

H. H. LEE & A. E. BUTTON.
 STARTING DEVICE FOR ELECTRIC MOTORS.
 APPLICATION FILED OCT. 27, 1908.

963,160.

Patented July 5, 1910.

Fig. 1.

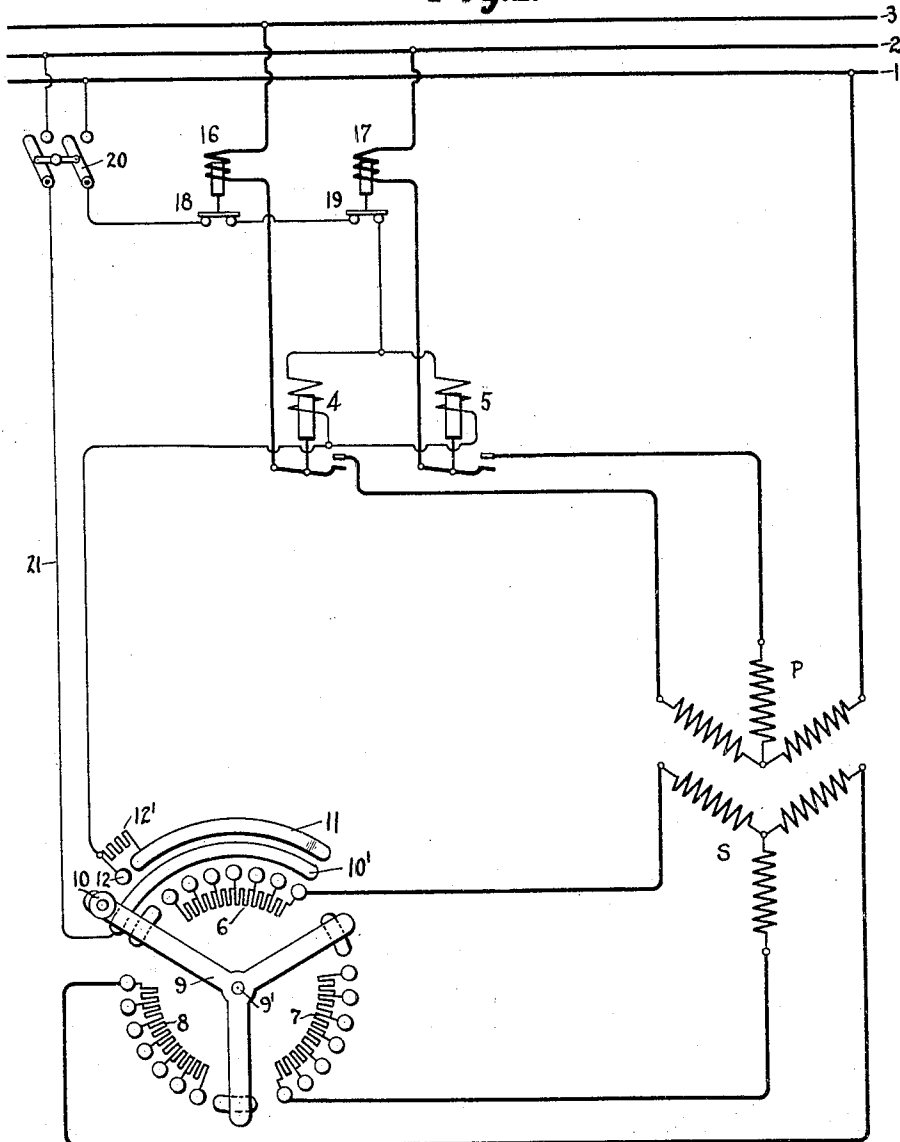
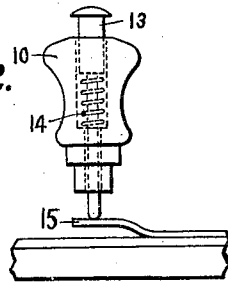


Fig. 2.



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UNITED STATES PATENT OFFICE.

HARRY H. LEE AND ARNOLD E. BUTTON, OF SCHENECTADY, NEW YORK, ASSIGNORS
TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

STARTING DEVICE FOR ELECTRIC MOTORS.

963,160.

Specification of Letters Patent.

Patented July 5, 1910.

Application filed October 27, 1908. Serial No. 459,706.

To all whom it may concern:

Be it known that we, HARRY H. LEE and ARNOLD E. BUTTON, citizens of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Starting Devices for Electric Motors, of which the following is a specification.

This invention relates to means for controlling electric motor circuits and has for its object the provision of a device whereby an electric motor may be started and brought to running speed in a safe and efficient manner.

Our invention relates more specifically to the starting of alternating current motors of the induction type. In starting induction motors of the "slip ring" type, it is essential that the secondary circuit be closed through the necessary resistances before the closing of the primary circuit. In carrying out our invention, therefore, we provide in connection with a hand operated device for cutting the resistance out of the secondary circuit, means whereby the primary circuit cannot be closed until all of the resistance is in series with the secondary of the motor. We also provide means whereby the member which controls the secondary resistance cannot be left in an intermediate position, so as to burn out the starting resistance.

In the accompanying drawing, in which we have shown our invention embodied in concrete form, Figure 1 is a diagrammatic view of our invention, showing the circuit connections; Fig. 2 is a detail of the operating handle, showing the switch.

Referring to the drawings, P represents the primary and S the secondary circuit of an induction motor of the "slip ring" type. The primary is arranged to be connected with the three phase mains 1, 2 and 3, by means of two electromagnetic switches 4 and 5, phase 1 being directly connected with the windings of the motor. The secondary of the motor is provided with starting resistances 6, 7 and 8, one in series with each phase of the motor. These resistances are provided with contact studs arranged in a circle. The controlling member 9 which consists of three arms, one for each section of resistance, is pivoted at 9' and provided with a handle 10 on one arm, so that the member will move the three arms to vary the three resistances of the secondary circuit

simultaneously. In the off position, the contact segment 10' is arranged to be engaged by the arm of the member on which the handle is mounted. A contact stud 12 is arranged adjacent the segment 11 and is connected therewith by means of the resistance 12'. The handle 10 is provided with a switch consisting of a plunger 13, normally pressed upward by means of the spring 14 but adapted to be engaged by the hand of the operator and pressed into engagement with the segment 11, to close the circuit of the contactors 4 and 5. The end of the segment 11 is offset upward, as shown at 15, so that when the arm reaches the end of its travels, the plunger will remain in engagement with the segment. Two overload relays, 16 and 17, provided with bridging contacts 18 and 19, are arranged in series with two primary windings and adapted to open the circuit of the contactors 4 and 5 upon overload.

The arrangement of circuits and mode of operation are as follows: When the switch 20 is closed, the handle 10 is grasped by the operator and moved into engagement with stud 12, the plunger 13 being pressed downward so as to engage the stud. A circuit is then completed as follows: from phase 1, across bridging contactors 18 and 19, through the coils of contactors 4 and 5 in parallel, stud 12, arm 9 and conductor 21 back to phase 2. The contactors 4 and 5 are thus energized and the primary circuit closed. By moving the member 9 in a clockwise direction with the plunger 13 forced downward, the resistances 6, 7 and 8 are cut out of the secondary circuit in a well-known manner. When the running position is reached, that is, when the resistance is all cut out of the secondary circuit, the circuit of the contactors 4 and 5 will be kept closed by the engagement of the plunger 13 with the offset 15 of the segment 11. As soon as the plunger 13 moves off the stud 12 in starting, the resistance 12' is connected in series with the coils of the contactors 4 and 5, thus reducing the current through these coils to such an extent that they will not operate but will be sufficiently energized to remain closed. Upon failure of voltage the contactors 4 and 5 will open the primary circuit. In order to again close the contactors, however, the member 9 must be brought back to starting position in order to eliminate the resistance 12' and increase

the current from a holding to an actuating current. Upon the occurrence of overload, the contactors will be deenergized by the operation of the relays 16 and 17.

5 While we have shown our invention embodied in concrete mechanism and as operating in a definite manner in accordance with the patent statutes, it is to be understood that we do not limit our invention
10 thereto, since various modifications will suggest themselves to those skilled in the art, without departing from the spirit of our invention, the scope of which is set forth in the annexed claims.

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

1. The combination with an alternating current motor, of means for starting the
20 same comprising a primary circuit closing device, a resistance for the secondary circuit, a controlling member arranged to vary said resistance, a normally open switch in connection with said member for completing
25 the circuit of the primary circuit closing device, said switch being arranged to be closed by the operator and held closed during the starting of the motor, and means for securing said switch in closed position when
30 the motor is brought to running position.

2. The combination with an alternating current motor, of means for starting the
35 same, comprising an electromagnetic switch for closing the primary circuit, a resistance for the secondary circuit, a controlling member arranged to vary the same, a normally open switch in connection therewith arranged to be closed by the operator in the
40 starting position to energize the electromagnetic switch, a resistance for reducing the energizing current of the electromagnetic switch to a holding current when the member is moved from starting position and
45 means for securing said switch in closed position when the member reaches running position.

3. The combination with a polyphase induction motor, of means for starting the same comprising a resistance having a sec-

tion for each motor phase, a controlling
50 member arranged to simultaneously vary the sectional resistances, a normally open switch in connection with said member arranged to be closed by the operator to close
55 the primary circuit during the starting of the motor, and means for securing said switch in closed position when the member is in running position.

4. The combination with a polyphase induction motor, of means for starting the
60 same comprising a plurality of electromagnetic switches for closing the primary circuit, a resistance for each motor phase of the secondary circuit, a controlling member arranged to simultaneously vary said re-
65 sistance, a normally open switch in connection with said member controlling said electromagnetic switches, and a resistance arranged to reduce the energizing current of said electromagnetic switches to a holding
70 current when the member is moved from starting position.

5. The combination with a polyphase induction motor, of means for starting the
75 same comprising a plurality of electromagnetic switches for closing the primary circuit, a resistance for each motor phase of the secondary circuit, a controlling member arranged to simultaneously vary said re-
80 sistance, a normally open switch in connection with said member arranged to be closed by the operator to energize said electromagnetic switches in the starting position, a resistance arranged to be connected in circuit
85 with said electromagnetic switches to reduce the energizing current to a holding current when the member is moved from the starting position, and means for securing said switch in the closed position when the member reaches running position.
90

In witness whereof, we have hereunto set our hands this 26th day of October, 1908.

HARRY H. LEE.
ARNOLD E. BUTTON.

Witnesses:

HELEN ORFORD,
BENJAMIN B. HULL.