S. B. PAINE.

APPARATUS FOR STARTING ELECTRIC MOTORS.

APPLICATION FILED MAY 28, 1909.

963,169.

Patented July 5, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

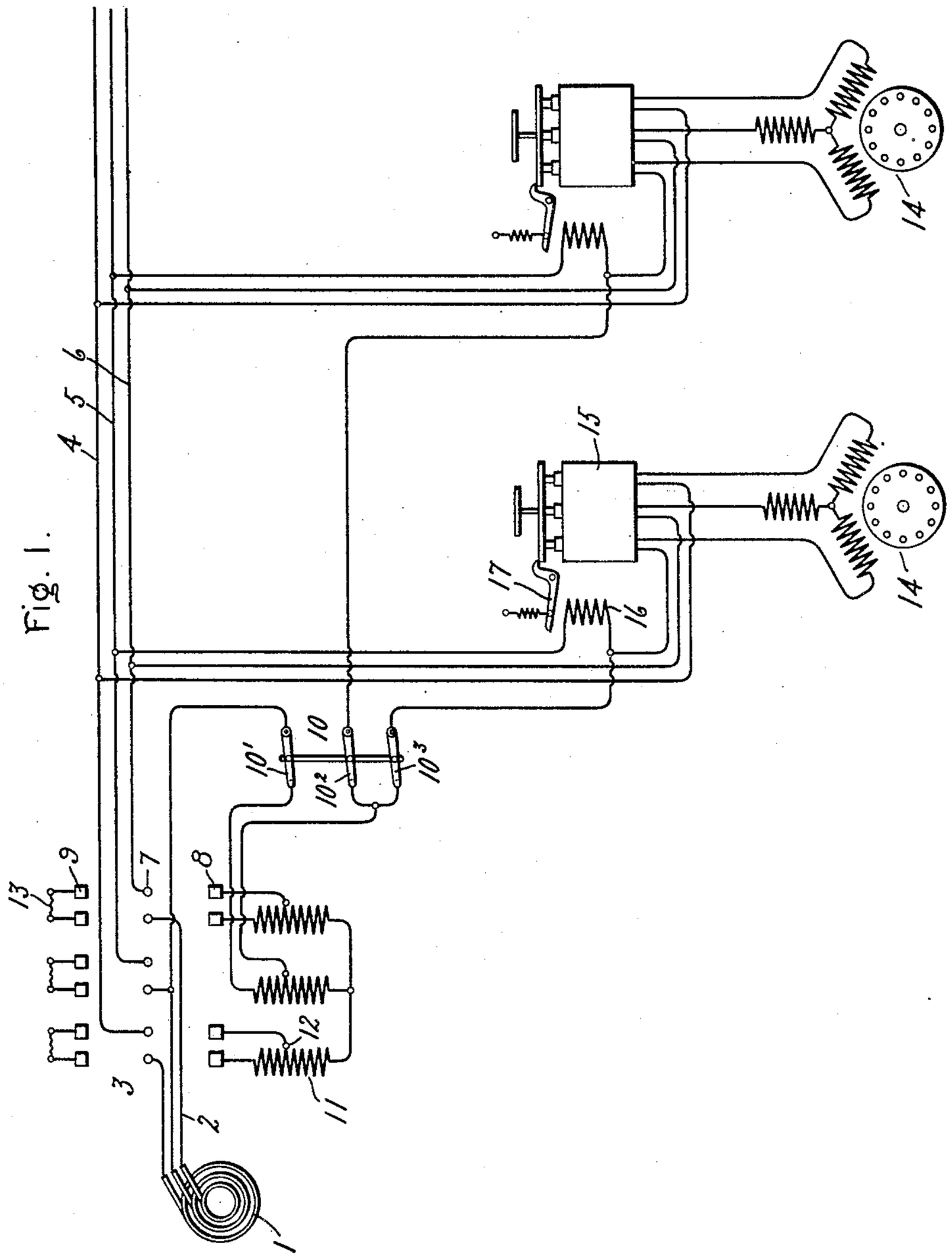

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Fig. 3.

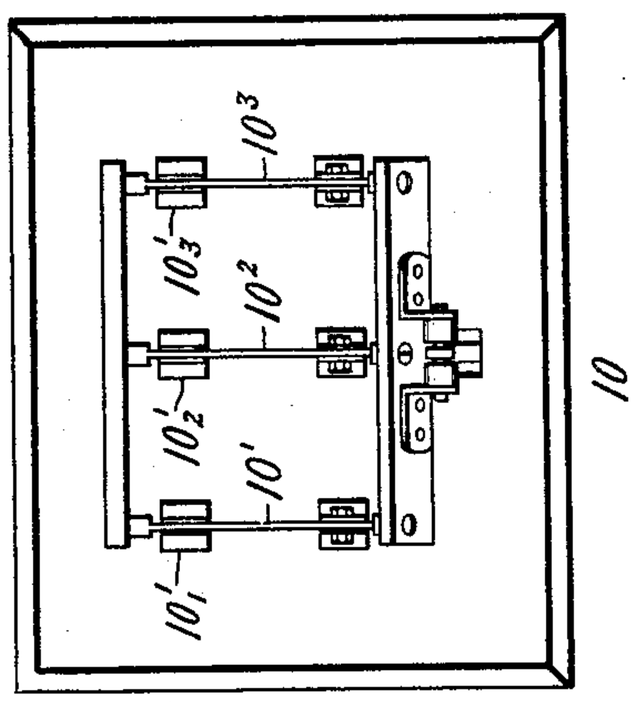
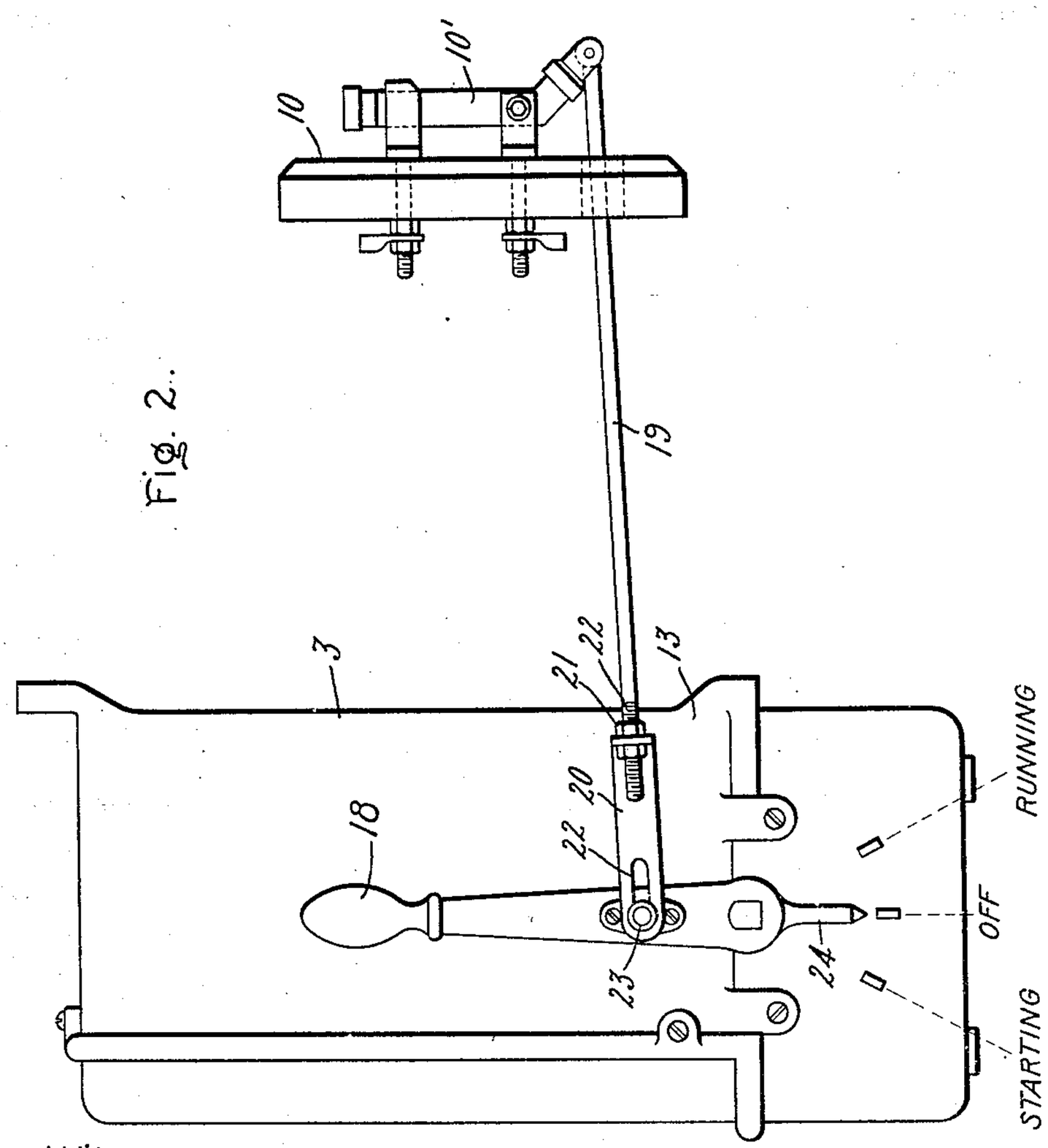


Fig. 2.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR STARTING ELECTRIC MOTORS.

963,169. Specification of Letters Patent. Patented July 5, 1910.

Application filed May 28, 1909. Serial No. 498,950.

To all whom it may concern:

Be it known that I, SIDNEY B. PAINE, a citizen of the United States, residing at Newton, county of Middlesex, State of Massachusetts, have invented certain new and useful Improvements in Apparatus for Starting Electric Motors, of which the following is a specification.

My invention relates to apparatus used in connection with starting a plurality of motors, and has for its object an improvement in such an apparatus.

I accomplish the object of my invention by a certain novel arrangement of apparatus and connections, the novel features of my invention being pointed out with more particularity in the claims annexed to and forming a part of this specification.

For a further understanding of my invention reference may be had to the accompanying drawing where—

Figure 1 shows diagrammatically the connections which I employ; Fig. 2 shows a detail of certain features of the apparatus which I employ; and Fig. 3 shows a detail of Fig. 2.

Referring first to Fig. 1, I have shown a source of voltage 1, this being illustrated by a three-phase generator. This source is connected by conductors 2 to a starting device 3. A plurality of conductors 4, 5, 6, are shown as also connected to the starting device 3. This starting device is shown as being the well-known type of starting compensator for the starting of induction motors and other apparatus, and its especial features consist of a number of movable contacts 7, which may be made to make contact with stationary conducting members 8 or 9. In addition to starting device 3 I employ an auxiliary switching device 10, the operation of which will be explained more in detail later. When the contacts 7 are in connection with contact 8 conductors 4, 5 and 6 are energized with a portion of the voltage from the source. This is accomplished by means of the usual form of compensator, which has windings 11 connected across conductors 2, these windings having taps 12, which are adapted to energize conductors 4, 5 and 6 with only a portion of the voltage from the source in the well understood manner. When contacts 7 are in connection with contacts 9, conductors 4, 5 and 6 are energized with full voltage from the source, these conductors being placed in series with conductors 2 through fuses 13, in the usual fashion.

A plurality of motors 14, shown as three-phase induction motors, are shown as connected in parallel to conductors 4, 5 and 6. Switches 15 are shown as connected in series between each motor and the conductors, these switches being shown as of the usual oil-insulated type. Over-load tripping devices, which consist of energizing coils 16 and mechanism 17 in operative relation therewith are shown, the over-load tripping devices in conjunction with a spring mechanism, which is usual in such switches and is not shown, opening the switches when an overload occurs upon the circuit.

The auxiliary switching device 10 is so arranged that when starting device 3 is operated so that contacts 7 are in connection with contacts 8, the overload tripping devices are rendered inoperative. When contacts 7 are in connection with contacts 9,—that is, when the motors are energized with full voltage from the source, or device 3 is in the so-called "running position," tripping devices 16 are rendered operative as auxiliary switching device 10 is moved in such a manner that its movable conducting members 10^1, 10^2 and 10^3 are moved out of contact with the stationary contacts $10_1{}^1$, $10_2{}^1$ and $10_3{}^1$, see Fig. 3.

Referring now to Fig. 2, I have shown a detail view of the starting device 3 and the auxiliary device 10. The starting device, of which only an outside view is shown, is illustrated as being of the usual compensator type, and has a handle 18, which is used for moving contacts 7 to connect them with contacts 8 or contacts 9. In operative relation with handle 18 is shown a rod 19, which is attached at one end to a member 20 by means of nuts 21 in operative relation with a screw-thread 22 formed upon the end of the rod. These nuts may be used for properly adjusting the length of the rod. The other end of rod 19 is shown as connected to switching device 10, the rod being connected to conducting members 10^1, 10^2, and 10^3, in such a manner that when the rod is moved it will make or break the connection between these members and the stationary members $10_1{}^1$, $10_2{}^1$ and $10_3{}^1$.

Member 20 is shown as formed with a

slot 22 extending through it. This slot engages with a pin 23, which is attached to handle 18. At the lower end of handle 18 is shown a pointer 24 to indicate the position of the moving contacts 7 in the usual manner.

The method of operation of these devices will be as follows: Referring to Figs. 1 and 2, starting device 3 is shown in the off position,—that is, contacts 7 are not in connection with either contacts 8 or 9. Auxiliary switching device 10 is in the position shown in Fig. 1. When it is desired to start up motors 14, handle 18 is moved so that it will be in such position that pointer 24 indicates the starting position of the device. When the handle is in this position, contacts 7 are in connection with contacts 8, conductors 4, 5 and 6 are energized with a portion of the voltage of the source, auxiliary contact device 10 has its contacts in the position shown in the drawings, as pin 23 on handle 18 moves against the right-hand edge of slot 22, and thus forces the contact members 10^1 etc., in the position shown. The overload tripping devices of the switches are rendered inoperative, the object of this being that as the running current of an induction motor is considerably less than the starting current, if these tripping devices are adjusten to open the switches for an overload which would injure the motors if they were running, they would open the switches for the starting conditions, which are not injurious to the motors as the heavy overload starting current usually required by the motors is required only for a comparatively short time. After the motors have obtained a reasonable speed in accordance with the usual practice, the handle 18 of starting device 3 will be moved to the running position, so that conductors 4, 5 and 6 will be energized with the full voltage from the source. When the handle is in this position, owing to the action of pin 23 against the left-hand edge of slot 22, the switching device 10 will have its contacts moved so that the overload tripping devices for the oil-switches will be placed in series between the motors and the source of voltage, and will thus cause the switches to operate if an overload occurs upon any of the motors.

While I have illustrated my invention as applied to the starting of three-phase induction motors, I do not limit myself to the starting of a particular type of motors with a particular number of phases, but seek in the appended claims to cover all different arrangements and modifications of the apparatus and connections which are described, as will be obvious to those skilled in the art and will not depart from the spirit of my invention.

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

1. In a system of distribution, a source of voltage, a plurality of conductors, a plurality of motors connected thereto, switches connected in series between the motors and the conductors, overload tripping devices for the switches, means for energizing the conductors with a portion of the generator voltage from the source and rendering the tripping devices inoperative, and means for energizing the conductors with full voltage from the source and rendering the tripping devices operative.

2. In a system of distribution, a source of voltage, a plurality of conductors, a plurality of motors connected thereto, switches connected in series between the motors and the conductors, overload tripping devices for the switches, means for simultaneously energizing the conductors with a portion of the voltage from the source and rendering the tripping devices inoperative, and means for simultaneously energizing the conductors with full voltage from the source and rendering the tripping devices operative.

3. In a system of distribution, a source of voltage, a plurality of conductors, a plurality of motors connected thereto, switches connected in series between the motors and the conductors, overload tripping devices for the switches, a compensator adapted in one position to connect the conductors to a portion of the voltage of the source and in a second position to the full voltage of the source, and means for rendering the tripping devices inoperative.

4. In a system of distribution, a source of voltage, a plurality of conductors, a plurality of induction motors connected in parallel thereto, switches connected in series between each motor and the conductors, overload tripping devices for the switches, a compensator adapted in one position to connect the conductors to a portion of the voltage of the source, and in a second position to the full voltage of the source, and means in operative relation with the compensator for rendering the tripping devices inoperative when the compensator is in its first position, and operative when the compensator is in its second position.

In witness whereof, I have hereunto set my hand this 26th day of May 1909.

SIDNEY B. PAINE.

Witnesses:

BENJAMIN B. HULL,

HELEN ORFORD.