

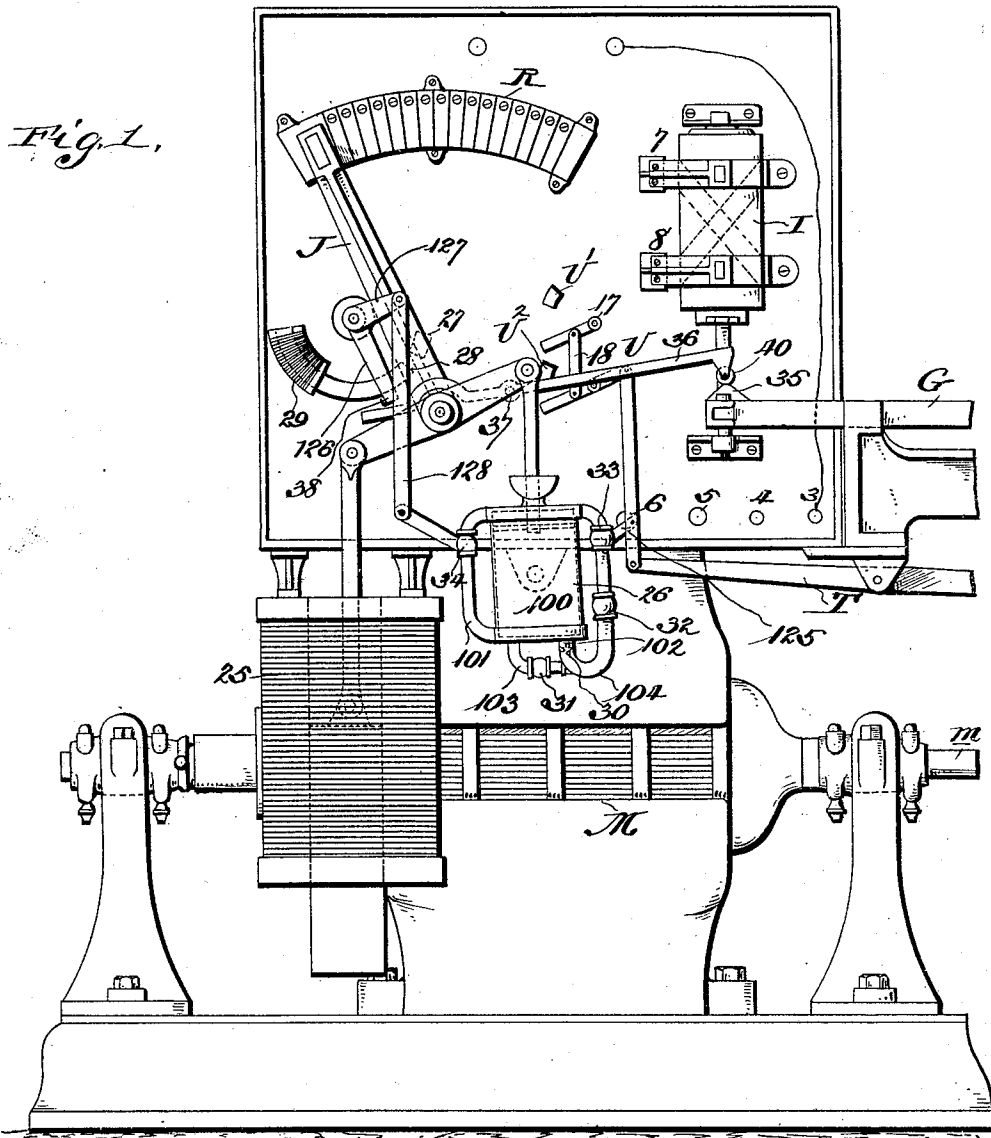
(No Model.)

2 Sheets—Sheet 1.

F. E. HERDMAN.
ELECTRIC MOTOR CONTROLLING APPARATUS.

No. 519,124.

Patented May 1, 1894.



WITNESSES:
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Frank A. Brown

INVENTOR:
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(No Model.)

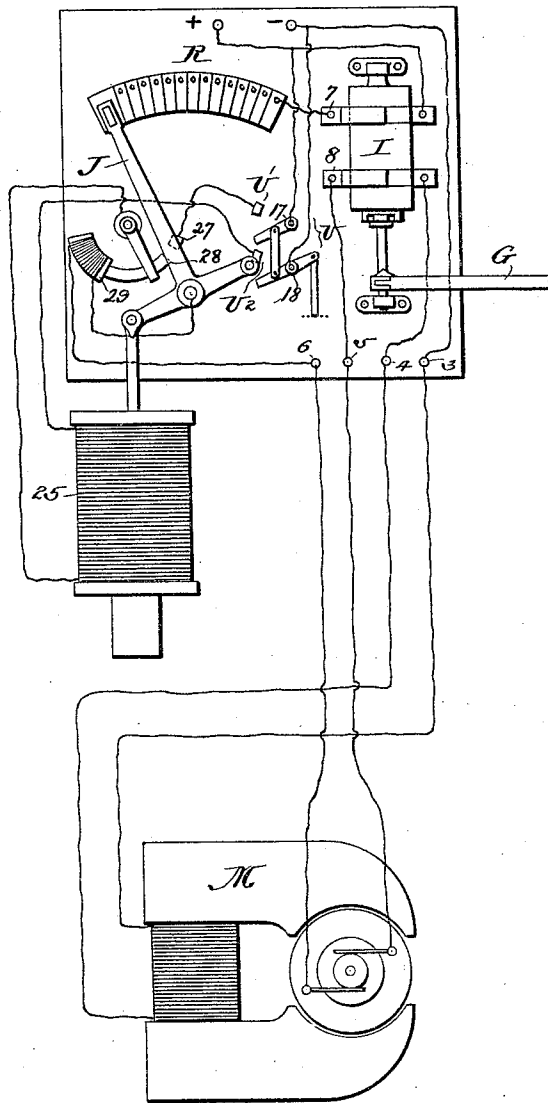
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Fig. 2.



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UNITED STATES PATENT OFFICE.

FRANK E. HERDMAN, OF INDIANAPOLIS, INDIANA.

ELECTRIC-MOTOR-CONTROLLING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 519,124, dated May 1, 1894.

Application filed October 20, 1892. Renewed January 11, 1894. Serial No. 496,550. (No model.)

To all whom it may concern:

Be it known that I, FRANK E. HERDMAN, a citizen of the United States, residing at Indianapolis, county of Marion, and State of Indiana, have invented a new and useful Improvement in Electric-Motor-Controlling Apparatus, 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 specifically to the combination and arrangement of devices whereby the admission of the current to the motor is controlled.

In the accompanying drawings Figure 1 represents a side elevation of my apparatus, sufficient to disclose my invention. Fig. 2 is a diagrammatic view showing the direction of the various circuits.

M is the motor provided with the shaft *m*, for the transmission of power, the field of the motor being in direct electrical connection with the source of current supply through binding posts 4 and 3, and the armature of the motor being in electrical connection with binding post 5, which is in electrical connection with brush 8 of the switch, I, the switch, I, being in electrical connection with both poles of current supply; and the resistances R are in electrical connection with brush 7 of switch, I, and said resistances, through arm, J, are in connection with the armature of the motor.

G is the operating arm for the switch, I.

U is a double pole switch, the contacts 17 and 18 of which are in electrical connection with the source of current supply. To the arm J is attached the core of a solenoid, 25, and dash pot, 26. The solenoid is in electrical connection with the contacts, U' and U² of switch U. In the electrical connection between contact, U' and the solenoid is the contact, 27, in contact with brush, 28. The electrical connection between arm J and the binding post 6 (by which resistances are connected with the armature of the motor) has in its circuit the solenoid 29, the core of which carries the brush 28. The dash pot 26 has a packed cylinder, 100, containing oil or other liquid or gas and has a pipe connection, 101, from its upper side to its lower side, so as to

allow the contents to pass from one side to the other of the piston.

To the bottom of the dash pot are connected two pipes, 102 and 103, one carrying the check valve 30 and the other carrying the small cock 31. In the main pipe, 104, to which these converge and which extends from one side of the piston to the other, is cock 32, and also cock, 33. It is desirable that when the current is cut off from the motor the arm J, should travel back over the resistances rapidly, and to accomplish this the oil must rapidly pass from the upper side of the piston to the under side, and to permit this, the check valve, 30, opens upward so that while arm J is returning it opens, allowing the oil rapidly to enter below the piston. The speed at which the oil passes can be controlled by means of the adjusting cock 32. As the passage of the arm, J, over the resistances, when the current is admitted, is desired to be slow, the passage of the oil from beneath the piston of the dash pot to the upper side must be slow. To accomplish this the check valve, 30, closes, and the cock 31 can be adjusted to control as desired. Link 125 connects cock 33 with the lever T, which lever is in connection with the operative mechanism. Cock 33 is so adjusted that when the lever T is in its central position this cock is closed. Either throw of the lever T from the center opens this cock. If the lever T be operated so that its switch connecting end is lowered, the switch U is brought in contact with contacts U' and U² and at the same time the cock 33 is opened. The circuit is now closed through the solenoid 25, which causes it to act forcing the arm over the resistances against the dash pot 26, and the speed of the movement of arm J is regulated by the adjustment of cock 31. When the lever T is operated to bring switch U to a central position, breaking the circuit with contacts U' U² thereby breaking the circuit of the solenoid 25,—the same movement of lever T brings the cock 33 to a central position. When in this position the oil located in the dash pot is prevented from passing to one side or the other, and the arm J is held in a fixed position. If the lever T be moved farther the cock 33 is operated, but in the opposite direction from that when the switch

is in contact with the contacts, U' and U². When open in this direction, the weight of the solenoid core draws the lever J back, the speed at which it is drawn back being governed by the speed at which the liquid in the dash pot is permitted to pass from one side to the other. In case the current passing through the main circuit becomes excessive and beyond what should be permitted to enter the motor, the weight of the core of the solenoid 29 is so adjusted that the strength of the solenoid at this time would become such as to draw said core, in thus drawing brush 28 off of contact with contact 27 and breaking the electrical circuit through the solenoid 25 and at the same time opening cock 34 to which said core is connected by lever 126, link 127 and bell crank 128, allowing the oil to pass freely from one side to the other of the dash pot. By this arrangement, if for any reason the current in the motor becomes too great the current is automatically cut off from the motor, thereby preventing damage to the motor. Under such conditions when the arm J is returned the current would be broken through the solenoid 29, thereby permitting the core to return, closing the circuit through the solenoid 25, which would again act and throw the arm J over the resistance contacts the same as before, so that as long as the lever is kept off of the center, and the current is too great for the armature this movement will be kept up. To obviate this to the operating bar G is attached an inclined plane 35, and upon this inclined plane rests a roller 40 having a lever 36 pivoted at 37, the bar end of this lever 36 coming in contact with projection 38 upon the core of the solenoid 29. When the solenoid 29 is operated and core drawn, the lever 36 would rise behind the projection 38 and thereby prevent the return of the core, and in consequence the circuit could not be again closed through the solenoid 25 until the operating bar G had been brought to the center (at which time the current will be cut out of the armature circuit) which would cause the active end of lever 36 to rise, freeing the projection 38 from said lever.

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

1. The combination with a source of current supply, and an electric motor of an armature current controlling switch, resistances in circuit with said switch, an arm in circuit with the armature of the motor and adapted to travel over said resistances, a solenoid, the core of which is connected to said arm, an independent solenoid controlling switch, electric connection between said switch and current supply and between said switch and solenoid and independent operating devices for each of said switches.

2. The combination with a source of current supply and an electric motor of an armature circuit controlling switch, resistances in circuit with said switch, an arm adapted to

travel over said resistances, electric connection between said arm and armature of motor, a solenoid through which said connection passes, the core of said solenoid carrying a brush, a solenoid the core of which is connected with said resistance arm, a solenoid controlling switch, electric connection between said switch and a contact as 27, and electrical connection between said solenoid and brush 28 carried by first mentioned solenoid core.

3. The combination with a source of current supply, and electric motor, a resistance interposed between the armature of the motor and source of current supply, a resistance arm in electric connection with said resistance and with said armature of the motor, a solenoid the core of which is connected with said arm, electrical connection between said solenoid and the source of current supply, a dash pot, the piston of which is connected with said resistance arm, a cylinder for said piston adapted to receive and contain a fluid and pipes leading from the lower to the upper portion of said cylinder.

4. The combination with a source of current supply, an electric motor, resistances interposed between the armature of the motor and source of current supply, a resistance arm in electrical connection with said resistance and with said armature of the motor, a solenoid the core of which is connected with said arm, electrical connection between said solenoid and the source of current supply, a dash pot, the piston of which is connected with said resistance arm, a cylinder for said piston adapted to receive and contain a fluid, a pipe leading from the upper to the lower portion of said cylinder, said pipe terminating in two branch pipes, cocks on said pipes, a cock on the main pipe and the controlling cock on the main pipe also.

5. The combination with a source of current supply and an electric motor of an armature current controlling switch, resistances in circuit with said switch, an arm in circuit with the armature of the motor and adapted to travel over said resistances, a solenoid the core of which is connected to said arm, an independent solenoid controlling switch, electric connection between said switch and current supply and between said switch and solenoid and independent operating devices for each of said switches, a dash pot connected to said resistance arm, a cylinder adapted to hold liquid, a pipe leading from the upper to the lower portion of said cylinder, a cock on said pipe, connection between said cock and the solenoid controlling the switch operating device.

6. The combination with a source of current supply and an electric motor of an armature circuit controlling switch, resistances in circuit with said switch, an arm adapted to travel over said resistances, in circuit with said switch, an arm adapted to travel over said resistances, electric connection be-

tween said arm and armature of motor, a solenoid through which said connection passes, the core of said solenoid carrying a brush, a solenoid, the core of which is connected
 5 with said resistance arm, a solenoid controlling switch electric connection between said switch and a contact as 27, and electrical connection between said solenoid and brush
 10 28 carried by first mentioned solenoid core, a dash pot, the piston of which is connected to the resistance arm, a cylinder adapted to contain liquid, a pipe connecting the bottom and top of said cylinder, a valve in said pipe, a lever connected to the core of the first mentioned solenoid and intermediate connection
 15 between said lever and said valve.

7. The combination with a source of current supply and an electric motor of an armature circuit controlling switch, resistances
 20 in circuit with said switch, an arm adapted to travel over said resistances, electric con-

nection between said arm and armature of motor, a solenoid through which said connection passes, the core of said solenoid carrying a brush, a solenoid the core of which is con- 25 nected with said resistance arm, a solenoid controlling switch, electric connection between said switch and a contact as 27, and electrical connection between said solenoid and brush 28 carried by first mentioned so- 30 lenoid core, an operating bar for operating the armature controlling switch, an inclined plane as 35, attached to said bar said inclined plane having a lever pivoted to a projection on the core of the first mentioned solenoid in 35 line with the end of said lever.

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

FRANK E. HERDMAN.

Witnesses:

W. V. MARTIN,
 JOSEPH COOK.