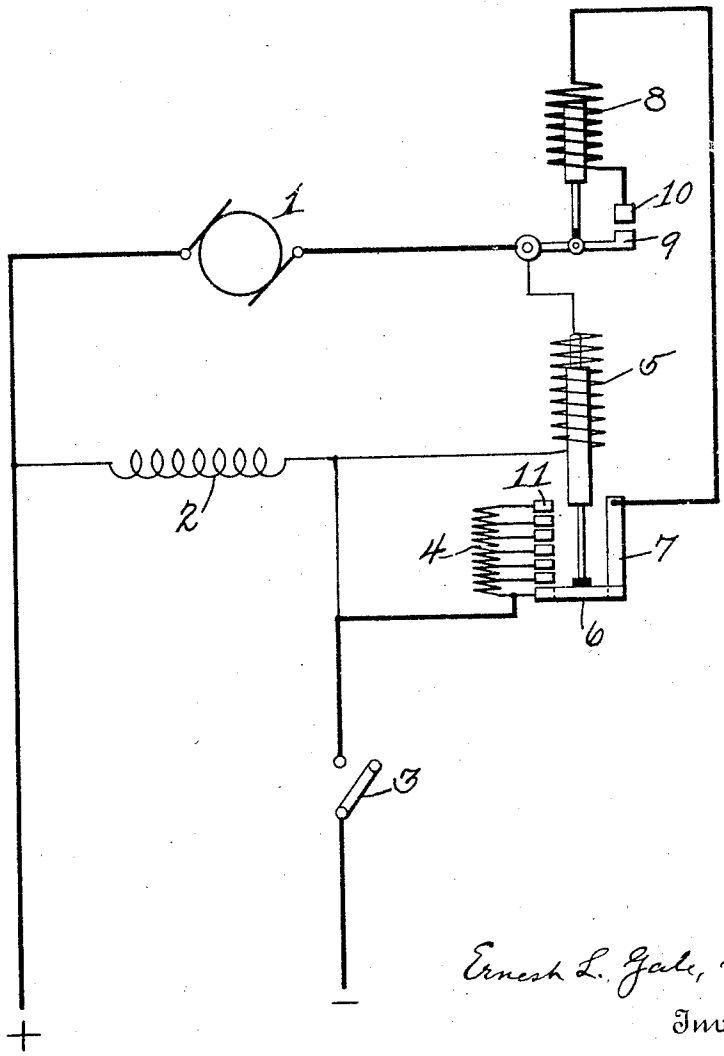
E. L. GALE, Sr.

CURRENT CONTROLLING APPARATUS.

APPLICATION FILED MAY 1, 1905.

1,048,450.

Patented Dec. 24, 1912.



Witnesses:

J. F. Rule.

Ernest L. Gale Jr.

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Inventor:

By L H Campbell

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UNITED STATES PATENT OFFICE.

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CURRENT-CONTROLLING APPARATUS.

1,048,450. Specification of Letters Patent. Patented Dec. 24, 1912.

Application filed May 1, 1905. Serial No. 258,378.

To all whom it may concern:

Be it known that I, ERNEST L. GALE, SR., a citizen of the United States, and a resident of Yonkers, in the county of Westchester and State of New York, have invented a new and useful Improvement in Current-Controlling Apparatus, of which the following is a specification.

My invention relates to apparatus for automatically starting and controlling electric motors.

Among the objects of the invention are to provide an improved and simplified construction which shall be reliable in operation and which will consume a minimum amount of current.

The accompanying drawing illustrates diagrammatically a system of electrical control embodying my invention. The controlling mechanism as shown is employed in connection with a direct current motor, comprising an armature 1 and a shunt field winding 2. Current is supplied from any suitable source through the positive and negative mains designated ± and =, respectively. A sectional starting resistance 4 is adapted to be connected in series with the motor armature before the latter is started and to be gradually cut out of the armature circuit as the motor accelerates. The starting resistance is controlled by means of an electromagnet 5, the core of which in connected to a sliding contact piece 6 in engagement with a contact bar 7 and contact pieces 11, the latter being connected to the starting resistance. An electromagnet comprising a magnet coil 8 in the main armature circuit and a switch lever 9 connected to the core of the magnet, is adapted to maintain the armature circuit closed after the magnet 5 has operated to close said circuit as presently described.

The parts are shown in the position assumed when the main line switch 3 is open. When the switch 3 is closed, the motor field 2 is connected directly across the mains. Circuit is also established through the magnet coil 5 in series with the motor armature. The magnet 5 being energized, lifts its core and moves the contact bar 6 upward, thereby introducing the starting resistance 4 in the armature circuit. The core of the magnet 5 strikes the switch lever 9 and moves it into engagement with the stationary contact 10, when all of the starting resistance is in the circuit. The switch lever 9 being raised, completes the armature circuit and permits the motor to start. As the motor accelerates the counterelectromotive force rises, resulting in a corresponding reduction in the potential across the magnet 5 so that the latter is gradually weakened permitting the retarded downward movement of the contact bar 6 to gradually cut out the starting resistance. The motor is thus permitted to run up to full speed. After the switch 9 has been closed by the core of the magnet 5, the coil 8 serves as a holding magnet to maintain the motor circuit until the current supply has been again cut off. It will be observed that after the starting resistance has been cut out of the armature circuit as has been explained, the magnet coil 5 will be practically short-circuited as the resistance of the magnet coil 8 is very low as compared with the magnet coil 5. The latter therefore consumes only a negligible quantity of current during the normal running of the motor.

It will be understood that various changes might be made in the particular arrangement and construction of the controlling apparatus herein shown, and I wish therefore not to be limited to the particular arrangement shown and disclosed.

What I claim is:—

1. In an automatic starter for electric motors, the combination with the motor circuits, of a resistance arranged in the armature circuit thereof and having a series of contact surfaces, a contact member movable in sliding engagement with said surfaces in two directions to vary the resistance in said circuit, said contact member being normally in running position, electro-magnetic means arranged to move said member into the starting position when the line circuit is closed, a normally open circuit-closing device movable by said means to include said member in the armature circuit when said member reaches the starting position, and an electro-magnet in the main armature circuit for holding said circuit-closing device closed while the motor is running.

2. In an automatic starter for electric motors, the combination with the motor circuits, of a resistance arranged in the armature circuit thereof and having a series of contact surfaces, a contact member movable in sliding engagement with said surfaces in

two directions to vary the resistance in said circuit, said contact member being normally in running position, electro-magnetic means arranged to move said member into the starting position when the line circuit is closed, a normally open circuit closing device movable by said means to include said member in the armature circuit when said member reaches the starting position, and electro-magnetic holding means for keeping said circuit-closing device closed while the motor is running under normal conditions.

3. In an automatic starter for electric motors, the combination with the motor circuits, of a resistance arranged in the armature circuit thereof and having a series of contact surfaces, a contact member movable in sliding engagement with said surfaces in two directions to vary the resistance in said circuit, said contact member being normally in running position, electro-magnetic means arranged to move said member into the starting position when the line circuit is closed, a normally open circuit-closing device movable by said means to include said member in the armature circuit when said member reaches the starting position, an electro-magnetic holding means for keeping said circuit-closing device closed while the motor is running under normal conditions, said circuit closing device being arranged to open automatically when the electro-magnetic holding device is deënergized.

4. In motor-controlling apparatus, the combination with an electro-magnet, of starting resistance, resistance varying apparatus operatively connected to said electro-magnet, an electric switch movable to closed position by said electro-magnet, and an additional electro-magnet for holding said switch closed.

5. In a self-starter, the combination with a controlling circuit including an electro-magnet winding, of a starting resistance, a resistance varying member, a switch operated by said electro-magnet when said resistance varying member reaches starting position, and a magnet in the main circuit for holding said switch closed while said starting resistance is being cut out and during the running of the motor.

6. In a self-starter for electric motors, the combination with starting resistance, of an electro-magnet in the circuit in parallel to the starting resistance, a resistance-varying member operated by said electro-magnet to control said starting resistance, a switch in the main circuit closed by said electro-magnet when the resistance-varying member is in starting position, and a holding magnet for said switch and in the main circuit.

7. In a self-starter for electric motors, the combination with a starting resistance initially out of circuit, of an electro-magnet, a resistance varying member operated by said electro-magnet, a switch in the main circuit operated by said electro-magnet when the resistance-varying member is in starting position, and a magnet in the main circuit for holding said switch closed.

8. In a self-starter for electric motors, the combination with a starting resistance initially out of circuit, of resistance-varying apparatus, a controlling circuit including an electro-magnet for operating said resistance-varying apparatus, an automatic switch operated by said electro-magnet to close the main circuit through said starting resistance in a circuit parallel to said controlling circuit, and an additional electro-magnet in the main circuit for holding said automatic switch closed during the running of the motor.

9. In a self-starter for electric motors, the combination with a starting resistance initially out of circuit, of a series of contacts connected to said starting resistance at intervals, a switch member in sliding engagement with said contacts, an electro-magnet for operating said member to insert the starting resistance and retard the movement of said member when the resistance is being cut out again, a switch operated by said electro-magnet when said member reaches the starting position for closing the main circuit through said starting resistance, the circuit through said electro-magnet being then in parallel to the starting resistance, and an additional electro-magnet in the main circuit for holding said switch closed during the running of the motor.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

ERNEST L. GALE, Sr.

Witnesses:

CHARLES M. NISSEN,
EDWIN C. MOTT.