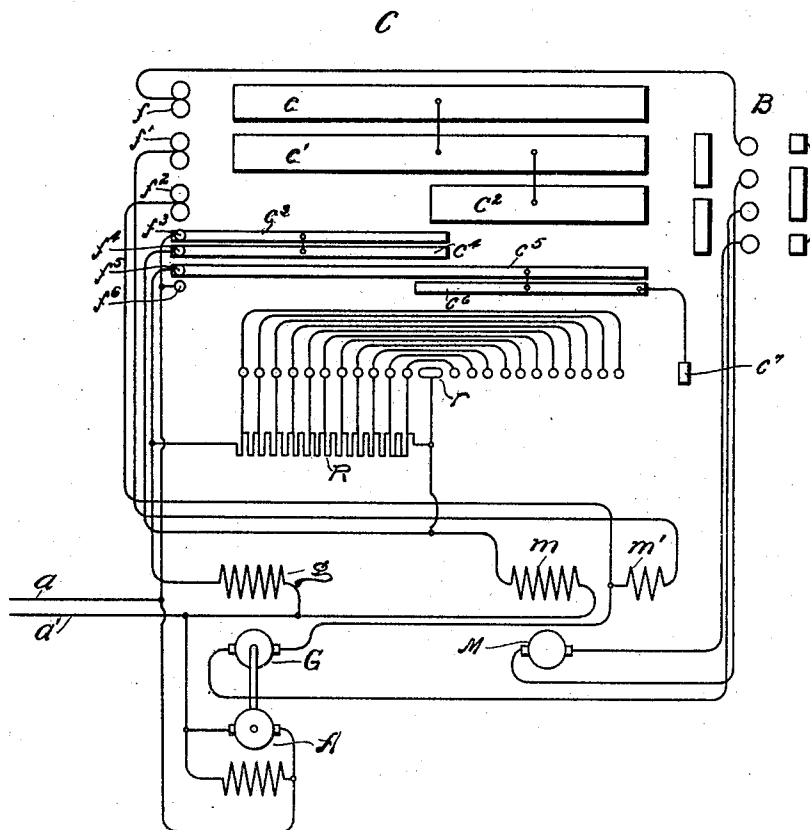


No. 773,836.

PATENTED NOV. 1, 1904.

H. E. WHITE.
CONTROLLING SWITCH.
APPLICATION FILED APR. 23, 1904.

NO MODEL.



WITNESSES:

George A. Thornton,
Allen Oxford

INVENTOR:

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UNITED STATES PATENT OFFICE.

HAROLD E. WHITE, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

CONTROLLING-SWITCH.

SPECIFICATION forming part of Letters Patent No. 773,836, dated November 1, 1904.

Application filed April 23, 1904. Serial No. 204,533. (No model.)

To all whom it may concern:

Be it known that I, HAROLD E. WHITE, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Controlling-Switches, of which the following is a specification.

My invention relates to controlling-switches for electric motors, and is particularly applicable in connection with what is commonly known as the "Ward-Leonard" system of motor control.

The object of my invention is to provide a novel and simple form of controlling-switch which shall enable a wide range of motor speeds to be obtained with efficiency. In what is known as the Ward-Leonard system of motor control the armatures of a generator and motor are connected together in a local circuit, and the fields of the generator or of both machines, which are separately excited, are varied. With this system a wide range of speeds may be obtained.

My invention consists in organizing and arranging a controlling-switch adapted to utilize a single resistance for both generator and motor fields in such manner that a progressive variation of the motor speed may be obtained over wide ranges.

My invention will best be understood from the accompanying drawing in which G represents the armature and g the field of an electric generator, which is driven by any suitable source of power—such, for instance, as a shunt-motor A , connected to the source of supply $a a'$.

M represents the armature of the motor to be controlled in speed, and m the separately-excited field.

m' represents a series field, as in this case I have shown the motor compound wound.

B represents a reversing-switch arranged to reverse the relative connections of the motor-armature M .

C represents the controlling-switch, by means of which the motor speed is varied.

Controlling-switch C consists of eight movable contacts, c to c^7 , and seven stationary contacts, f to f^6 , together with a number of re-

sistance-contacts connected to points on the resistance R . With the controlling-switch in the position shown circuits are closed as follows: from line-wire a to finger f^3 , contact c^3 , contact c^4 , finger f^4 . Here the current divides, part passing directly through motor-field m to line-wire a' and part passing through resistance R and generator-field g in series to line-wire a' . Motor-field m is thus connected directly across the line $a a'$, while generator-field g has the entire resistance R in series with it. In the position of switch C , as shown, the armature-circuits of generator and motor are open. Now if controlling-switch C be moved until contact c is brought into engagement with stationary contact-finger f a circuit is closed, as follows: from the right-hand brush of generator G through the series motor-field m' , contact f' , contact c' , contact c , contact f , through reversing-switch B , to motor-armature M , and through reversing-switch B to generator-armature G . The circuit of the motor-armature is thus closed, and the motor starts. This position corresponds to the lowest motor speed, since motor M has full field, while generator G has its minimum field, strength. As the controller C is moved still farther contact c' engages successively the stationary contacts connected to resistance R , and, as will be seen from the drawing, thereby reduces the resistance in series with generator-field g . When movable contact c' reaches the central contact r , resistance R is entirely short-circuited and both motor and generator are operating with full field. At the same time movable contact c^6 comes into engagement with contact-finger f^6 , thereby connecting generator-field g directly across the mains $a a'$ independently of contact c' . As controlling-switch C is moved to its next position movable contact c^2 is brought into engagement with contact-finger f^2 . The effect of this is to short-circuit the series field m' of the motor, and thereby to increase the motor speed. As the movement of the controlling-switch C is continued contact c' leaves the central resistance-contact r and traverses the left-hand resistance-contacts, thereby placing portions of resistance R in series with motor-field m , as will be seen

by tracing out the circuits, and further increasing the motor speed. In the last position of the controller the entire resistance R is in series with the motor-field m .

5 With the controlling-switch thus organized a single resistance may be utilized for both generator and motor, so as to obtain a uniform acceleration of the motor over wide ranges of speed. It will be understood that the arrangement of the contacts may be varied to meet varying requirements, and accordingly I do not desire to limit myself to the particular construction and arrangement of parts here shown, since changes which do not depart from the spirit of my invention and which are within the scope of the appended claims will be obvious to those skilled in the art.

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

20 1. In combination, an electric generator, an electric motor driven thereby, a separate source of excitation for both fields, a resistance, and a controlling-switch arranged to include variable portions of said resistance in series with either field.

25 2. In combination, an electric generator, an electric motor driven thereby, a separate source of excitation for both fields, a resistance, and a controlling-switch arranged to connect said resistance in series with the gener-

ator-field, then to gradually cut said resistance out of circuit, and then to gradually cut said resistance into circuit in series with the motor-field.

3. In combination, a separately-excited generator, a motor driven by said generator and having a separately-excited field and a series field, a resistance, and a controlling-switch arranged to connect said resistance in series with the generator-field, then to gradually cut said resistance out of circuit, then to cut the series field of the motor out of circuit, and then to gradually cut the said resistance into circuit in series with the separately-excited motor-field.

4. In combination, a separately-excited generator, a motor driven by said generator and having a separately-excited field and a series field, a resistance, and a controlling-switch adapted to include variable portions of said resistance in series with either of the separately-excited fields and to cut said series field into and out of circuit.

In witness whereof I have hereunto set my hand this 21st day of April, 1904.

HAROLD E. WHITE.

Witnesses:

BENJAMIN B. HULL,
HELEN ORFORD.