No. 786,017. PATENTED MAR. 28, 1905.

E. F. DUTTON.

STARTING RHEOSTAT.

APPLICATION FILED NOV. 13, 1902.

2 SHEETS—SHEET 1.

Fig. 1.

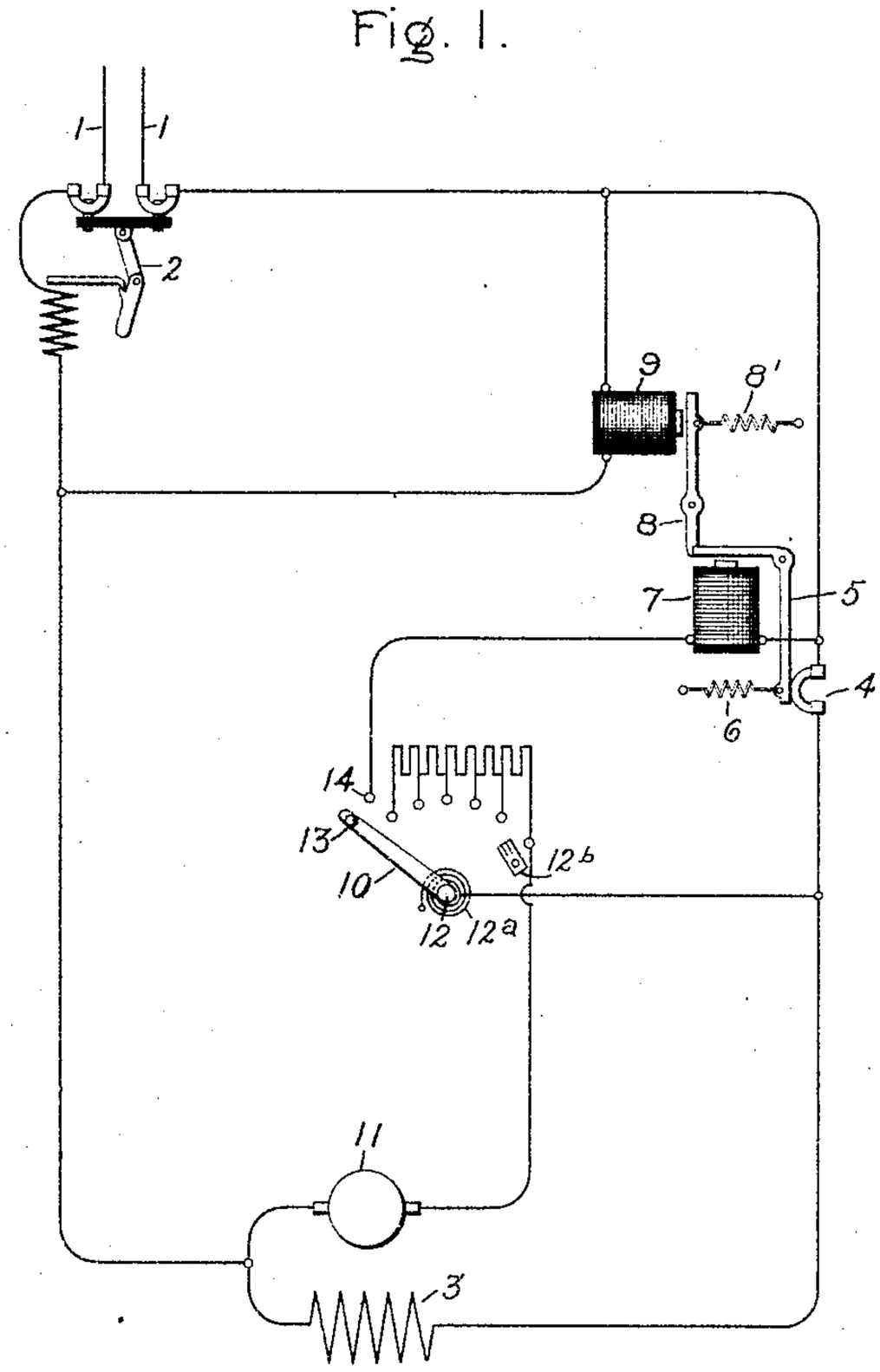
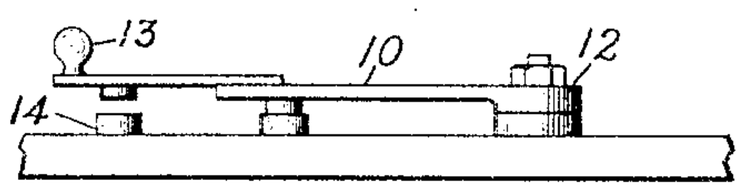


Fig. 2.



Witnesses.

George H. Tilden.

Helen A. Ford

Inventor.

Edgar F. Dutton.

by Albert G. Davis

Att'y.

No. 786,017. PATENTED MAR. 28, 1905.

E. F. DUTTON.

STARTING RHEOSTAT.

APPLICATION FILED NOV. 13, 1902.

2 SHEETS—SHEET 2.

Fig. 4.

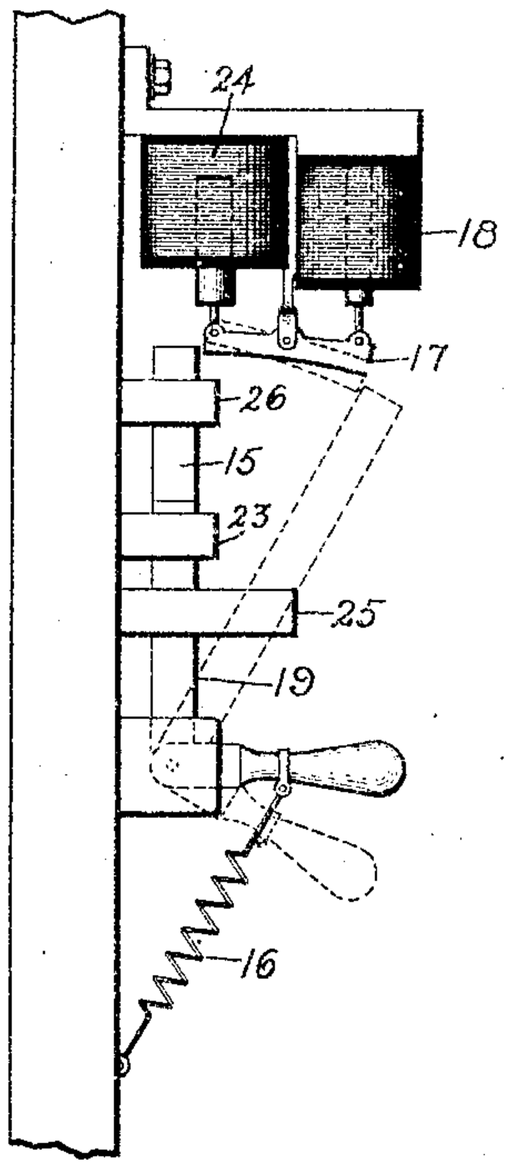
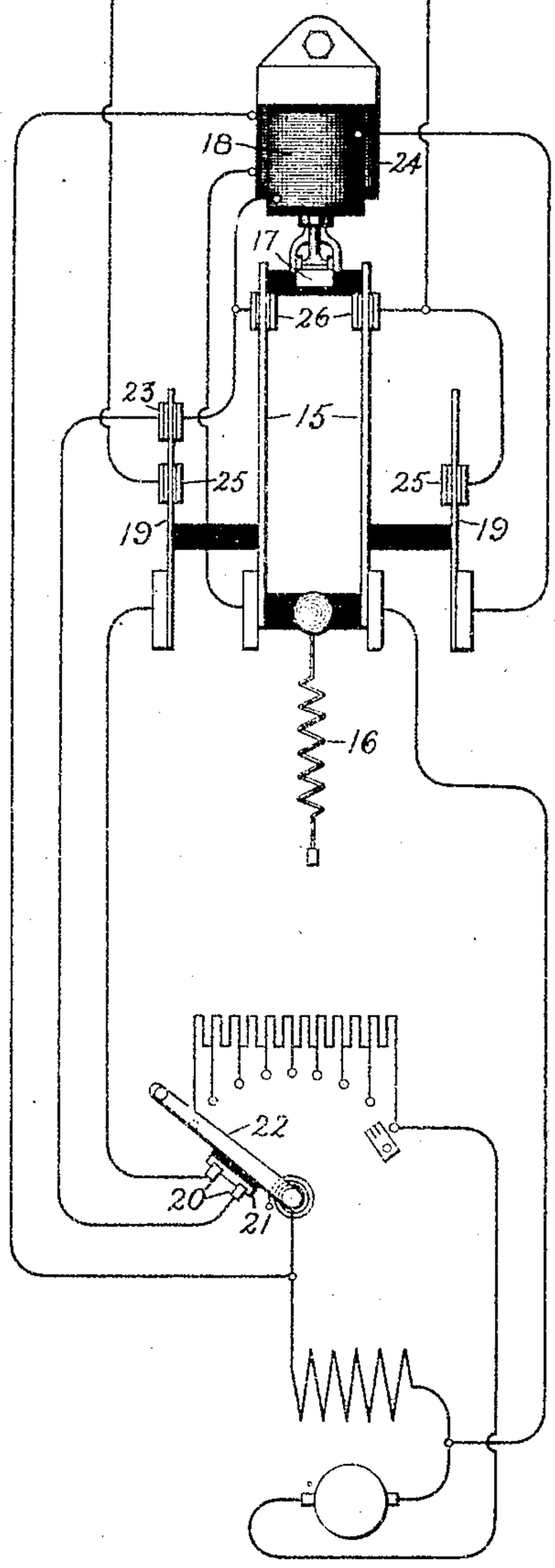


Fig. 3.



Witnesses.

George H. Tilden.

Helen Orford

Inventor.

Edgar F. Dutton.

by Albert G. Davis

Att'y

No. 786,017. Patented March 28, 1905.

UNITED STATES PATENT OFFICE.

EDGAR F. DUTTON, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

STARTING-RHEOSTAT.

SPECIFICATION forming part of Letters Patent No. 786,017, dated March 28, 1905.

Application filed November 13, 1902. Serial No. 131,161.

To all whom it may concern:

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

This invention relates to motor-rheostats. These devices are commonly provided with overload and underload circuit-interrupting devices which form part of the rheostat and in opening under heavy loads burn the contacts or roughen them, so that very strong springs are required to throw the arm to the off position when released.

My invention permits the employment of a lighter spring and avoids the burning of the contacts by breaking the circuit at a point independent of the brush-arm.

My invention also renders the rheostat proof against danger by careless operation. For example, if an operator leaves the brush-arm on an intermediate contact the resistance, which has only a momentary carrying capacity for heavy current, will be burned out. Again, if he leaves the rheostat in "full-on" position before throwing on current the motor-windings are very liable to damage. I prevent these disasters by constructing the parts so that the rheostat-arm must be shifted to the off position before the circuit can be closed, the circuit being opened on emergency, as where there is an unusually heavy load or "no voltage" independently of the rheostat-arm, but still always leaving the apparatus in condition to start by a proper manipulation of the rheostat-arm.

One feature of my invention involves the employment of a device at or near the off position of the rheostat-brush which controls the closure of the motor-circuit and to which the brush must be shifted before the circuit can be closed at all.

Another feature comprises the employment of cut-outs or breakers for overload and underload separate from the rheostat parts.

The invention may be carried out in various ways. The form I have adopted consists of a combined underload and overload breaker, the switch element of which is mechanically locked against closure until a control-magnet dependent on the off position of the rheostat-arm is energized.

The invention comprises various features of novelty, which will be hereinafter described and claimed.

In the accompanying drawings, Figure is a diagram of circuits embodying my invention. Fig. 2 is a side view of the rheostat. Fig. 3 is a modification. Fig. 4 is a side elevation of the circuit-breaker used in said modification.

Referring first to Figs. 1 and 2, the mains 1 are connected with the double-pole automatic overload-circuit breaker 2 of any suitable type. The field-coil 3 of the motor is connected across the line through the fixed contacts 4 of an automatic switch acting as an underload or no-voltage breaker having a pivoted contact-arm 5, opened by a spring 6 and closed by a setting-coil 7. A pivoted locking-dog 8 engages with and holds said arm when closed, said dog being held in locking position by a no-voltage coil 9 in shunt to the motor. A spring 8′ retracts the dog and unlocks the contact-arm 5 when the no-voltage coil is deënergized. The starting-rheostat arm 10, which controls the circuit of the motor-armature 11, is spring-controlled, turning on a pivot 12 and having attached a spring 12^a, which returns it to an off position when free. The end of said arm is resilient to act as a circuit-closer when pressed down to engage with a contact 14, (see Fig. 2,) and this can be done when said arm is in the off position only. The contact 14 is in circuit with the setting-coil 7. At the full-on position the lever 10 is held against the tension of the spring by a friction-clip 12^b. The operation is as follows: When the main circuit-breaker 2 is open, the no-voltage coil and setting-coil are deënergized and the switch 4 5 is open. On closing the circuit-breaker 2 the no-voltage coil swings the dog into locking position; but the no-voltage switch 4 5 still remains open, so that no current will flow to the motor field-coil. In order to close the field-circuit, the rheostat-arm must be swung to the off position, so that the switch-arm can be closed upon

the contact 14, which energizes the setting-coil 7 and closes the contact-arm 5. In closing said arm pushes aside the locking-dog, which, however, swings back when the contact-arm has passed it and locks said arm. The rheostat-arm can now be thrown over to cut out the resistance and start the motor, since the deënergizing of the setting-coil does not open the auxiliary circuit-breaker. The clip 12^b detains the switch-arm in full-on position; but if the arm is released at any intermediate position by the operator the spring opens the circuit, thus preventing a large current passing for a dangerous length of time through the resistance.

In Figs. 3 and 4 the construction is somewhat simplified. The circuit-breaker is a double-pole single-throw spring-switch 15, having a spring 16 making a snap break when released. It is locked, when shut, by a double-ended detent 17, pivoted at a point between its ends and retained in locking position by a control-coil 18, deënergized in a no-voltage condition of the circuit, whose core is pivotally attached to one end of said detent. When the control-coil is deënergized, the detent is moved into locking position by any suitable means, such as gravity acting on the enlarged and heavy end of the detent. When thus dropped, the heavy end of the detent acts as a stop to prevent the closing of the switch until the control-coil is energized, as indicated by the dotted-line position in Fig. 4. Auxiliary blades 19 are rigidly connected with but insulated from the switch 15. In series with these auxiliary blades and the control-coil is a pair of contacts 20, adapted to be connected by a circuit-closing bridge-piece, such as a blade 21, attached to but insulated from the rheostat-arm 22. The contacts 20 are so located that the blade 21 will close on them when the rheostat-arm is in the off position only. One of the auxiliary blades is arranged to make contact with a clip 23 when the switch is fully closed, and thus shunt the contacts 20. The switch is in the motor-circuit, which also includes an overload-coil 24, whose movable core is pivotally connected with the lighter end of the detent, which latter latches the switch when in closed position. (See Fig. 4.) The operation is as follows: With all circuits open, the detent occupies the dotted-line position shown in Fig. 4. When the circuit-breaker is thrown in, it is stopped by the detent in the dotted-line position. The auxiliary blades 19 have, however, made contact with their clips 25, which are longer than the main clips 26. If the rheostat-arm is in the full-on position or any intermediate position, the control-coil remains inert and the switch of the circuit-breaker cannot be closed on the motor, but when the rheostat-arm is moved to the off position the blade 21 closes on the contacts 20 and the circuit of the control-coil is completed. The detent is thereupon lifted and the circuit-breaker can be closed, pushing up the lighter end of the detent as it passes, but locked by said end as soon as it reaches the full-on position, as seen in full lines in Fig. 4. At this instant the contacts 20 are shunted by one of the auxiliary blades 19, closing into the clip 23. The rheostat-arm can now be moved to cut out the resistance without opening the circuit of the control-magnet. In case the current fails or an overload comes on the detent is tripped and the spring 16 instantly opens the circuit-breaker, which cannot be closed again until the rheostat-arm is swung back to the off position to close the circuit through the contacts 20.

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

1. The combination with a motor-rheostat, of a circuit-breaker, a coil for holding said circuit-breaker closed, and a circuit-closer on the rheostat-arm in circuit with said coil.

2. A motor-controlling rheostat comprising a circuit-closer, a control-magnet governing its closure, and means governing the circuit connections of said magnet dependent upon the return of the rheostat-arm to the "off" position.

3. The combination with a rheostat, of an automatic circuit-breaker in the motor-circuit, a control-coil for the breaker, and a contact at or near the off position of the rheostat-arm for energizing the coil.

4. The combination with a motor-rheostat, of a circuit-closer on the rheostat-arm, a contact adjacent to the off position of said arm coöperating with said circuit-closer, and a coil in circuit with said contact and controlling the closing of the circuit-breaker.

5. The combination with a motor-rheostat, of a motor-switch, a circuit-closer on the rheostat-arm, a contact adjacent to the off position of said arm coöperating with said circuit-closer, a coil in circuit with said contact and controlling the closing of said switch, and means whereby after the switch has been closed the circuit-closer may be opened without affecting the circuit-breaker.

6. The combination with a motor-rheostat, of a circuit-breaker, a no-voltage coil for locking said circuit-breaker when closed, and a circuit-closer on the rheostat-arm controlling the closing of the circuit-breaker.

7. The combination with a motor-rheostat, of a circuit-breaker, a no-voltage coil for locking said circuit-breaker when closed, a control-coil for the circuit-breaker, and a circuit-closer on the rheostat-arm controlling said control-coil.

8. The combination with a motor-rheostat, of a circuit-breaker, a no-voltage coil for locking said circuit-breaker when closed, a control-coil for said circuit-breaker, a circuit-closer on the rheostat-arm, and a contact adjacent to the off position of said arm with which said circuit-closer coöperates.

9. The combination with a motor-rheostat, of a circuit-breaker, a circuit-closer on the rheostat-arm, and means whereby said circuit-closer permits the closing of the circuit-breaker when the rheostat-arm is in the off position only.

10. The combination with an electric motor, of a controlling-rheostat having a spring-controlled arm, a control-coil for the motor-circuit, a contact at or near the off position of the rheostat governing said coil, and a detent for the rheostat-arm at "full-on" position.

11. The combination with an electric motor, of a controlling-rheostat, an overload-breaker, a switch in the motor-circuit, a control-coil therefor, a contact at or near the off position of the rheostat governing said coil, and an underload-magnet for opening the switch.

12. The combination with an electric motor, of a controlling-rheostat, a circuit-breaker having overload and underload coils and a hand-set switch for the motor, a lock obstructing the closure of the switch controlled by the underload-magnet, and a contact at or near the off position of the rheostat-arm for energizing the underload-magnet.

13. The combination with an electric motor, of a controlling-rheostat, a combined underload and overload breaker mechanically independent of the rheostat movements, overload and underload magnets acting on a common spring-switch arm, the former locking it under normal loads and the other locking it against closure under no voltage, and means dependent on the off position of the rheostat-arm for opening the no-voltage lock.

In witness whereof I have hereunto set my hand this 12th day of November, 1902.

EDGAR F. DUTTON.

Witnesses:

BENJAMIN B. HULL,

HELEN ORFORD.