

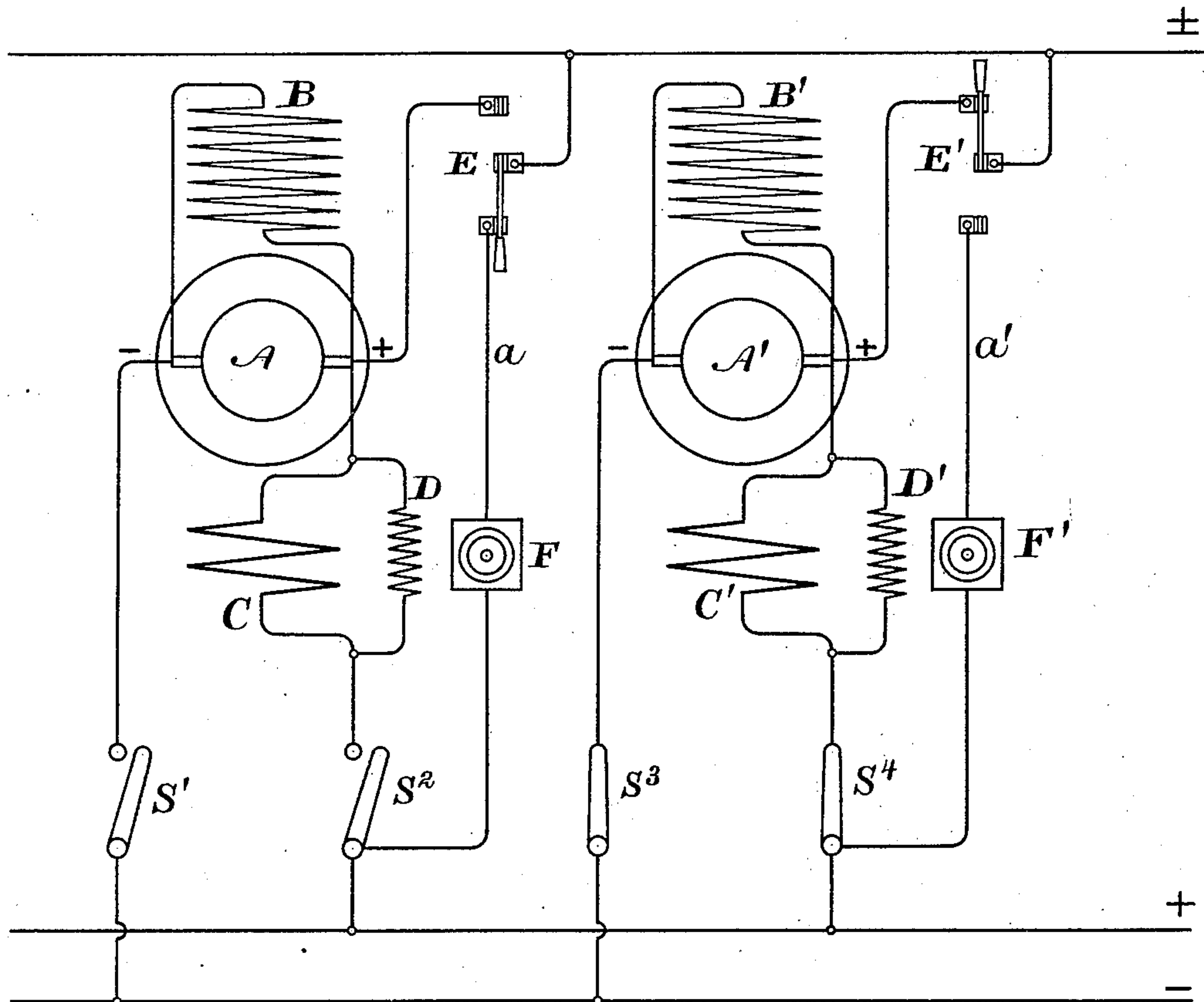
(No Model.)

W. B. POTTER.

RUNNING COMPOUND WOUND GENERATORS IN MULTIPLE.

No. 559,907.

Patented May 12, 1896.



WITNESSES.

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UNITED STATES PATENT OFFICE.

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RUNNING COMPOUND-WOUND GENERATORS IN MULTIPLE.

SPECIFICATION forming part of Letters Patent No. 559,907, dated May 12, 1896.

Application filed February 25, 1896. Serial No. 580,686. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM B. POTTER, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Running Compound-Wound Generators in Multiple, (Case No. 349,) of which the following is a specification.

My invention relates to running compound-wound dynamo-electric machines in multiple, and has for its object to provide for the peculiar difficulty sometimes found in systems employing such machines, which occurs more often in electric railways than in other installations. It sometimes occurs in the operation of electric roads that where the load changes very greatly it becomes desirable to change the ratio of overcompounding. For instance, in what are called the "rush hours" of electric-railroad work, in the afternoons and mornings, when the load upon the entire station is very great, utilizing its capacity to the utmost, a high percentage of compounding is necessary in order to supply the outlying portions of the line with current, whereas at other times, when part of the station is shut down, and principally at night when but few cars are run and those on long headway, the demand for current is small and the overcompounding needs to be less. As a typical case, suppose there were a half-dozen generators in multiple supplying a road which in the afternoon would need the entire capacity of the station for current, a large number of cars being run at short intervals, while at night a single generator would readily supply the entire output of the station, the number of cars being small. As ordinarily installed at the present time, railway-generators have a proportion of overcompounding of about one-tenth, or, as it is ordinarily called, "ten per cent. overcompound." It will readily be seen that where two or three thousand amperes are taken this entire amount may be necessary, while if the current output were cut down to one-tenth of this the voltage on the line would rise in undue proportion, the resistance remaining substantially constant and the drop increasing with the amount of current flowing in accordance with Ohm's law. It is to remedy this particular condition of affairs and

provide a substantially uniform rate of speed for the cars at all times of the day that I have devised my present invention, it being well known that an increase of potential would accelerate the motors. By the arrangement which I have devised whenever a machine is shut down the series coils of the other machines are shunted through a resistance substantially equal to that of the entire series circuit of the machine which has been shut down. Where there are several machines, there would be several resistances. The consequence is that the percentage of overcompounding is lower for each machine shut down and that the current supplied to the system is at such voltage as is properly proportioned to the drop. In speaking of the resistance which is interpolated to take the place of the machine which is cut out I do not mean to limit myself to an exact equivalence, as it is manifest that, if desired, a somewhat higher proportion of overcompounding than an exact aliquot proportioning may be observed, or under some peculiar circumstances a lower ratio might be provided, as where it is intended that the night cars on the road shall be run at a less rate of speed than in the daytime.

The accompanying drawing is a diagram illustrating my invention as applied to two machines, its application to a greater number being readily apparent, wherein—

A A' are the armatures of the machines; B B', their shunt-coils; C C', the series coils; D D', fixed resistances shunting the series coils. In installing such machines it is customary to wind the series coils in the shop to give a certain definite ratio of over compounding, say ten per cent., but as it is impossible to so proportion the machines that they shall be exact counterparts of each other the fixed resistances D D' are usually inserted around the series coils to balance the machines in their final running, so that their load-curves will be as closely alike as possible. The resistance of the series circuit from the plus-brush of the machine to the bus-bar is therefore composed of two parts in multiple, the resistance D and the series coil C. The bus-bars in the drawing are marked plus and minus, and the equalizing-bus is marked with the neutral sign. Switches E E' and S' to S⁴ are

also provided for throwing the machines into and out of circuit.

One particular feature of my invention is the resistances F F' , interpolated in the leads
 5 a a' , communicating, respectively, with the switches S^2 S^4 . This resistance, as already explained, is substantially equal in amount to the resistance of the series coil C plus the shunting resistance D , taking the two in multiple. As already pointed out, I do not wish
 10 to limit myself to this precise proportion, as it might be varied, but it is not ordinarily necessary or desirable to make this resistance an adjustable one.

15 Another feature of my invention is the use of a double-throw single-pole switch, such as that shown at E or E' , between the equalizing connection and the plus bus-bar in the lead a , in which the resistance F is interpolated.
 20 This switch serves to connect either the series circuit of the machine to the equalizer or the shunting resistance F . By this combination I am enabled to change the ratio of compounding in the way pointed out, by a single motion,
 25 and as this is ordinarily done at a time when the station attendants are occupied with necessary changes to adapt the station to its night load it is of great importance to effect it with as little delay and manipulation as
 30 possible.

The method of operation is as follows: When it is desired to shut down one of the machines—for instance, machine A —the switches S' S^2 are opened, and the switch E
 35 is thrown, the machine A is slowed down and stopped, the switches of course being opened at the proper time in this operation, and the resistance F thus becomes a shunt around the series coil and its adjusting resistance of the
 40 machine A' . Similarly, should the machine

A' be shut down, the switches S^3 S^4 would be opened and the switch E' thrown, cutting in the resistance F' as a shunt around the series coil and its adjusting resistance of the machine A . 45

Of course in installing the apparatus where a number of generators were used there would be a shunting resistance for each one of the machines.

What I claim as new, and desire to secure 50 by Letters Patent of the United States, is—

1. The means for adjusting the compounding effect of generators operated in multiple, consisting of a shunt around the series circuit of each of such machines, the shunt being substantially equal in resistance to the resistance
 55 of the series coil and its adjusting resistance.

2. In combination, a number of compound-wound dynamo-electric machines operated in multiple, a resistance in multiple with each
 60 machine substantially equal to the resistance of its series coil and adjusting resistance, and switches for cutting in and out the shunting resistance.

3. In combination, a number of generators 65 operating in multiple and provided with an equalizing connection, a shunt around the series circuit of each machine between the equalizer and the positive bus, and a double-throw switch in the shunt adapted to connect
 70 in one position the positive side of the machine to the equalizer, and in the other position the positive bus-bar to the equalizer.

In witness whereof I have hereunto set my hand this 18th day of February, 1896.

WILLIAM B. POTTER.

Witnesses:

B. B. HULL,

A. F. MACDONALD.