

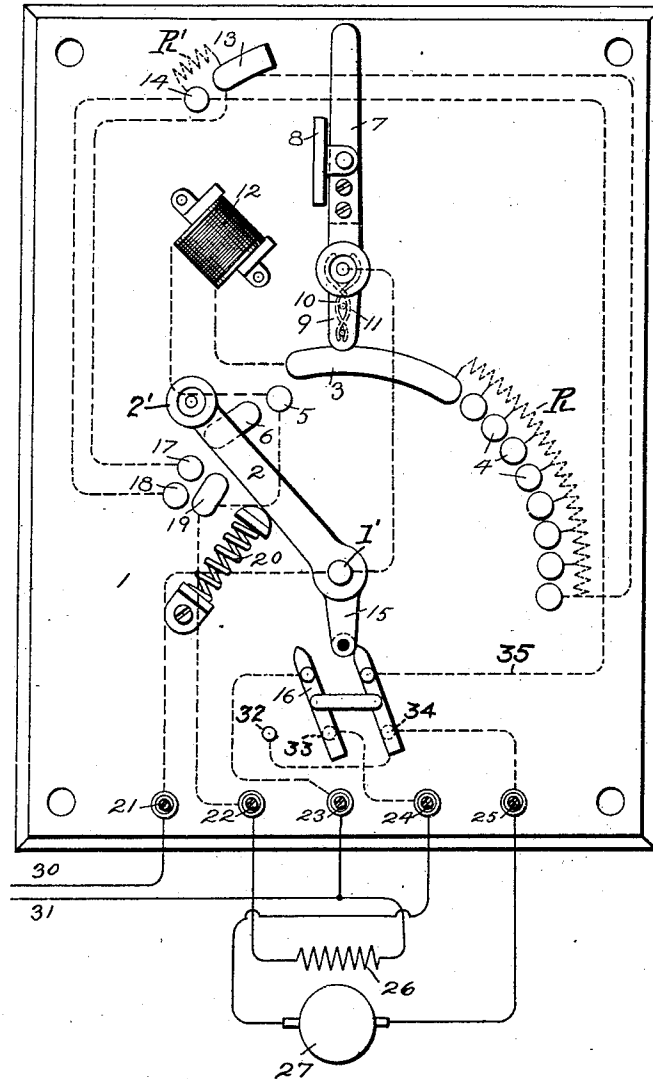
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P. H. ZIMMER.
RHEOSTAT.

APPLICATION FILED NOV. 16, 1905.

917,700.

Patented Apr. 6, 1909.



WITNESSES.

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UNITED STATES PATENT OFFICE.

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RHEOSTAT.

No. 917,700.

Specification of Letters Patent.

Patented April 6, 1909.

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To all whom it may concern:

Be it known that I, PAUL H. ZIMMER, a citizen of the United States, residing at Schenectady, county of Schenectady, and State of New York, have invented certain new and useful Improvements in Rheostats, of which the following is a specification.

This invention relates to rheostats, and its object is to provide a simple and inexpensive device for use both in starting and regulating the speed of an electric motor.

My improved rheostat is designed particularly for use with small shunt-wound motors, but it will be obvious that its application is not limited to motors of any particular size or type.

In carrying out my invention I provide a compound motor starting and speed regulating rheostat in which both the starting and regulating mechanisms are operated by a single handle. A no-voltage release magnet holds the parts in running position and the connections are such that if for any reason current is cut off from the motor, the starting mechanism is returned to the "off" or starting position. The starting of the motor is accomplished by rotating one of the controlling members in one direction while the speed is increased by rotating the other member in the opposite direction.

The parts are so arranged as to prevent the motor from being started on a weakened field while necessitating the use of only a single operating handle.

Other objects of my invention will appear in the course of the following specification and the novel features thereof will be definitely indicated in the claims appended hereto.

In the accompanying drawing which shows the preferred embodiment of my invention, 1 indicates a base-plate of soapstone or other insulating material preferably forming the cover for the box which contains the resistance. A switch-arm 2 having an operating handle 2' is pivoted at 1' on the base-plate and carries a brush adapted to make contact with a segment 3 and with a plurality of contact studs 4 arranged in the arc of a circle of which the pivot 1' is the center. These studs are connected to a resistance R in the usual way, as shown. A contact stud 5 is mounted on the base-plate to the left of the segment 3 and so close to it that the brush carried by the switch-arm 2 may bridge the

segment and stud. Adjacent to stud 5 is a dead contact 6 which supports switch-arm 2 when in the "off" position. Pivottally mounted on the base-plate above segment 3 is a switch-arm 7 carrying an armature 8. Arm 7 is provided with an extension 9 on the opposite side of its pivot adapted to be engaged by the switch-arm 2 to turn the arm 7 on its pivot. The springs 10 and 11 are provided as shown, to normally hold arm 7 in the position illustrated.

An electromagnet 12 having its coils connected in circuit between the segment 3 and stud 5 is mounted on the base plate 1 to cooperate with armature 8 when arm 7 is moved by the arm 2 to the left or in a counterclockwise direction into engagement with the magnet 12. In the path of the switch-arm 7, when moved to the position in which armature 8 engages the poles of the no-voltage or retaining magnet 12, are two contacts 13 and 14 connected by a resistance R' as shown. The switch-arm 2 is provided with a projection 15 carrying an insulated pin which, when the switch-arm 2 is moved to the left or in a counterclockwise direction from the position shown in the drawing, engages one of the arms of the pole changer 16 and causes the arms of the pole changer to turn on their pivots to reverse the connections leading therefrom, as will be readily understood. When the switch arm 2 has been turned to the left from the position shown and is released from the hand of the operator, it is returned to its "off" position by the coiled spring 20 mounted on the base.

At the bottom of the base-plate are five binding posts 21 to 25 inclusive, and the mains 30 and 31 from a source of supply of electric energy are connected to binding posts 21 and 23, respectively. Binding post 21 is connected to the pivotal points of switch-arms 2 and 7, and post 23 is connected to one blade of the pole-changer 16, the other blade of which is connected to the contact stud 14. The field 26 of the motor is connected between binding posts 23 and 22, the latter of which is connected to contact 19 and stud 5. The armature 27 of the motor is connected between binding posts 24 and 25, which are connected to the pole-changer contacts 33 and 34 respectively. Contact 32 is likewise connected to contact 34, as shown.

The operation of my improved rheostat, as thus constructed, is as follows: When the arms are in the "off" position illustrated in the drawing and it is desired to start the motor, switch-arm 2 is moved by the handle 2' to the right in a clockwise direction. When the arm 2 engages stud 5, the field of the motor is energized, the circuit being from main 30 to binding post 21, to switch-arm 2, stud 5, contact 19, binding post 22, field 26, to main 31. Continuing the movement, the arm leaves stud 5 and bears on the segment 3, thus connecting the coils of the retaining magnet 12 in series with the motor field. On further movement, switch-arm 2 engages the extension 9 and turns switch-arm 7 on its pivot to the left or in a counterclockwise direction to close the armature circuit. In order not to endanger the coils of the motor armature by the admission of too large a current thereto at starting, the circuit through the armature is first closed through a resistance R' , and this resistance afterward cut out. When switch-arm 2 has moved arm 7 into engagement with contact 13, the armature circuit is closed from main 30 to post 21, arm 7, contact 13, through the resistance R' to contact 14, through conductor 35 to the right hand blade of the pole-changer 16, post 25, armature 27, post 24, through the left hand blade of the pole-changer to post 23, and then to main 31. The motor now starts and the further movement of the switch-arm 2 moves arm 7 on to contact 14 and cuts out the resistance R' in the armature circuit, thus admitting the full running current to the armature. In this position arm 7 is held by the retaining magnet 12. The motor now being running at normal speed, further movement of the switch arm 2 to the right carries it past the extension 9 and over the contacts 4 cutting the resistance R in the field circuit to increase the motor speed.

To stop the motor, arm 2 is turned to the left until it reaches the position in which it bridges segment 3 and stud 5. In this position, magnet 12 is short-circuited and releases arm 7, which is returned to its normal position by the springs 10 and 11, thus opening the armature circuit. A further movement of arm 2 to the left, carrying it off of stud 5 and on to dead contact 6, opens the field circuit after the armature circuit has been opened. When this occurs, the field 26 of the motor is short-circuited through the motor armature, the armature resistance, the field resistance and the coils of the electromagnet 12, to prevent damage to the parts of the motor and rheostat due to the inductive discharge on breaking the field circuit, the path being from post 22, through field 26 to post 23, pole-changer 16, post 24, armature 27, post 25, pole-changer 16, contact 14, through the resistance R' to contact 13,

through the resistance R to segment 3, electromagnet 12, contacts 5 and 19, back to post 22.

If, while the motor is running, the voltage on the lines decreases abnormally, or if the circuit is broken magnet 12 releases switch-arm 7, which is thrown to the "off" position by spring 10, thus opening the armature circuit.

To again start the motor, switch-arm 2 must be brought around to the position illustrated, in which all of the resistance R is cut out of the field circuit before the motor can be started, so that it is impossible to start up on a weak field.

If it is desired to run the motor in the opposite direction, switch-arm 2 is moved to the left from the position shown in the drawings. This movement operates the pole-changer 16 into engagement with contacts 32 and 33 to reverse the armature connections, and brings switch-arm 2 into engagement with contacts 17 and 19. The armature circuit is then closed as follows: from main 30 to arm 2, contact 17, resistance R' , conductor 35, right hand blade of pole changer 16, contact 33, armature 27, contact 34, contact 32, left hand blade of pole changer 16, post 23, and back to main 31. The armature circuit is then closed in a direction opposite to that established on a movement of the switch-arm to the right, and contact 19 closes the field circuit. Further movement brings the switch-arm into engagement with contact 18, thus cutting out the armature resistance R' . The motor is thus, by a single device, brought up to speed without endangering the armature coils by the admission of full running current thereto immediately at starting and, when properly started, this speed may be varied by regulating the field strength.

In the rheostat illustrated and described herein, only one step of resistance in the armature circuit is shown, and no means are provided for regulating the speed of the motor when running backward. However, it is obvious that modifications in these and other respects can be made without departing from the spirit of my invention, and I aim to cover all such modifications in the claims appended hereto.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. A controlling device for electric motors comprising starting and speed regulating mechanism, a no-voltage magnet, and an operating handle arranged to start the motor, regulate its speed, and bring the starting mechanism under the influence of the no-voltage magnet.

2. A controlling device for electric motors comprising starting and speed regulating mechanism, a no-voltage magnet and an operating handle arranged to move the starting mechanism into running position so as to be

held by the no-voltage magnet and then to regulate the speed.

3. A controlling device for electric motors comprising starting and speed regulating mechanisms and an operating handle therefor arranged to move one of said mechanisms in one direction to start the motor and the other in the opposite direction to increase the speed.

4. A controlling device for electric motors comprising pivoted resistance varying members, a no-voltage magnet, and connections whereby one of said members rotates the other member to vary its resistance until it is held by the no-voltage magnet and is then free to be rotated to vary its own resistance.

5. A controlling device for electric motors comprising armature and field resistances, pivoted controlling members therefor, a retaining magnet, and connections whereby one of said members rotates the other member in one direction to vary the armature resistance until it engages the retaining magnet and said first member is then free to be rotated in the opposite direction to vary the field resistance.

6. A controlling device for electric motors comprising armature and field resistances, pivoted controlling members therefor, and connections whereby one of said members rotates the other member in one direction to cut out armature resistance and is then free to be rotated in the opposite direction to insert field resistance.

7. A device for starting and regulating the speed of electric motors comprising a starting resistance for the motor armature circuit, a pivoted arm for cutting said resistance out of circuit, a speed regulating resistance for the motor, a second pivoted arm provided with an operating handle for varying said speed regulating resistance, and means operatively connecting the two arms together so that by moving the operating handle the starting arm is rotated in one direction to start the motor and the speed regulating arm is then free to be rotated in the opposite direction to increase the speed of the motor.

8. A device for starting and regulating the speed of electric motors comprising a starting resistance for the motor armature circuit, a pivoted arm for cutting said resistance out of circuit, a speed regulating resistance for the motor, a second pivoted arm provided with an operating handle for varying said regulating resistance, and a projection on one of said arms arranged to be engaged by the other arm so that by moving the operating handle the starting arm is rotated in one direction to start the motor and the speed regulating arm is then free to be rotated in the opposite direction to increase the speed of the motor.

9. In combination, a supply circuit, a motor armature connected to said supply circuit, a motor field connected to said sup-

ply circuit, a resistance connected in said field circuit, a second resistance connected in said armature circuit, a movable member for controlling said field circuit and a second movable member for controlling said armature circuit, said second member movable by the first member in one direction to remove the resistance controlled thereby from the armature circuit, and said first member movable in an opposite direction to insert the resistance controlled thereby in the field circuit.

10. In combination, a supply circuit, a motor armature connected in said supply circuit, a motor field connected in said supply circuit, a resistance connected in said field circuit, a second resistance connected in said armature circuit, a movable member for controlling said field resistance and a second movable member for controlling said armature resistance, said second member movable in one direction by the first member to remove said armature resistance from circuit and said first member movable in an opposite direction to insert said field resistance in circuit, means tending to keep said second member in its initial position, and a magnet for retaining said second member in a predetermined position.

11. In combination, a supply circuit, a motor armature connected in said supply circuit, a motor field connected in said supply circuit, a resistance connected in said field circuit, a second resistance connected in said armature circuit, a movable member for controlling said field resistance, a second movable member for controlling said armature resistance, said second member movable in one direction by the first member to remove said armature resistance from circuit, and said first member movable in an opposite direction to insert said field resistance in circuit, a spring tending to keep said second member in its initial position, and a magnet for retaining said second member in a predetermined position.

12. A controlling device for electric motors comprising starting mechanism, a no-voltage magnet for retaining the same in running position, speed control mechanism and connections whereby the retaining magnet is short circuited when the speed control mechanism reaches a predetermined position.

13. In combination, a movable member, a resistance controlled thereby, a second movable member, a resistance controlled thereby, a magnet to retain said second movable member in a predetermined position, means for causing said members to move together until said second member is grasped by said magnet and thereafter permitting said first member to move independently of said second member.

14. In combination, a movable member, a resistance controlled thereby, a second movable member, a resistance controlled thereby,

means tending to keep said second movable member in its initial position, a magnet for retaining said second member in a predetermined position, and means whereby said first member will move said second member to a position to be grasped by said magnet and thereafter operate independently of said second member.

15. A rheostat having means for closing circuit to the armature of an electric motor, a retaining device therefor, a movable switch-arm for regulating the resistance in the motor field circuit, and means controlled by the position of said arm for rendering said retaining device ineffective.

16. A rheostat having means for closing circuit to the armature of an electric motor, an electromagnetic retaining device therefor, a movable switch-arm for regulating the resistance in the motor circuit, and means dependent upon the position of said arm for short-circuiting said electromagnetic retaining device.

17. A rheostat having means for closing circuit to the armature of an electric motor, an electromagnetic retaining device therefor, a movable switch-arm for regulating the resistance in the circuit of the motor field, and means dependent upon the position of said arm for rendering said retaining device ineffective.

18. A rheostat having a switch-arm movable over contacts to vary the resistance of the armature circuit of an electric motor, a retaining device therefor, a switch-arm movable over contacts to vary the resistance of the field circuit of the motor, and means controlled by the position of said last-mentioned arm for rendering said retaining device ineffective.

19. A rheostat having a pivoted switch-arm movable over contacts to vary the resistance of the armature circuit of an electric motor, an electromagnetic retaining device therefor, an independently-pivoted switch-arm movable over contacts to vary the resistance of the field circuit of the motor, and means dependent upon the position of said last-mentioned arm for short-circuiting said electromagnetic retaining device.

20. A rheostat having two switch-arms movable over contacts to vary the resistance in the motor circuits, means whereby movement of the first arm moves the second arm over the contacts with which it cooperates, a retaining device for the second arm, and means controlled by the return of the first arm to the "off" position for releasing the second arm.

21. A rheostat having two independently-pivoted switch-arms movable over contacts to vary the resistance in the motor circuits, means whereby the first arm moves the second arm over the contact with which it cooper-

ates, an electromagnetic retaining device for the second arm, and means whereby returning the first arm to the "off" position renders said electromagnetic retaining device ineffective.

22. A rheostat having two independently pivoted switch-arms movable over contacts to vary the resistance in the field and armature circuits respectively of an electric motor, a part on the arm governing the armature resistance which is engaged by the other arm during a portion of its movement to move said arm over the contacts with which it cooperates, and an electromagnetic retaining device for said arm governing the armature resistance to hold it at the limit of its travel.

23. A rheostat having two switch-arms independently movable to vary the resistance in the field and armature circuits respectively of an electric motor, and means whereby the motor field is short-circuited through the armature and the field and armature resistance when the two switch-arms are in the "off" position.

24. A rheostat having two switch-arms movable over contacts to vary the resistance in the field and armature circuits respectively of an electric motor, means whereby movement of the arm governing the field resistance moves the other arm to vary the armature resistance, and means constructed and arranged to short-circuit the motor field through the armature and the field and armature resistance when the switch-arm governing the field resistance is in the "off" position.

25. A rheostat having two switch-arms movable over contacts to vary the resistance in the field and armature circuits respectively of an electric motor, means whereby movement of the arm governing the field resistance moves the other arm to cut resistance out of the armature circuit, and means controlled by the return movement of the arm governing the field resistance to the "off" position whereby the other arm is moved to the "off" position to open the armature circuit before opening the field circuit.

26. A rheostat having two switch-arms movable over contacts to vary the resistance in the field and armature circuits respectively of an electric motor, means whereby movement of the arm governing the field resistance moves the other arm over the contacts with which it cooperates, means whereby moving the arm governing the field resistance to open the field circuit opens the armature circuit before the field circuit is opened, and means whereby the field is short-circuited through a resistance when said arm is in the "off" position.

27. In combination, a supply-circuit, a motor-armature connected in said supply-circuit, a motor-field connected in said sup-

ply-circuit, a resistance connected in said
field-circuit, a second resistance connected in
said armature-circuit, a movable member
movable in one direction to remove said field
5 resistance from circuit, a second movable
member movable in an opposite direction to
insert said armature resistance in circuit, and
a magnet connected in said supply-circuit for

retaining said second movable member in a
predetermined position.

In witness whereof, I have hereunto set
my hand this 15th day of November, 1905.

PAUL H. ZIMMER.

Witnesses:

BENJAMIN B. HULL,
HELEN ORFORD.