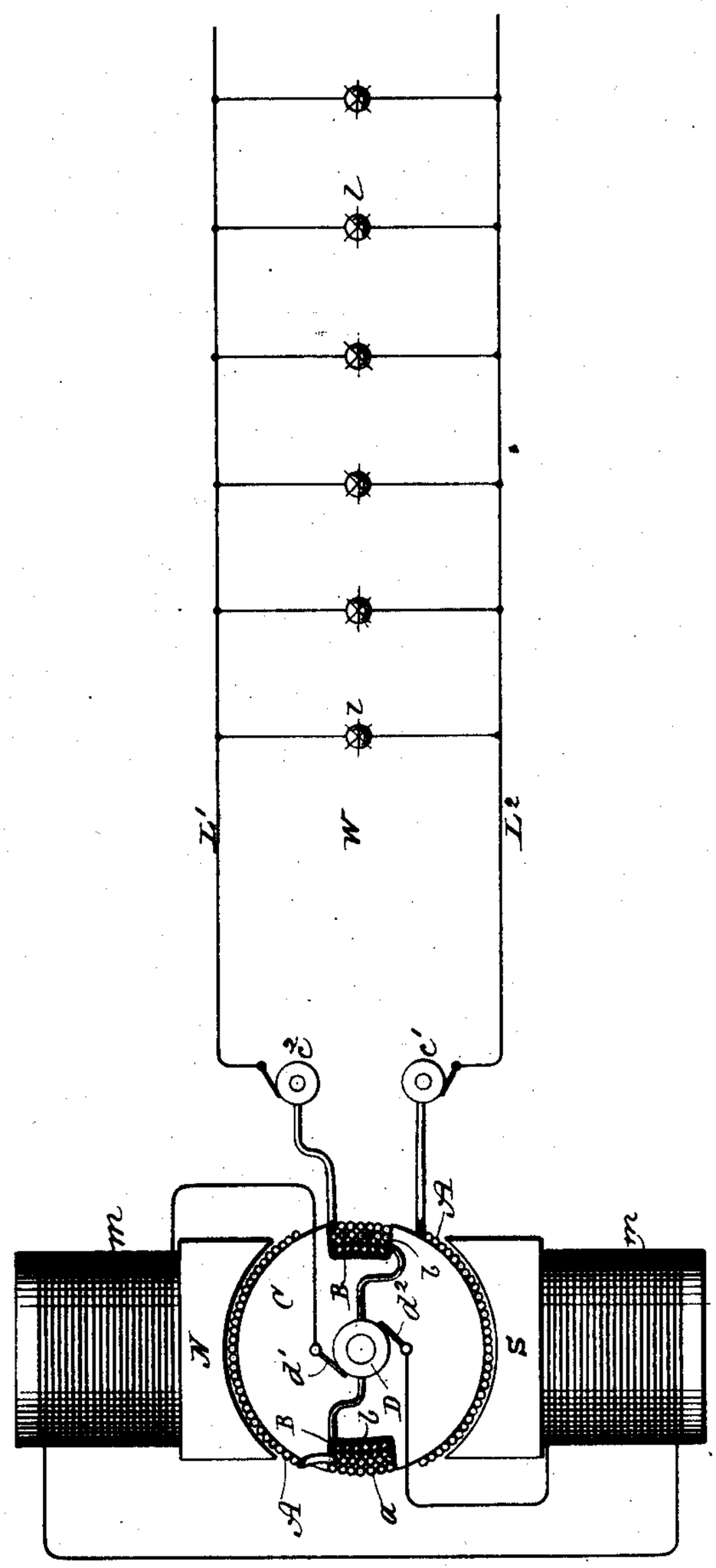
(No Model.)

W. STANLEY, Jr.

SELF REGULATING DYNAMO ELECTRIC GENERATOR.

No. 431,217. Patented July 1, 1890.



Witnesses:

Raphael Netter

Sands F. Randall

Inventor:

William Stanley Jr.

By

Clarkson A. Collins

Attorney.

UNITED STATES PATENT OFFICE.

WILLIAM STANLEY, JR., OF GREAT BARRINGTON, MASSACHUSETTS.

SELF-REGULATING DYNAMO-ELECTRIC GENERATOR.

SPECIFICATION forming part of Letters Patent No. 431,217, dated July 1, 1890.

Application filed September 23, 1889. Serial No. 324,727. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM STANLEY, Jr., a citizen of the United States, residing in Great Barrington, in the county of Berkshire and State of Massachusetts, have invented certain new and useful Improvements in Self-regulating Dynamo-Electric Generators, (Case No. 133,) of which the following is a specification.

My invention relates especially to that class of alternate-current electric generators in which the current required for exciting the field-magnets is derived from the armature of the machine itself instead of from an external source; and the object of my improvements is to automatically vary the excitation of the field-magnets in proportion to variations in the load or in the amount of work being done in the work-circuit, in order to maintain a constant difference of potential between the terminals of the work-circuit, notwithstanding variations in the quantity of current flowing therein.

In carrying the invention into effect an armature is wound with two independent sets of coils, one of which supplies current to the work-circuit containing translating devices, while the other has its terminals connected with the field-magnet coils. In the field-magnet circuit is interposed a rectifying-commutator for the purpose of rendering the current supplied to the field-magnet coils continuous in direction, while the terminals of the coils supplying current to the work-circuit are connected in the usual manner to collector-rings. To those armature-coils which supply current for the excitation of the field-magnets are applied supplemental coils, each of which consists of a comparatively few turns of wire and is connected in series with one of the coils supplying current to the work-circuit. The relative positions of the coils are such that there shall be a flow of current through a given supplemental coil derived from the armature-coil with which it is connected at the time when the armature-coil to which it is applied is at or near its position of minimum electro-motive force. The supplemental coils are connected so that the current will flow through them in such a direction as to strengthen the polarization of the armature, and hence to increase the potential developed in those armature-coils to which they are applied.

The invention will be best understood by reference to the accompanying drawing, which is a diagram illustrating the organization of apparatus.

Referring to the figure, N S represent the field-magnets of a dynamo having field-magnet-coils *m m*.

C is the armature-core, upon which are wound independent armature-coils A B, approximately at right angles to one another.

The armature-coil B is preferably wound in a recess *b*, so that it lies within the exterior circumference of the core C, and its terminals are connected with the field-magnet coils *m m* by means of a commutator D and brushes d' d^2. The coil A is connected with the mains L' L^2 of the work-circuit W by means of collector-rings c' c^2. Applied to the coil B is a supplemental coil *a*, consisting of a comparatively few turns of wire and connected in series with the coil A. The armature-coil B, together with the supplemental coil *a*, is preferably wound in a recess *b*, so as to lie within the exterior circumference of the armature-core C. It is evident that current from the coil A will flow through the supplemental coil *a* at the moment when the coil B is in its position of minimum electro-motive force, and the flow of current through the coil *a* will develop lines of force in a direction operating to strengthen the polarity of the armature-core and increase the number of the lines of force threading the coil B. On an increase in the number of translating devices in circuit in the work-circuit W there will be a decrease in the difference of potential between the terminals of the coil A supplying current to the work-circuit, and in order to maintain the difference of potential constant an increase in the excitation of the field-magnets is necessary. The fall in potential is, however, accompanied by an increased flow of current in the work-circuit, and consequently through the supplemental coil *a*, and the number of lines of force of the magnetic field of the machine threading the coil B is augmented by the additional lines of force developed by the increased flow of current through the coil *a*; hence there will be an increase in the potential developed in the coil B, with a correspond-

ing increase in the excitation of the field-magnets, and the difference of potential between the terminals of the work-circuit will be maintained constant. Conversely the tendency to a rise in the difference of potential between the terminals of the work-circuit consequent upon a decrease in load will be checked, since the number of lines of force threading the coil B will decrease with the decrease in the quantity of current flowing through the coil *a*.

It is evident that the position of the coil *a* will be reversed with each reversal in the direction of the current flowing through it, and thus the lines of force developed by the current in the coil *a* will maintain a constant direction, as related, to the direction of the lines of force of the magnetic field of the machine, and will always operate to assist the magnetization of the armature-core.

For convenience of illustration I have shown the machine as constructed with only two armature-coils, the one supplying current to the work-circuit and the other to the field-magnet coils. In practice, however, it is desirable, for reasons well understood by those skilled in the art, that there should be two or more armature-coils in each set, the regulating-coils being arranged with reference to the field-supplying and work-supplying coils in the manner already shown.

The advantages of my invention will be readily apparent to those skilled in the art, since by means of it a constant difference of potential may be automatically maintained between the terminals of a dynamo-electric machine through great variations in the amount of load upon the work-circuit.

I have not attempted to describe herein all possible forms of the apparatus invented by me, various modifications of which will readily occur to those skilled in the art; nor have I attempted to describe all possible forms of apparatus by means of which the method of operation herein described and which also forms part of my invention may be carried into effect, but only the best form of apparatus now known to me for the purpose.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a self-exciting electric-current generator, the combination of two independent sets of armature-coils lying within the same field of force, the one supplying current to the field-magnet coils and the other to the work-circuit, and regulating-coils applied to the first-named set of armature-coils and wound upon the same core therewith and in circuit with the armature-coils which supply current to the work-circuit, substantially as set forth.

2. In a self-exciting electric-current generator, the combination of two independent sets of armature-coils, the one set supplying current to the field-magnet coils and the other supplying current to the work-circuit, regulating-coils applied to the first-named set of armature-coils and wound upon the same core therewith and in circuit with the armature-coils which supply current to the work-circuit, and a rectifying-commutator in the field-circuit, substantially as and for the purposes set forth.

3. In a self-exciting electric-current generator, the combination of an armature-coil supplying current to the work-circuit, a second armature-coil supplying current for the excitation of the field-magnets, and a regulating-coil connected in circuit with the first-mentioned armature-coil and wound upon the armature-core, substantially as set forth.

4. In an electric-current generator, a set of armature-coils supplying current to a work-circuit, a second set of armature-coils supplying current for the excitation of the field-magnets, and in combination with the coils of the second set, regulating-coils wound upon the armature-core therewith and traversed by alternating currents derived from the first-named set of armature-coils, substantially as set forth.

5. The combination, with a field-magnet, of an armature-coil delivering currents continuous in direction to the coils of such field-magnet, a second armature-coil delivering currents to a work-circuit, and a regulating-coil connected in series with the second armature-coil and occupying such a position upon the armature-core as to establish lines of force supplementing the normal field of force in which the first-named armature-coil revolves.

6. In a self-exciting self-regulating electric-current generator, the combination of two independent sets of armature-coils, the one serving to excite the field-magnets of the generator, the other to deliver current to the work-circuit, and supplemental armature-coils applied to the exciting-coils and connected in circuit with the coils of the other set, whereby currents traversing said supplemental coils operate to establish lines of force acting upon the exciting-coils, in value dependent upon the current derived from the coils of the second set of armature-coils and in direction dependent upon the relative position of said supplemental coils and the coils with which they are connected.

7. The hereinbefore-described method of generating and regulating electric currents, which consists in generating electric currents by the movement of a conductor in a field of force and maintaining a field of force thereby, generating alternating currents in a separate conductor in said field of force, developing by means of such alternating currents supplemental lines of force approximately fixed in direction with reference to said field of force, and directly augmenting the value of said field of force by adding thereto the supplemental lines of force developed by said alternating currents.

8. The hereinbefore-described method of generating and regulating electric currents, which consists in developing alternating currents in two independent armature-circuits

subject to a common field of force, directing the current in one of such circuits to a work-circuit and commutating the current flowing in the other circuit and maintaining the field of force thereby, augmenting the number of lines of force of such field by directly adding thereto supplemental lines of force developed by the current flowing in such first-named circuit, thereby varying the number of lines of force acting upon the circuit which supplies current for the excitation of the field-magnets, and consequently the value of the current therein in proportion to variations in the current in the work-circuit.

9. The hereinbefore-described method of governing the generation of electric currents, which consists in modifying the effective value of the field of force in which the armature revolves by developing an alternating current in a coil upon the armature, transmitting said current through a separate coil revolving within such field of force, and reversing the position of such coil with each alternation of the alternating current.

10. The hereinbefore-described method of governing the generation of electric currents, which consists in modifying the number of lines of force traversing the armature by developing an alternating current and causing it to circulate around the armature and in reversing the position of the armature and of the conductor conveying such alternating current with each alternation.

11. The hereinbefore-described method of controlling the electro-motive force of an electric generator, which consists in establishing lines of force for the armature, modifying the number of lines of force in which the armature revolves by alternating currents generated synchronously with the reversals in the position of the armature, and causing such alternating currents to develop lines of force constant in direction with reference to the first-named lines of force.

12. The method of governing the effective field-force of an electric generator, which consists in creating a variable subsidiary or controlling polarization for the armature by transmitting electric impulses around the armature, causing the conductor conveying such impulses to reverse its position and the impulses to reverse in direction synchronously with the reversals in the position of the armature.

13. The method of governing the electro-motive force of an electric generator, which consists in transmitting an alternating electric current around the armature, and thereby creating a variable, subsidiary, or controlling polarization for the armature, causing the conductor conveying such current to reverse its position synchronously with the reversals in the position of the armature and with the alternations of the current, and in varying the quantity of such alternating current, thereby varying the effective field of force of the generator, and thus its electro-motive force.

In testimony whereof I have hereunto subscribed my name this 10th day of September, A. D. 1889.

WILLIAM STANLEY, JR.

Witnesses:
WM. F. ZIMMERMAN,
MOSES J. DE WITT.