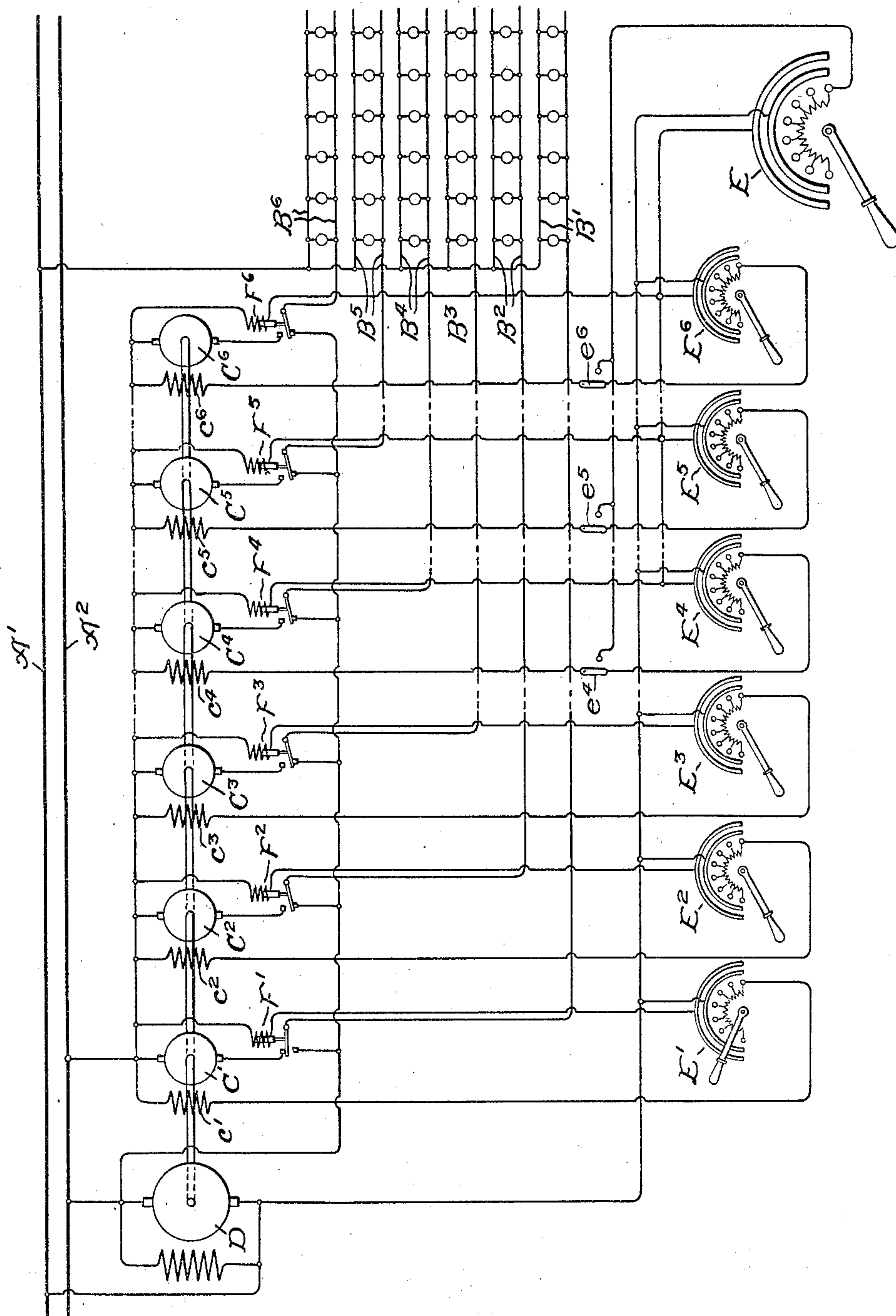


No. 894,522.

PATENTED JULY 28, 1908.

W. L. MERRILL.
VOLTAGE REGULATING SYSTEM.

APPLICATION FILED OCT. 27, 1906.



Witnesses:
Marcus L. Byng.
Helen A. Ford.

Inventor:
Wilbur L. Merrill,
by *Alfred S. Davis* Att'y.

UNITED STATES PATENT OFFICE.

WILBUR L. MERRILL, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

VOLTAGE-REGULATING SYSTEM.

No. 894,522.

Specification of Letters Patent.

Patented July 28, 1908.

Application filed October 27, 1906. Serial No. 340,813.

To all whom it may concern:

Be it known that I, WILBUR L. MERRILL, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Voltage-Regulating Systems, of which the following is a specification.

My invention relates to the control of electric circuits requiring variable-voltage, and is particularly applicable to the control of lighting circuits in theaters. Such circuits are ordinarily arranged with large rheostats in each circuit, so that the brilliancy of the lamps of the several circuits may be independently controlled by operating rheostats.

Since in theater lighting a large number of the lamps are operated for long periods at low voltages, not only is a great amount of power wasted in the rheostats, but also the rheostats must be of very large size to carry the current continuously without over-heating. By substituting for the usual rheostat in each circuit, a counter-electromotive force generator with means for controlling its field-strength, and providing means for connecting each lamp circuit directly to the source of current, or indirectly through the counter-electromotive force generator, the power usually wasted in rheostats may be saved. Thus, when the lamps are burning at full brilliancy they are supplied directly from the main circuit. When a lower voltage is required, the drop in voltage is obtained by counter-electromotive force, which, instead of wasting power in heat, returns power to the source.

My invention consists in arranging the switch for cutting each generator into and out of circuit, so that it is automatically actuated when the field-circuit of the generator is closed. By means of this arrangement the main circuit conductors need not be brought to the controlling switches at all, and great economy in wiring is secured.

My invention further comprises an arrangement of field rheostats, such that each generator may be controlled independently, or a plurality of generators may be controlled simultaneously.

My invention will best be understood by reference to the accompanying drawing, which shows diagrammatically a variable-voltage control system arranged in accordance with my invention.

In the drawing, A^1 and A^2 are main conductors representing a source of current.

B^1 to B^6 represent lamp circuits supplied from the mains.

C^1 to C^6 represent the armatures of counter-electromotive force generators, the fields being indicated by c^1 to c^6 .

D represents the driving means for the generators, and may conveniently be a shunt-wound motor supplied from the mains, as shown, carrying on its shaft the armatures of all the generators.

E^1 to E^6 represent the field-rheostats for the several generators.

F^1 to F^6 represent electro-magnetically actuated switches controlled by the field rheostats, and arranged normally to connect the several lamp-circuits directly to the mains, but when energized, to connect the lamp-circuits to the mains indirectly through the armatures of the several generators.

E represents a large rheostat adapted to control the fields of a plurality of generators simultaneously.

e^1 to e^6 represent switches arranged to connect three generator fields either to the individual rheostats or to the large rheostat E.

The operation of the system is as follows: When full brilliancy is required on the lamp circuits, the rheostats E^2 to E^6 and E are in the positions shown, so that the magnetically-actuated switches F^2 to F^6 are deenergized, and the lamp-circuits are connected directly across the mains A^1 and A^2 . Now, if it is desired to reduce the brilliancy of the lamps the arm of a rheostat may be moved so that it will be in some such position as that shown by the arm of the rheostat E^1 in circuit B^1 . This establishes two circuits, one extending from conductor A^2 , through the field c^1 , and through the resistance of rheostat E^1 to conductor A^1 , and the other extending from conductor A^2 through the magnet winding of the magnetically actuated switch F^1 , and through the semi-circular contacts of rheostat E^1 to conductor A^1 . The field C^1 is consequently supplied with its minimum current and at the same time switch F^1 is energized, connecting the circuit B^1 to the mains through the armature C^1 . The introduction of the generator-armature into the lamp circuit is thus produced automatically upon the closing of the field-circuit of the generator. The rheostat-arm may be

moved successively over the several resistance-stops, strengthening the field c' and reducing the voltage impressed on the circuit B^1 . This reduction of voltage in circuit B^1 does not produce an entire waste of power, as in rheostatic control, but the counter-electromotive force generator acts as a motor, tending to drive the motor D as a generator, so as to return energy to the mains.

10 With the switches e^4 , e^5 and e^6 in the position shown, each one of the generators may be controlled independently. It is desired to control the three generators C^4 , C^5 and C^6 simultaneously, the switches e^4 , e^5 and e^6 may be shifted to their other positions, in 15 which the three generator fields are connected in parallel to the large rheostat E . It will be seen that this large rheostat is connected to the three magnetically-actuated switches F^4 , F^5 and F^6 , so that when this 20 rheostat is moved to close the field-circuits, the three generator-armatures will simultaneously be cut into their respective lamp circuits.

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

1. In combination, a source of current, a plurality of circuits normally supplied directly therefrom, a plurality of counter-electromotive-force generators, adjustable individual field rheostats connected to the fields 30 of each generator, and relays operatively

connected to the individual field rheostats having their contacts arranged to disconnect a conductor of each of the circuits supplied 35 by the source of current from the source and to connect these conductors to the source each through the armature of a separate generator.

2. In combination, a source of current, a 40 plurality of circuits normally supplied directly therefrom, a plurality of counter-electromotive-force generators, adjustable individual field rheostats connected to the fields of each generator, relays operatively connected to the individual field rheostats having 45 their contacts arranged to disconnect a conductor of each of the circuits supplied by the source of current from the source and to connect these conductors to the source each 50 through the armature of a separate generator, and an adjustable field-rheostat adjustably connected to a plurality of generator fields in parallel operatively connected to a plurality of relays for simultaneously operating 55 the relays and simultaneously controlling the voltage of the generators connected to the circuits by the relays.

In witness whereof, I have hereunto set my hand this 25th day of October, 1906.

WILBUR L. MERRILL.

Witnesses:

ALEX. F. MACDONALD,
HELEN ORFORD.