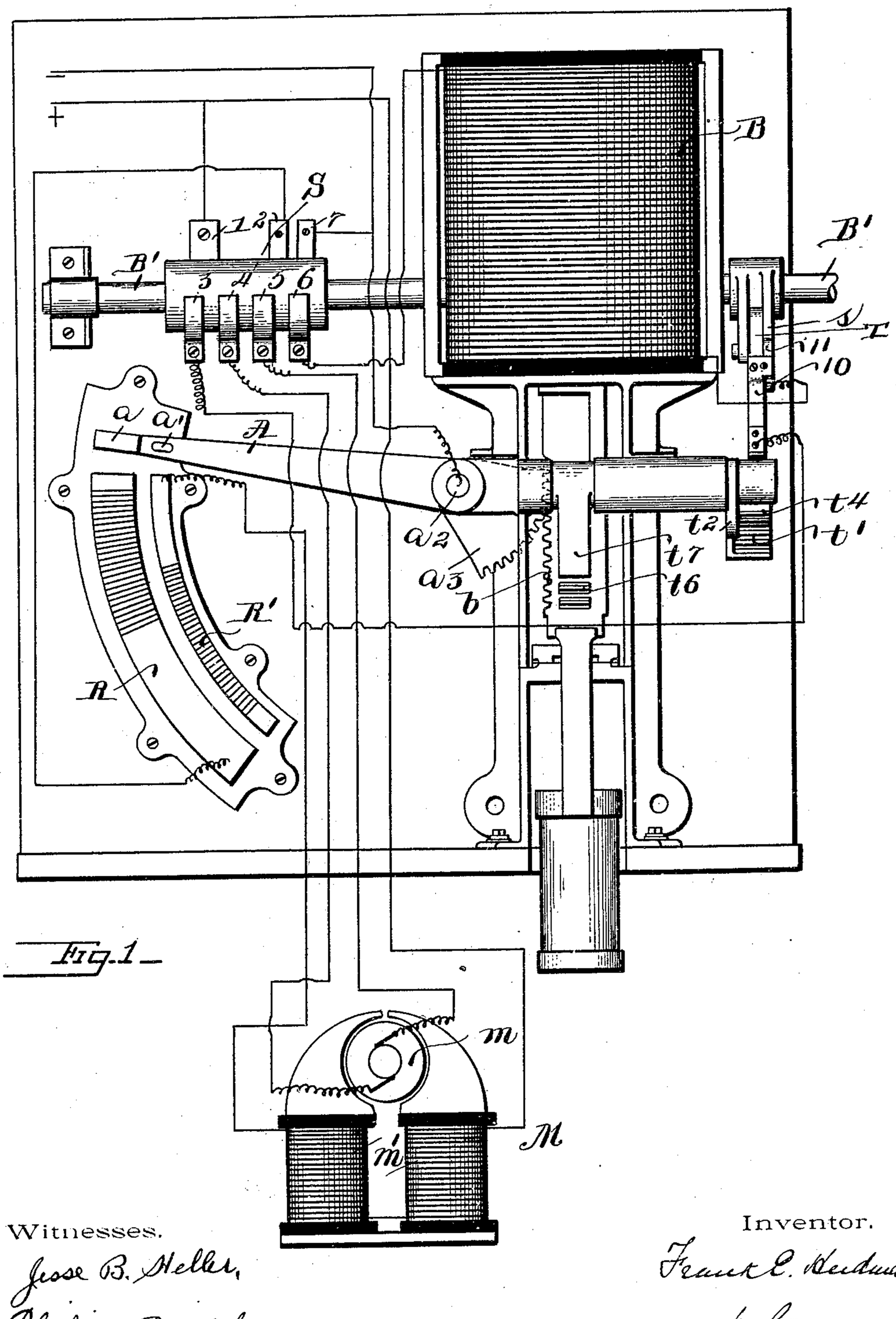

Fig. 1.

Witnesses.

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(No Model.) 2 Sheets—Sheet 2.

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MECHANISM FOR ADMISSION OF CURRENTS TO MOTORS AND REGULATION OF CURRENTS IN SAME.

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Fig. 2.

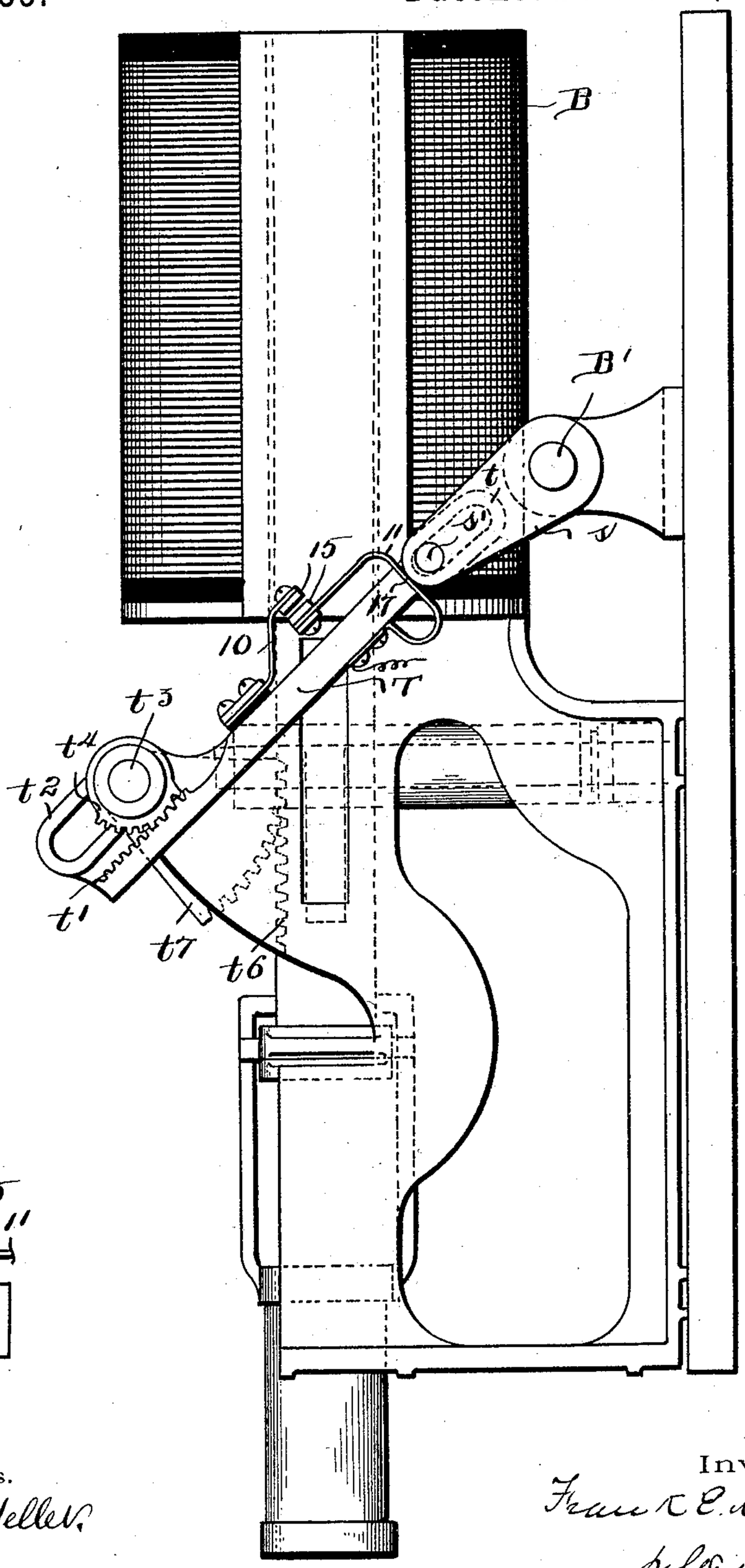
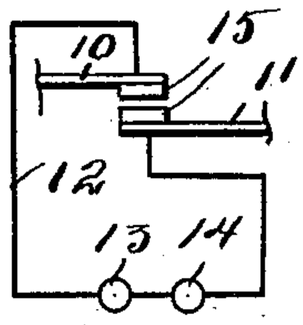


Fig. 3.



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UNITED STATES PATENT OFFICE.

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MECHANISM FOR ADMISSION OF CURRENTS TO MOTORS AND REGULATION OF CURRENTS IN SAME.

SPECIFICATION forming part of Letters Patent No. 551,635, dated December 17, 1895.

Application filed June 28, 1895. Serial No. 554,303. (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.

My invention relates to certain improvements in the mechanism described and claimed in an application, Serial No. 543,638, filed March 29, 1895. In that case there was provided a motor with circuit connections from the source of current-supply to the armature and field of the motor passing through resistance, and a resistance-arm adapted to travel over and cut in or out the resistance in the circuit to the armature and the field. This arm was moved in one direction by a solenoid which was energized when the switch was operated to throw current onto the motor. The operating-bar by which the motor-switch was operated was connected by mechanism (which will appear fully in this application) to the solenoid, and the operator was enabled, by moving the bar, to move the solenoid-core in a direction opposite to that in which it was moved by the solenoid when energized, and thus move the arm also in an opposite direction. Specifically speaking, in the application last mentioned the construction illustrated was such that the movement of the solenoid by the mechanism connected to the operating-bar was against the full strength of the solenoid, and sometimes, due to the friction, the necessary power to move it was considerable. This application has for its object to automatically break the circuit to the solenoid or increase the resistance in said circuit and thus diminish the strength of the solenoid when the operating-bar is moved or operated so as to move the solenoid-core and with it the resistance-arm in a direction opposite to that in which they both moved when under the action of the current in the solenoid.

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

In the drawings, Figure 1 is a front view of the device, and also shows the wiring of the same. Fig. 2 is a side elevation. Fig. 3 is a diagram showing resistance between the brushes.

M is the motor, on which m is the armature and m' the field.

S is 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 the brushes a and a', the brush a controlling the current to the armature and the 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 the 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 resistance R R′.

B′ is the operating-bar for controlling the switch S. Connected to the operating-bar is a crank s, provided with pin s'.

T is an arm having at one end the slotted portion t, in which slotted portion 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. Keyed 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 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.

The wiring is as follows: The current passes from one pole of the source of current-supply, which in this case, as shown, forms the + pole, to the brush 1, and, when the switch is properly operated, from the brush 1 through the switch-cylinder to brushes 3 and 4. From brush 4 the current passes directly to one pole of the armature. From the other pole of the armature it passes to the brush 5, from the brush 5 to the brush 2, from the brush 2 to the armature resistance-plate, and through the resistance-arm A to the other pole of current-supply. The current passes directly from one pole of the source of current-supply to the fields, and from the fields to the field resistance-plate through the arm A to the

other pole of current-supply. From brush 3 the current passes to the spring binding-post 10 secured to and insulated from the arm T. From the spring binding-post 11, also secured to and insulated from the arm T, the wire passes to the solenoid B, and from the solenoid B a wire passes to the brush 6, from thence through brush 7 to the other pole of the source of current-supply. The binding-posts 10 and 11 have connecting them a loose wire 12, having one or more lamps or other resistance devices 13 and 14 on said wire. It may thus be seen that the circuit to the solenoid which controls the movement of the arm A passes through the binding-posts 10 and 11. Each of these binding-posts carries a binding-brush or contact-plate 15, and when these two plates are in contact with each other the full force of the current passes to the solenoid B; but when they are separated the circuit is either entirely broken to the solenoid B, and it becomes de-energized, or else, in case the wire 12 be used, the circuit is formed including the resistance devices 13 and 14, which reduces the current strength passing through the solenoid, and thus reduces its power.

When the operating-bar is thrown from the center in either direction to operate the switch, the crank-arm is also moved in that direction, causing the pin s' to move in the slot t from the lower toward the upper end. This causes the two brushes 15, due to their spring connection, to come together, and the current passes to the solenoid energizing it, and causing its core to move and with it the arm A. The arm A passes over the resistances R and R', the first action being to cut out the resistances in the armature-circuit, and the further movement being to cut in resistances into the field-circuit. This movement of the solenoid through the medium of the rack t^6 acting upon the segmental gear t^7, rocking the shaft t^3, causing the segmental gear t^4 to act upon the rack t' and move the rack, and with it the arm T, so that the slotted end of the arm is moved upward, following the movement of the pin s'. The position in which the operating-bar is thrown develops the extent of movement which the solenoid can have, for when the movement is sufficient to cause the slotted end of the arm T to reach the pin s' the further movement or effort at movement of the solenoid compresses the spring 17, which rests against the end of the slotted arm T and separates the two brushes 15, which either causes the current to entirely cease to pass to the solenoid, or else throws resistance into the circuit of the solenoid.

When the operating-bar is moved toward the center, the pin s', through the medium of the rack t', will operate on the segmental gear t^4, rocking the shaft t^3 in a direction reverse to that which it was rocked by the rack t^6, and through the medium of the segmental gear t^7 force the solenoid-core in a direction opposite to that in which it was moved by the current. At the same time the pin s' will compress the spring 17, and again either break the circuit to the solenoid or throw resistances in the circuit. 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, and is sufficient to allow of the throw of the operating-bar, which will enable a full movement of the arm A over both the field and armature resistances before the slotted end is caught again by the pin. By this construction, therefore, the extent to which the solenoid acts and the extent to which the resistance-arm moves is controllable by the operator. Again the operator can move the solenoid-core, and with it the arm, back over the resistances, decreasing the resistance in the fields, increasing the resistance in the armature, and, in the movement to do this, causes either the current to the solenoid to be broken or resistances to be put into the circuit, so that this movement is made without the opposition from the solenoid due to its magnetism.

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 and operating mechanism, of a device in its movement adapted to vary the current's strength in the circuit to the translating device, a solenoid adapted when energized to move said current regulating device in one direction, 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 device in the opposite direction, a switch device independent of the translating device switch controlling the current to the solenoid, and means to open said switch device in the last mentioned operation of the operative mechanism.

2. In combination with a source of current supply, a translating device, circuit connections to said translating device and operating mechanism, of a device adapted in its movement to vary the current's strength in the circuit to the translating device, a solenoid adapted when energized to move said current regulating device in one direction, 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 device in the opposite direction, a connection to the solenoid through resistances, a switch device independent of the translating device, the arrangement being such that when said switch device is open the current passes to the solenoid through resistances and when closed independent of the resistances, and means to open said switch device in the last mentioned operation of the operative mechanism.

3. In combination with a source of current supply, a translating device, circuit connections to said translating device and operating

mechanism, 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 actuating mechanism from the center limits the movement of the solenoid when energized, 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, a switch device independent of the translating device switch, controlling the current to the solenoid, said switch device being normally closed and controlled by the connection between the operating mechanism and solenoid, the arrangement being such that a tendency of the solenoid to move beyond the limit set by the operating mechanism opens said switch device, and the movement of the operating mechanism toward the center opens said switch.

4. In combination with a source of current supply, a translating device, circuit connections to said translating device and operating mechanism, 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 actuating mechanism from the center limits the movement of the solenoid when energized, 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, a connection to the solenoid through resistances, a switch device independent of the translating device switch, the arrangement being such that when said switch device is open the current passes to the solenoid through resistances and when closed independent of the resistances, said switch device being normally closed and controlled by the connection between the operating mechanism and solenoid, the arrangement being such that a tendency of the solenoid to move beyond the limit set by the operating mechanism opens said switch device, and the movement of the operating mechanism toward the center opens said switch.

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, a solenoid adapted when energized to move said current regulating device in one direction, and mechanism adapted to act against said solenoid, and move said last mentioned device in the direction opposite to that in which it is moved by the solenoid, a switch device independent of the motor switch and controlling the current to the solenoid, said switch being controlled by said last mentioned mechanism and adapted to open said switch when operated to move the solenoid as last described.

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 and move said last mentioned device in the direction opposite to that in which it is moved by the solenoid, a connection to the solenoid through resistances, a switch device independent of the translating device switch, the arrangement being such that when said switch device is open the current passes to the solenoid through resistances and when closed independent of the resistances, said switch being controlled by said last mentioned mechanism, said mechanism being adapted to open said switch when the mechanism acts to move 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, spring contacts connected with said current varying device in the circuit to the solenoid, said contacts being normally closed and controlled by the action of the pin and walls of the slot.

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 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, spring contacts connected with said current varying device in the circuit to the solenoid, said contacts being normally closed and controlled by the action of the pin and walls of the slot, and wire connection between said contacts including resistances.

9. 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, spring contacts connected with said current varying device in the circuit to the solenoid, said contacts being normally closed and controlled by the action of the pin and walls of the slot.

10. 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, spring contacts connected with said current varying device in the circuit to the solenoid, said contacts being normally closed and controlled by the action of the pin and walls of the slot and wire connection between said contacts including resistances.

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 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, spring contacts connected with said current varying device in the circuit to the solenoid, said contacts being normally closed and controlled by the action of the pin and walls of the slot.

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 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, spring contacts connected with said current varying device in the circuit to the solenoid, said contacts being normally closed and controlled by the action of the pin and walls of the slot, and a wire connection between said contacts including resistances.

13. 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, spring contacts connected with said current varying device in the circuit to the solenoid, said contacts being normally closed and controlled by the action of the pin and walls of the slot.

14. 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, spring contacts connected with said current varying device in the circuit to the solenoid, said contacts being normally closed and controlled by the action of the pin and walls of the slot, and wire connection between said contacts including resistances.

15. 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, spring contacts connected with said current varying device in the circuit to the solenoid, said contacts being normally closed and controlled by the action of the pin and walls of the slot.

16. 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, spring contacts connected with said current varying device in the circuit to the solenoid, said contacts being normally closed and controlled by the action of the pin and walls of the slot, and wire connection between said contacts including resistances.

17. 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, spring contacts connected with said current varying device in the circuit to the solenoid, said contacts being normally closed and controlled by the action of the pin and walls of the slot.

18. 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, spring contacts connected with said current varying device in the circuit to the solenoid, said contacts being normally closed and controlled by the action of the pin and walls of the slot, and wire connection between said contacts including resistances.

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

FRANK E. HERDMAN.

Witnesses:

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C. D. HOYT.