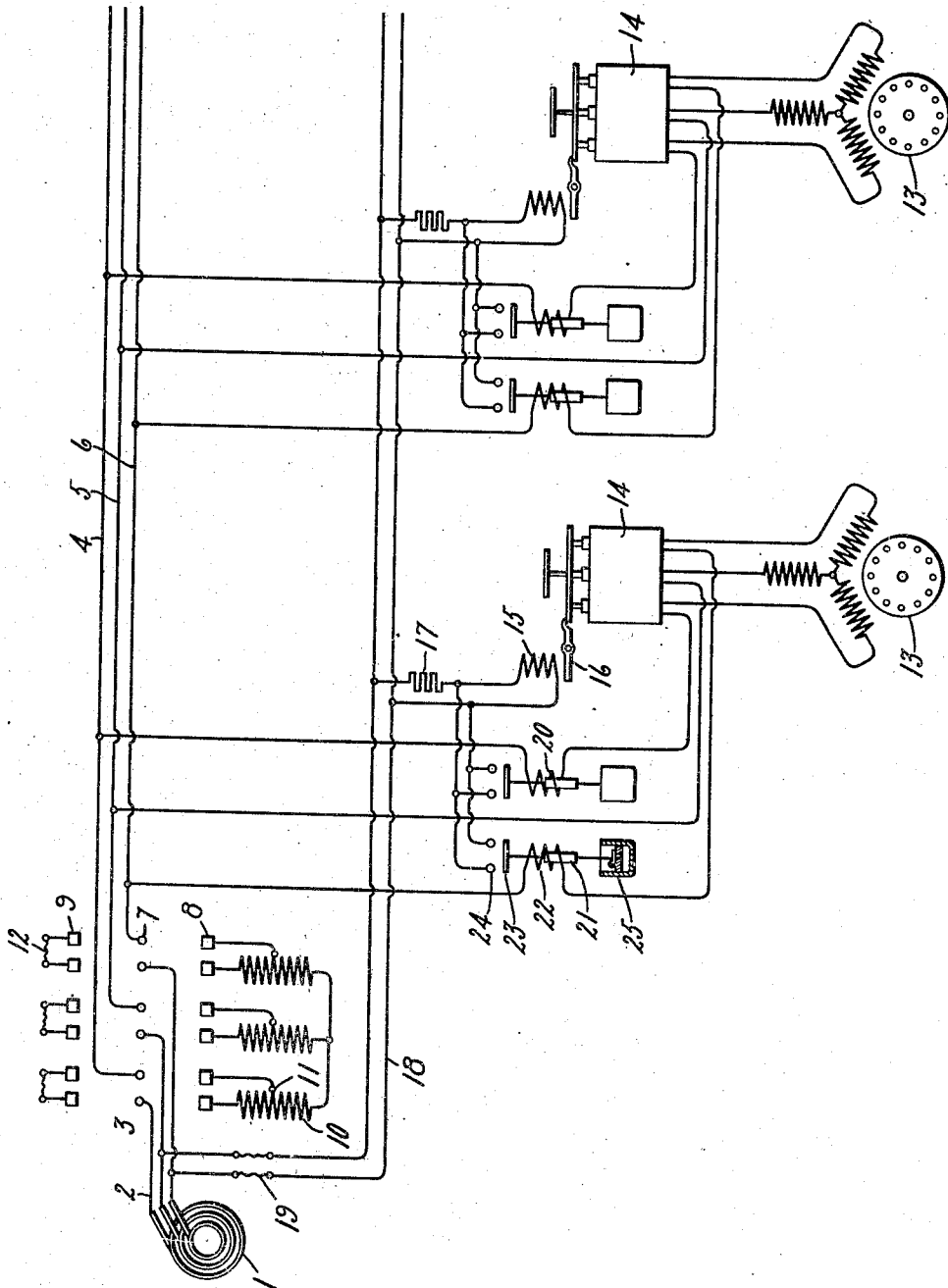


S. B. PAINE.
 APPARATUS FOR STARTING ELECTRIC MOTORS.
 APPLICATION FILED MAY 28, 1909.

940,550.

Patented Nov. 16, 1909.



Witnesses:

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 Att'y.

UNITED STATES PATENT OFFICE.

SIDNEY B. PAINE, OF NEWTON, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

APPARATUS FOR STARTING ELECTRIC MOTORS.

940,550.

Specification of Letters Patent.

Patented Nov. 16, 1909.

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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 the starting of a plurality of electric motors, and has for its object an improvement in the apparatus used in such a connection.

I accomplish the object of my invention by the employment of certain forms of apparatus and connections pertaining thereto, 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, which shows diagrammatically the connections and apparatus which I employ.

1 is a source of voltage which is illustrated as being a three-phase generator connected by conductors 2 to a suitable switching device 3, which is shown as being of the usual type of starting compensator employed with induction motors. Conductors 4, 5 and 6 are shown also connected to this starting device, the starting device being connected between the source and the conductors. The essential features of this starting device consist of a plurality of movable contacts 7, which may be made to engage with stationary contacts 8 and 9. When contacts 7 are in connection with contacts 8, conductors 4, 5 and 6 are energized from a portion of the voltage of the source; this being accomplished by suitable compensator windings 10, which are connected across conductors 2 and have connected to them taps 11 which energize conductors 4, 5 and 6 in the well known manner. When contacts 7 are in contact with contacts 9, the conductors 4, 5 and 6 are energized from full voltage from the source, fuses 12 being placed in series with these conductors in the usual manner.

A plurality of motors 13, as shown, are connected in parallel to conductors 4, 5 and 6, a switch being connected in series between each motor and the conductors. These switches are diagrammatically illustrated as

being of the usual oil-insulated type, and have in connection with them an electromagnetic under-voltage tripping device which consists of a coil 15, and tripping device 16, which, in conjunction with the usual mechanism, not shown, opens switch 14 when the voltage across coils 15 is lower than a predetermined amount. Connected in series with coil 15 is shown a resistance 17, the coil and resistance being connected by conductors 18 to conductors 2, either directly as shown or through a suitable transformer. Thus, the energization of these coils will be independent of the position of the starting device 3. Conductors 18 are shown as having placed in series with them fuses 19 for purposes of safety, and it is obvious that if so desired, switches may be placed in series with these conductors.

In addition to the under-voltage tripping devices, in connection with switches 14 are also shown overload tripping devices 20. These devices consist of a magnetic core which will be raised when a current above a predetermined amount flows in coil 22, shown in operative relation with core 21, and is connected in series with one of the phases of the circuits leading to the motor. When the core has been raised a certain amount contact 23 will make contact with contacts 24 and thus short circuit coil 15 of the under-voltage tripping device, and cause the switch 14 to open. In operative relation with movable core 21 is shown a dash-pot mechanism 25, which retards the motion of the overload device so that it will require a considerable period of time before it makes contact with contacts 24. The object of this mechanism is that when an induction motor is starting, it requires a current considerably in excess of the usual current which it takes when running. If the overload tripping devices are adjusted to be actuated slowly and not instantaneously when the motors are started with such excessive current as would normally cause these devices to be actuated, their movement is adjusted so as to be of such slow nature that there will not be sufficient time for them to trip the oil switches before the heavy starting current becomes reduced through the speeding up of the motors.

The operation of my apparatus will then be as follows:—When it is desired to start up a plurality of motors the under-voltage

tripping devices are connected up as shown, so that in case the voltage from the source is below normal, switches 14 will be open and it will be impossible to start motors 13.

5 The starting device 3 is then placed in such a position that contacts 7 are in connection with contacts 8, and conductors 4, 5 and 6 are, therefore, energized with a portion of the voltage from the source. The motors
10 will start up with a current in excess of the normal running current and the overload devices 20 will begin to be actuated, but their movement will be comparatively slow, because of the action of the dash-pot mechanism 25. After the motors have speeded up the usual amount, switching device 3 will be so operated that contacts 7 are in connection with contacts 9 and the motors will be energized with the full voltage from the
20 source. The current flowing in the coils of the overload tripping devices will be greatly diminished and the cores of these devices will tend to move downward due to the action of spring mechanism, not shown. The
25 running conditions will now prevail for the motors. If the voltage on the line decreases below a certain amount, oil switches 14 will be opened and if an overload occurs on any motor, the switch in series with it will be
30 opened to the action on the overload tripping device.

While I have shown my invention as applied to a certain form of apparatus and connections therefor, it is obvious that a
35 number of such forms and connections will be obvious to those skilled in the art, and I seek in the appended claims to cover all such forms and connections which will be in the spirit of my invention.

40 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 starting device connected between the source and the
45 conductors for simultaneously energizing the conductors alternately with a portion of the voltage from the source and with full voltage from the source, a plurality of motors

connected in parallel to the conductors, switches connected in series between the motors and the conductors, overload tripping devices for the switches, under-voltage electromagnetic tripping devices for the switches and conductors connecting said tripping devices to the source independently from the
55 starting device.

2. In a system of distribution, a source of voltage, a plurality of conductors, a compensator connected between the source and the conductors adapted in one position to energize the conductors with a portion of the voltage from the source and in another position with the full voltage from the source, a plurality of motors connected in parallel to the conductors, switches connected in series between the motors and the conductors, under-voltage electromagnetic tripping devices for the switches, conductors connecting said tripping devices to the source so as to be independent of the position of the compensator, and means operative upon an overload for actuating said tripping devices.

3. In a system of distribution, a source of voltage, a plurality of conductors, a compensator connected between the source and the conductors adapted in one position to energize the conductors with a portion of the voltage from the source and in another position with the full voltage from the source, a plurality of motors connected in parallel to the conductors, switches connected in series between the motors and the conductors, under-voltage electromagnetic tripping devices for the switches, conductors
85 connecting said tripping devices to the source so as to be independent of the position of the compensator, and means operative upon an overload to short-circuit said tripping devices after a predetermined time.

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

SIDNEY B. PAINE.

Witnesses:

BENJAMIN B. HULL,
HELEN ORFORD.