No. 793,904. PATENTED JULY 4, 1905.

W. D. POMEROY.

INDUCTION MOTOR.

APPLICATION FILED NOV. 24, 1903.

2 SHEETS—SHEET 1.

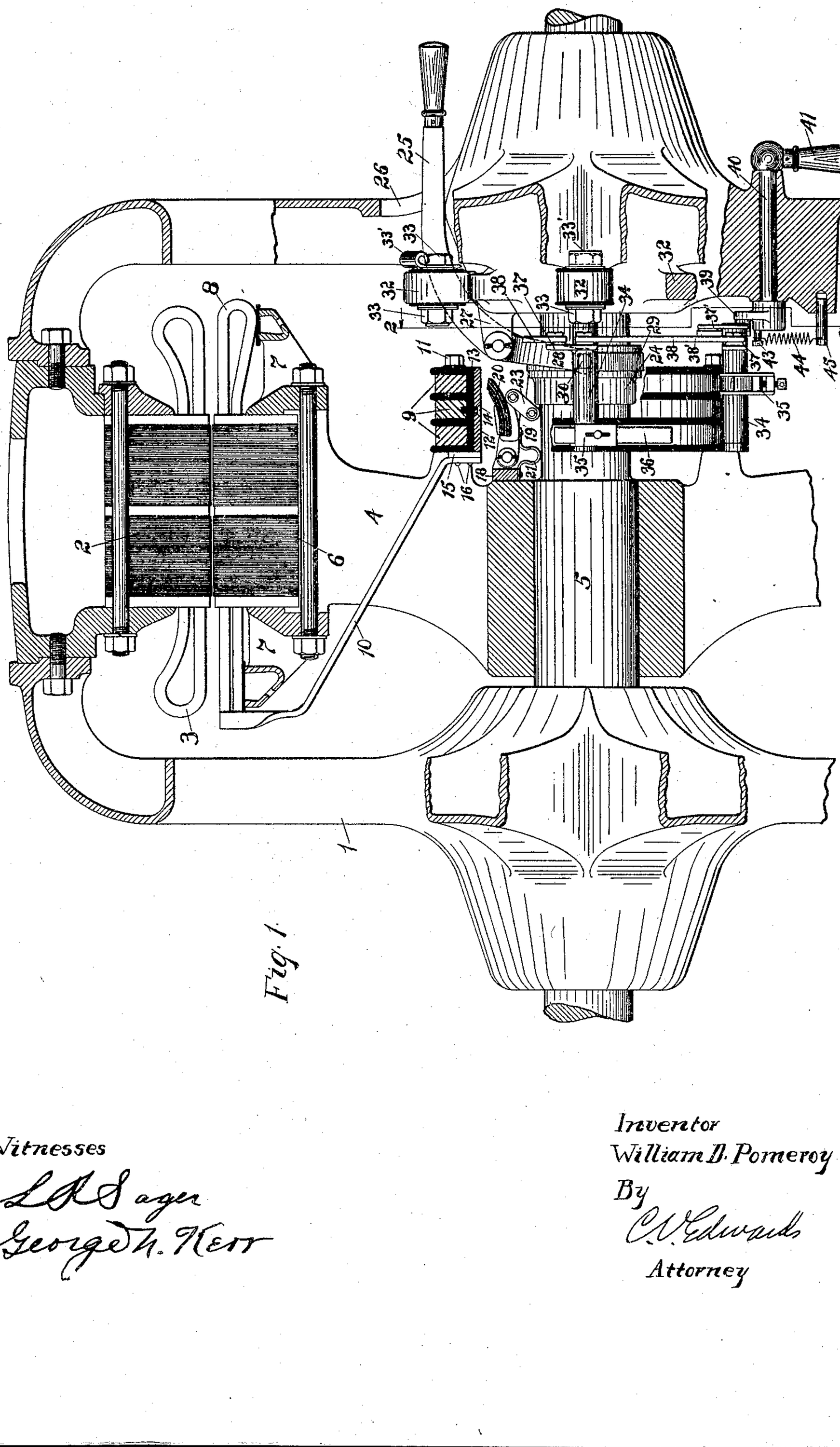

Fig. 1.

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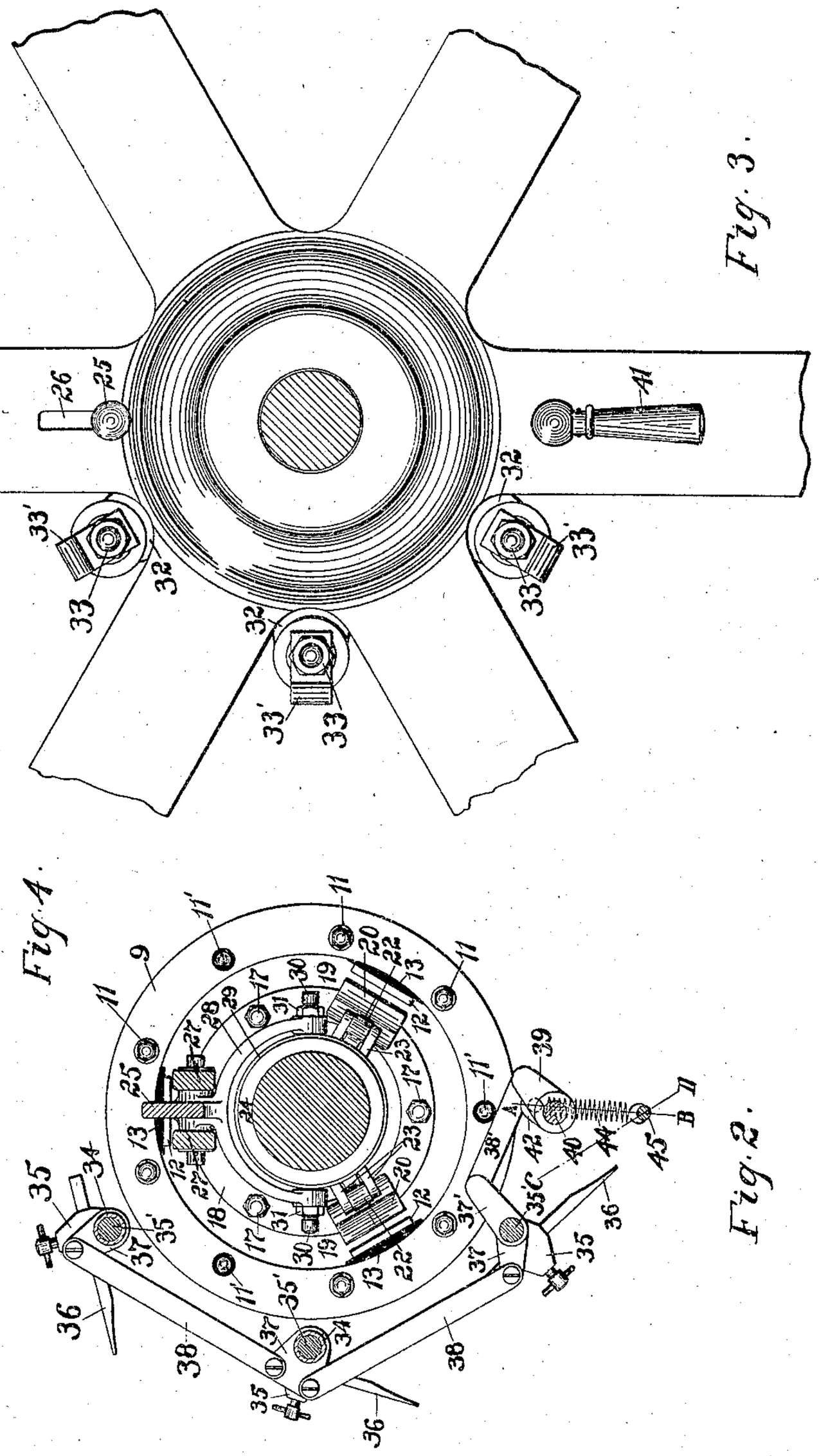

Fig. 3.

Fig. 4.

Fig. 2.

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UNITED STATES PATENT OFFICE.

WILLIAM D. POMEROY, OF NORWOOD, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE BULLOCK ELECTRIC COMPANY, A CORPORATION OF OHIO.

INDUCTION-MOTOR.

SPECIFICATION forming part of Letters Patent No. 793,904, dated July 4, 1905.

Application filed November 24, 1903. Serial No. 182,450.

To all whom it may concern:

Be it known that I, WILLIAM D. POMEROY, a citizen of the United States, residing at Norwood, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Induction-Motors, of which the following is a full, clear, and exact specification.

My invention relates to dynamo-electric machines, and particularly to induction-motors.

It is desirable for the best running conditions of induction-motors that the resistance of the closed secondary windings be very low. This low resistance is not advantageous, however, for starting, owing to the fact that the currents induced in the secondary windings are so large that they react upon the field and greatly weaken the same, giving a very low starting torque. If a resistance is inserted in the windings upon starting, the strength of the induced currents is correspondingly reduced and an effective starting torque obtained. It is therefore common to insert resistance in circuit with the windings on starting and to gradually cut this resistance out as the motor comes up to speed. In this manner the requirements for best starting and running conditions are fulfilled.

The object of my invention is to provide a simple, positive, and easily-controlled means for inserting resistance in the rotor-circuit upon starting and to short-circuit the windings after the motor has obtained full speed.

By my invention leads from the rotor-windings are connected to slip-rings, and the windings are short-circuited by means located within the slip-rings. Means are also provided for raising the brushes after the rings are short-circuited. Separate handles are provided for operating the short-circuiting means and for raising and lowering the brushes. In one case a hand-lever is used and in the other a shaft turned by a handle, so that the means for operating the different parts can be readily distinguished. I also arrange a single spring which will either keep the brushes raised or in contact with the collector-rings.

My invention will be understood from the following description and accompanying drawings and the novelty thereof set forth in the appended claims.

In the drawings, which show the preferred form of construction, Figure 1 is a horizontal sectional view of a part of an induction-motor, showing my invention applied thereto and with some parts in full. Fig. 2 is a section on the line 2 2 of Fig. 1. Fig. 3 is a right-hand end view of Fig. 1, and Fig. 4 is a diagram of connections.

The frame 1 of the machine carries the laminations 2 and the stator-windings 3. The spider 4 of the rotating element is fixed to shaft 5, journaled in the frame 1. The spider carries the laminations 6, bolted between the end heads 7. The rotor-windings 8, which may be of any desirable form, are connected to the slip-rings 9. Leads are connected to the winding at one end and pass between the arms of the spider to the collector-rings at the opposite side, as shown, by lead 10, and the arms of the spider are inclined somewhat, so as to allow space for the starting devices within the frame. The slip-rings are suitably insulated and are secured to the spider by cap-screws 11 and centered by dowel-pins 11′, insulated from the rings. Three leads from the rotor-winding are connected to the metal plates 12, which extend under the slip-rings, and separated therefrom by the fiber strips 13. Each plate 12 is secured to and in electrical contact with one of the slip-rings by a screw 14. The inner end of each plate 12 has a part 15 bent at right angles, to which the lead 10 is connected, as by rivets 16.

Mounted upon the rotating element and secured thereto by bolts 17 is a metal ring 18. Three switches 19, all of the same construction, are pivoted at one end on the ring 18 and carry laminated copper strips forming brushes 20 at the opposite end. Each switch is connected by a flexible lead 21 with the ring 18 to secure good electrical connection. Near the outer end of the switches are perforated lugs 22, connected by links 23 to lugs carried by the slidable collar 24. In the position shown the switches are out of contact

with the plates 12; but it is evident that upon moving collar 24 to the right the switches will contact with the plates 12, and the winding will be short-circuited through the leads 10, plates 12, switches 19, and ring 18. The lever 25 for throwing the collar 24 to the right or left is located at one side of the machine and projects through an opening 26 in one of the arms of the frame. The lever is pivoted in lugs 27, projecting from the frame and carries the yoke 28. A ring 29 engages a groove in collar 24 and is connected to the yoke by screws 30, locked by nuts 31.

The brush-studs 35′ are mounted in lugs 32, projecting from the frame, and are suitably insulated and secured to the lugs by nuts 33. Current is conducted from the studs through terminal lugs 33′, which are secured in position by nuts 33. Upon each stud is mounted a sleeve 34, to which the brush-holders 35 are secured and which in turn carry the brushes 36. Each sleeve 34 has integral therewith radial arms 37, connected with each other by fiber links 38. One of the sleeves is provided with an additional arm 37′, connected by a fiber link 38′ to an arm 39, fixed to a shaft 40, journaled in the frame of the machine. A handle 41 is fixed to shaft 40 outside the frame and at the side opposite to hand-lever 25. It is evident that by turning the handle the brushes will be brought into contact with the slip-rings or raised therefrom through the medium of shaft 40 and the arms and links. A second arm 42 extends from shaft 40, and a pin 43, extending therefrom, is connected by a spring 44 to a second pin 45, fixed to the frame. It will be noted that the pins 43 and 45 are so located that when the brushes are in their raised position, as shown, the line of action of the spring is to one side of the axis of shaft 40, as shown by line A B, and the spring will therefore keep the brushes in a raised position. When the brushes are in contact with the slip-rings, the line of action of the spring is then on line C D on the opposite side of axis of shaft 40, and the spring will consequently force the brushes into contact with the slip-rings.

A diagram of connections is shown in Fig. 4, in which the rotor-windings 8 are shown connected in star form and connected by leads 10 to the slip-rings 9. The brushes 36 contact with the rings and are connected to the adjustable rheostat 46.

The operation of my device is as follows: Before starting, the handles 25 and 41 are thrown in such a position that the switches 19 are out of contact with plates 12 and the brushes in contact with the slip-rings. The full resistance 46 is then in circuit with the rotor-windings, and as the motor speeds up this resistance is gradually reduced. After the resistance has been sufficiently reduced or cut out the handle 25 is thrown outwardly, which brings the short-circuiting switches in contact with the plates 12 and short-circuits the winding. The handle 41 may then be turned to raise the brushes.

Although I have described a specific form of my invention, it is understood that I am not limited to the exact construction shown, and it is evident that various changes may be made in the form of construction and still be within the scope of the claims.

I claim as my invention—

1. In an induction-motor, the combination of the rotating element having secondary windings, and means for short-circuiting said windings comprising slip-rings to which the windings are connected, a metal member carried by the rotating element, short-circuiting switches pivoted thereto and in electrical connection therewith, a slidable collar, links connecting said collar and said switches, and a handle for sliding the collar.

2. In an induction-motor, the combination of the rotating element having secondary windings, slip-rings carried by the rotating element, a metal plate secured to each slip-ring and insulated from the others, leads connecting said plates to the windings, switches carried by the rotating element and in electrical connection with each other, and means for throwing said switches into and out of contact with said plates.

3. In an induction-motor, the combination of the rotating element having secondary windings, slip-rings carried by the rotating element, a metal plate secured to each slip-ring and insulated from the others, each plate extending across the inner periphery of said slip-rings, leads connecting said plates to the windings, switches carried by the rotating element and in electrical connection with each other, and means for throwing said switches into and out of contact with said plates.

4. In an induction-motor, the combination of the rotating element having secondary windings, slip-rings carried by the rotating element, a metal plate secured to each slip-ring and insulated from the others, each plate extending across the periphery of said slip-rings and having one end bent at right angles, leads connecting said plates to the windings, switches carried by the rotating element and in electrical connection with each other, and means for throwing said switches into and out of contact with said plates.

5. In a dynamo-electric machine, the combination of a rotating element having windings, slip-rings to which the windings are connected, brushes, means for raising and lowering all of said brushes simultaneously, comprising parts capable of being oscillated, and a spring secured to the frame of the machine and to one of said oscillating parts so that the line of action of the spring is on one side of the axis of one of said oscillating parts when

the brushes are raised, and on the opposite side when the brushes are in contact with the slip-rings.

6. In a dynamo-electric machine, the combination of a rotating element having windings, slip-rings to which the windings are connected, brushes, means for raising and lowering said brushes, a shaft for operating said means, and a spring secured to the frame of the machine and to a part carried by said operating-shaft, so that the line of action of the spring is on one side of the axis of the shaft when the brushes are raised, and on the opposite side when the brushes are in contact with the slip-rings.

7. In a dynamo-electric machine, the combination of a rotating element having windings, slip-rings to which the windings are connected, brush-studs fixed to the frame, sleeves on said studs, brushes carried thereby, a shaft and connections for turning said sleeves to raise or lower the brushes, and a spring connected to the frame of the machine and to a part carried by said shaft so that the line of action of the spring is on one side of the axis of the shaft when the brushes are raised and on the opposite side when the brushes are in contact with the slip-rings.

8. In a dynamo-electric machine, the combination of a rotating element having windings, slip-rings to which the windings are connected, brush-studs fixed to the frame, sleeves on said studs, brushes carried thereby, said sleeves having arms, an operating-shaft having an arm, links connecting all of said arms, and a spring connected to the fixed frame of the machine and to a part carried by said operating-shaft, so that the line of action of the spring is on one side of the axis of the shaft when the brushes are raised and on the opposite side when the brushes are in contact with the slip-rings.

9. In an induction-motor, the combination of the rotating element having secondary windings, slip-rings to which the windings are connected, means for short-circuiting the slip-rings, brushes, means for raising and lowering the brushes, and a hand-lever for operating one of said means and a shaft having a handle for operating the other of said means.

10. In an induction-motor, the combination of the rotating element having secondary windings, slip-rings to which said windings are connected, means for short-circuiting the slip-rings, a hand-lever for operating said short-circuiting means, brushes, means for raising and lowering the brushes, comprising a shaft and an operating-handle on said shaft.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM D. POMEROY.

Witnesses:

L. K. SAGER,

SANFORD KLEIN.