No. 894,565. PATENTED JULY 28, 1908.

P. H. ZIMMER.

RHEOSTAT.

APPLICATION FILED DEC. 26, 1907.

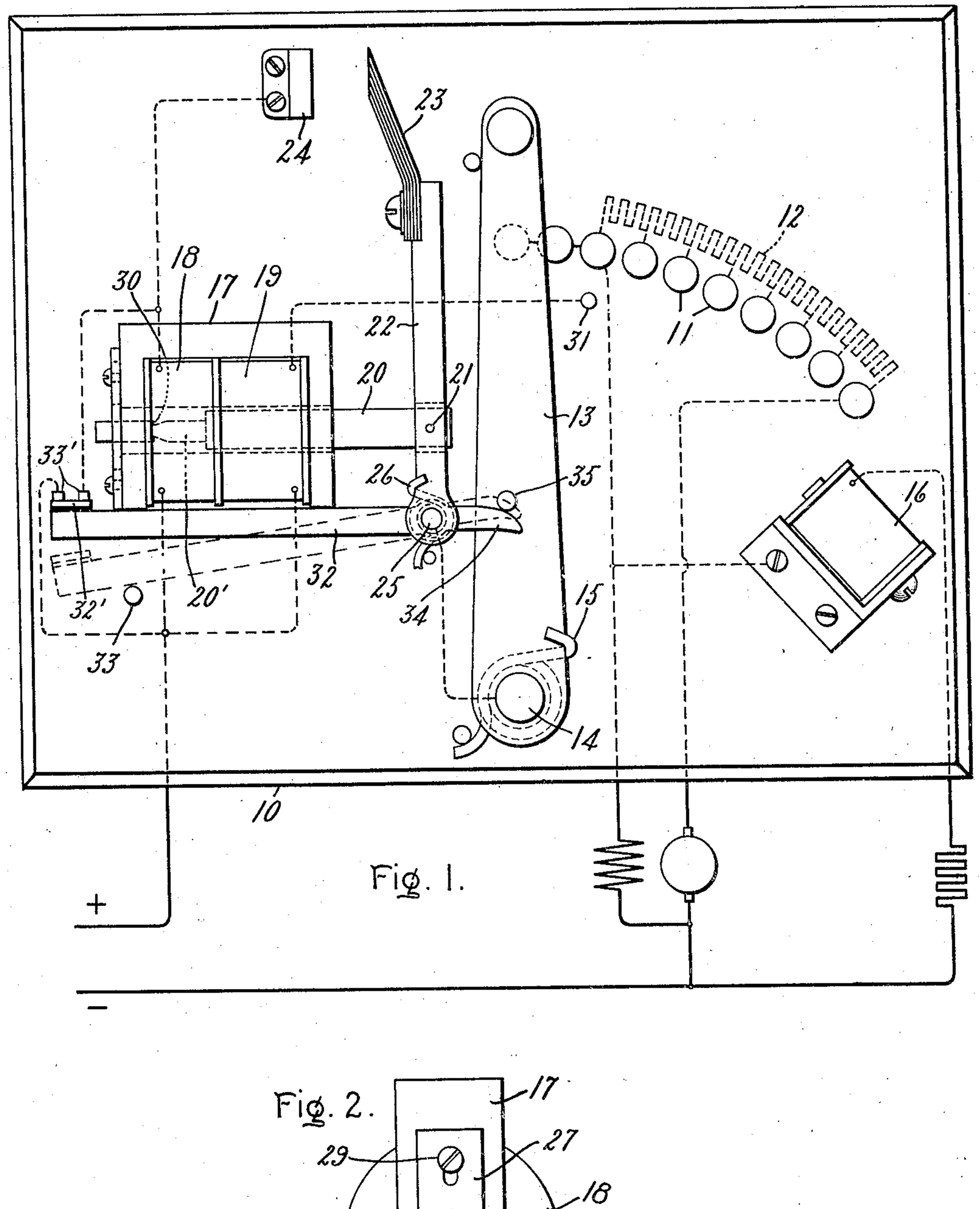

Fig. 1.

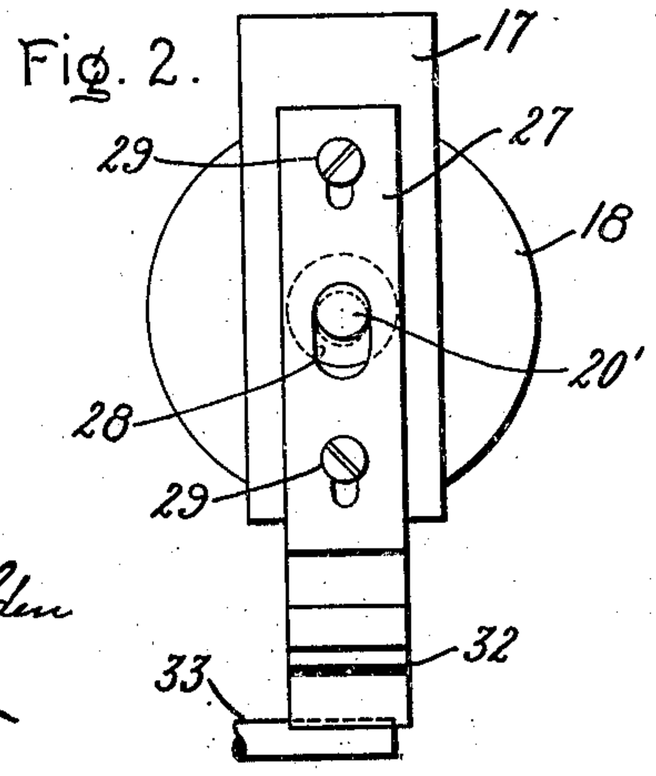

Fig. 2.

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UNITED STATES PATENT OFFICE.

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RHEOSTAT.

No. 894,565. Specification of Letters Patent. Patented July 28, 1908.

Application filed December 26, 1907. Serial No. 408,145.

To all whom it may concern:

Be it known that I, PAUL H. ZIMMER, a citizen of the United States, residing at Schenectady, in the 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 devices for controlling motor circuits and has for its object the provision of a device of this character, which cannot be destroyed either by the carelessness of the operator or upon the occurrence of abnormal conditions on the circuits, and which at the same time is simple in construction in addition to being extremely reliable, efficient and durable.

My invention relates more specifically to motor starting rheostats. In devices of this character it is common to start the motor by moving the arm over the contact studs until the no-voltage magnet is reached, the circuit being closed upon the first contact stud. Upon failure of voltage the arm returns to starting position and the current will be opened upon the first stud thereby resulting in an injury to the contact studs.

One of the objects of my invention is to provide in combination with an electromagnetic switch for closing the main circuit, means for opening said switch upon the occurrence of overload conditions. I also make arrangements whereby the switch may be automatically opened on the return of the controlling arm to starting position.

In the accompanying drawings in which I have shown my invention embodied in concrete form, Figure 1 is a plan view of the rheostat containing my improvements, and showing the circuit connections, and Fig. 2 is a detail of the latching mechanism.

Referring to the drawings, 10 is the usual insulating base of slate or soapstone provided with a series of contact studs 11 forming the terminals of starting resistance 12. A controlling arm 13 is pivoted at 14 so that its free end passes over the contact studs to cut out resistance in the usual way. The arm is biased to the starting position shown in the drawing by means of a spring 15, while the no-voltage magnet 16 retains the arm in running position. An electromagnetic device composed of a magnetic frame 17 and a pair of windings 18 and 19 is arranged upon the slate base in a convenient position. The windings are preferably of the solenoid type arranged so as to have a common core or plunger 20 movable through both of said windings. The core 20 is pivoted at 21 to a switch arm 22 having a laminated contact 23 engaging the fixed contact 24 and pivoted to the slate base at 25. The switch arm 22 is biased to an open position by means of a spring 26 and is closed by means of the control of the coils upon the core 20. This core is provided with a reduced extension 20′ of non-magnetic material arranged so as to provide an engaging shoulder for the latch 27 secured in sliding engagement with the end of the magnetic frame 17. This latch is provided with a slot 28 through which the end of the core projects and is secured in place and guided by means of screws 29 working in slots in the latch.

When the switch is closed the core 20 will be drawn in until the shoulder 30 passes the latch 27. The latter then drops and holds the switch closed. The winding 19 is only intended to be in circuit for a short time when the rheostat is being started in order to close the switch 22 and to this end one of its terminals is connected with a stud 31, which is engaged by the starting arm. The other winding 18 is intended to remain in the circuit all of the time, and one of its terminals is therefore connected with the contact 24 so as to be in series with the switch 22. An armature 32 is pivoted at 25 so as to coöperate with the pole pieces of the magnetic field 17. This armature will normally be held by gravity in contact with the stop pin 33 but when the magnetic device is sufficiently energized to attract it the end of the armature will engage the latch 27 so as to raise it and release the switch arm 22. Armature 32 is provided with a bridging contact 32′ adapted to bridge contacts 33′ when the armature is raised and short-circuit the winding 18 as shown. Normally the magnetic field of the winding 18 will not be sufficiently strong to attract the armature 32 but when the iron core 20 enters the winding the magnetic field will be so improved that magnet 18 will be able to raise the armature and trip the latch upon the occurrence of overload conditions. The armature 32 has a projecting portion 34 which is adapted to be engaged by the projection 35 on the starting

arm so that when the latter returns to its starting position it will engage the armature and raise it so as to trip the latch and release the arm 22.

The arrangement of circuits and the mode of operation are as follows: When it is desired to start the motor, the starting arm is moved to the right, and in so doing stud 31 is engaged so that current passes from the positive main through winding 19 thence to stud 31, the controlling arm and back to the negative main. The energizing of the winding 19 causes the switch arm to close upon the contact 24 and the latch 27 locks it closed. The arm is moved off of the stud 31 but the switch remains closed and the winding 18 is energized through the closing of the switch 22. The arm is then held in running position by the no-voltage magnet in the usual way. The core 20 being inserted in the winding 19, upon the occurrence of overload the armature 32 will be drawn up and the switch arm 22 released to open the circuit. Upon failure of voltage the controlling arm will return to the starting position and open the main circuit by tripping latch 27 and short-circuiting coil 18. In this way the main circuit is always opened and closed by means of the switch 22, which is constructed for this purpose and has proper contacting surfaces. The arrangement is exceedingly simple and is at the same time positive in its action.

While I have described a specific mechanism for bringing about the results herein described, it should be understood that I do not limit my invention to the particular arrangement of parts and mode of operation disclosed except in so far as it is limited by the scope of the claims annexed hereto.

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

1. A starting rheostat comprising a resistance varying arm biased to starting position, a switch in series therewith, an electromagnetic device for closing said switch when the arm is moved towards running position, and means controlled by said electromagnetic device for opening said switch upon the occurrence of overload conditions.

2. A starting rheostat comprising a resistance varying arm, a switch in series therewith biased to open position, an electromagnetic device for closing said switch when the arm is moved towards running position, a locking device for holding said switch in closed position, and means controlled by said electromagnetic device for releasing said switch upon the occurrence of overload conditions.

3. A starting rheostat comprising a resistance varying arm biased to starting position, a switch in series therewith, an electromagnetic device for closing said switch when the arm is moved towards running position, and means operating upon the closing of said switch for rendering said electromagnetic device effective to open the switch upon the occurrence of overload conditions.

4. A starting rheostat comprising a resistance varying arm, a switch in series therewith biased to open position, an electromagnetic device for closing said switch when thie arm is moved towards running position, a locking device for holding said switch in closed position, and means operating upon the closing of said switch for rendering said electromagnetic device effective to release said switch upon the occurrence of overload conditions.

5. A starting rheostat comprising a resistance varying arm biased to starting position, a switch in series therewith, an electromagnetic device for closing said switch when the arm is moved towards running position, and means operating upon the closing of said switch for arranging the magnetic field of said device to render it effective to open the switch upon the occurrence of overload conditions.

6. A starting rheostat comprising a resistance varying arm, a switch in series therewith biased to open position, an electromagnetic device for closing said switch when the arm is moved towards running position, a locking device for holding said switch in closed position, and means operating upon the closing of said switch for arranging the magnetic field of said electromagnetic device to render it effective to release said switch upon the occurrence of overload conditions.

7. A starting rheostat comprising a resistance varying arm biased to starting position, a switch in series therewith, an electromagnetic device for closing said switch when the arm is moved towards running position, means operating upon the closing of said switch for arranging the magnetic field of said device to render it effective to open the switch upon the occurrence of overload conditions, and means for reducing the energy of said electromagnetic device before the arm reaches running position.

8. A starting rheostat comprising a resistance varying arm biased to starting position, a switch in series therewith, an electromagnetic device having a double winding and a common core for closing said switch when the arm is moved towards running position, means for deënergizing one of said windings before the arm reaches running position, and means operating upon the closing of said switch for shifting the core into said second winding to strengthen its magnetic field and render it effective to open the switch upon the occurrence of overload conditions.

9. The combination with the starting rheostat, of a switch in series therewith, an electromagnetic device for closing the same, a locking device for holding the switch in closed position, means controlled by said

electromagnetic devices for releasing said switch upon the occurrence of overload conditions, and means whereby said electromagnetic device is rendered responsive to overload conditions only after the switch is closed.

10. The combination with a starting rheostat provided with no-voltage release features, of a switch in series therewith, an electromagnetic device for closing the same upon the initial movement of the rheostat arm, a locking device for holding the switch in closed position, means controlled by said electromagnetic device for releasing said switch upon the occurrence of overload conditions, means for releasing said switch upon the return of the rheostat arm towards starting position, and means whereby said electromagnetic device is rendered responsive to overload conditions only after the switch is closed.

11. The combination with a starting rheostat having no-voltage release features, of a switch in series therewith and an electromagnetic device for closing the same comprising a pair of windings, a common core movable into one of said windings upon the closing of said switch to strengthen its magnetic field, means for energizing and deënergizing the other of said windings when the starting rheostat is moved towards running position, and means controlled by said first winding for opening said switch upon the occurrence of overload conditions.

12. The combination with a starting rheostat having no-voltage release features, of a switch in series therewith biased to open position and an electromagnetic device for closing the same, comprising a pair of windings, a common core movable into one of said windings upon the closing of said switch to strengthen its magnetic field, a locking device for holding said switch in closed position, means controlled by said winding for releasing said switch upon the occurrence of overload conditions, and means for energizing and deënergizing the other of said windings when the starting rheostat is moved towards running position.

13. A starting rheostat comprising a resistance varying arm biased to starting position, a switch in series therewith, an electromagnetic device for closing said switch when the arm is moved towards running position, means controlled by said electromagnetic device for opening said switch upon the occurrence of overload conditions, and means for opening said switch upon the return of the arm to starting position.

14. A starting rheostat comprising a resistance varying arm biased to starting position, a switch in series therewith biased to open position, an electromagnetic device for closing said switch when the arm is moved towards running position, a locking device for holding said switch in closed position, means controlled by said electromagnetic device for releasing said switch upon the occurrence of overload conditions, and means for releasing said switch upon the return of the arm to starting position.

15. A starting rheostat comprising a resistance varying arm biased to starting position, a switch in series therewith biased to open position, an electromagnetic device for closing said switch when the arm is moved towards running position, a locking device for holding said switch in closed position, means operating upon the closing of said switch for rendering said electromagnetic device effective to release said switch upon the occurrence of overload conditions, and means for releasing said switch on the return of the arm to starting position.

16. The combination with a starting rheostat having no-voltage release features, of a switch in series therewith biased to open position and an electromagnetic device for closing the same comprising a pair of windings, a common core movable into one of said windings upon the closing of said switch to strengthen its magnetic field, a locking device for holding said switch in closed position, means controlled by said winding for releasing said switch upon the occurrence of overload conditions, means for energizing and deenergizing the other of said windings when the starting rheostat is moved towards running position, and means for releasing said switch upon the return of the rheostat to starting position.

In witness whereof, I have hereunto set my hand this 23rd day of December, 1907.

PAUL H. ZIMMER.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.