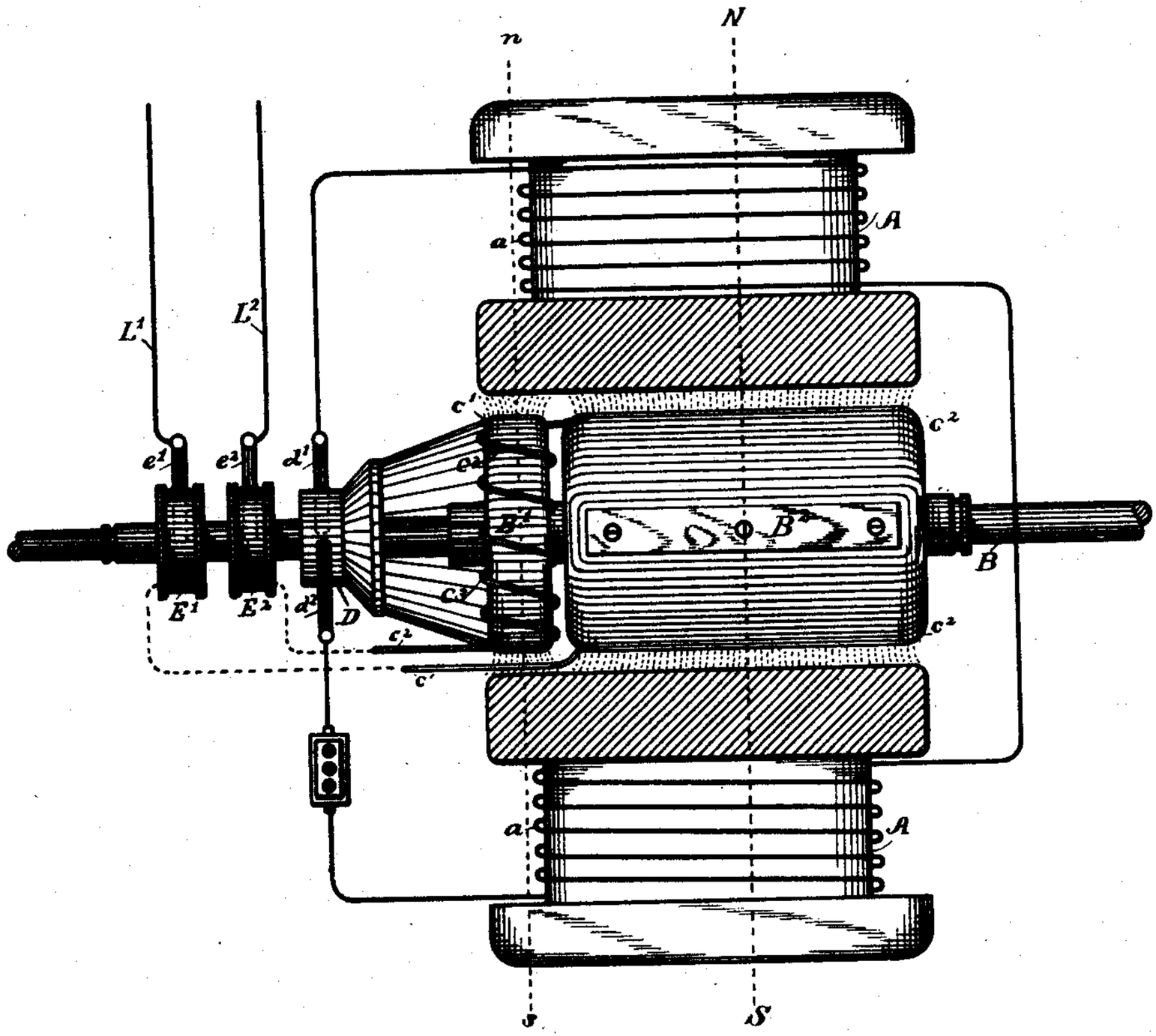
(No Model.)

O. B. SHALLENBERGER.

DYNAMO ELECTRIC MACHINE.

No. 431,235. Patented July 1, 1890.



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DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 431,235, dated July 1, 1890.

Application filed January 24, 1889. Serial No. 297,374. (No model.)

To all whom it may concern:

Be it known that I, OLIVER B. SHALLENBERGER, a citizen of the United States, residing in Rochester, in the county of Beaver and State of Pennsylvania, have invented a certain new and useful Improvement in Dynamo-Electric Generators, (Case 267,) of which the following is a specification.

The invention relates to the class of electric generators in which the field of force for the armature is maintained by means of currents which may either be generated in the machine itself or obtained from a separate source.

The special objects of the invention are to provide a simple and efficient method of obtaining the proper field of force for such generators, whether designed to deliver continuous or alternating currents to the work-circuit, and to secure such variation or regulation on the part of the field of force as may be required by reason of variations in the current delivered to the work-circuit. In some instances it is required that the electro-motive force of the generator should remain approximately constant, notwithstanding the variations in the amount of work being done. In other instances it is desirable that the difference of potential at the terminals of the machine should increase in direct proportion to the increase of current, in order to compensate for the increased drop or load upon the circuit due to the flow of the increased current.

The invention has therefore this further object of providing for such varying difference of potential wherever occasion shall require.

The general plan of carrying the invention into practice is as follows: Two armatures are placed side by side upon an armature-shaft and they revolve in the fields of force established by a single field-magnet. The terminals of one of the armatures are connected with the field-magnet coils through a suitable commutator and it supplies the current necessary to excite the field-magnet. The terminals of the other armature are connected with suitable commutator or collector rings through a supplemental coil applied to the first-named armature. The currents delivered to the work-circuit are derived from the second armature, and are either continuous in direction or alternating, as may be required, and accordingly as they are delivered through a commutator or simple collecting-rings in manner well understood. For convenience of description, the first-named armature will be referred to as the "field-circuit armature" and the second as the "work-circuit armature." The alternating impulses which flow through the supplemental coils of the field-circuit armature are always in the proper direction to tend to establish a line of polarization in a given direction with reference to the field-magnet. As the current flowing to the work-circuit increases, the value of this line of polarization also increases. The effective polarization to which the exciter-armature is subjected may be augmented or lessened, according to the direction of this line of polarization thus established. This in turn acts to vary the electro-motive force of the work-circuit armature. Therefore this variable line of polarization may be appropriately termed the "compensating polarization of the machine," for through its instrumentality the variations in current delivered by the work-circuit armature automatically cause variations in the electro-motive force of the machine.

Any required direction may be given to the compensating polarization by changing the position of the supplemental coils, and its value may be changed by varying the number of convolutions. By means of these two variable factors numerous resultant effects may be produced upon the field of force of the generator and upon the value of the current delivered to the work-circuit. Thus as more current is required the difference of potential may be made to remain the same or increased or diminished as required.

There are many different ways whereby the invention may be carried into practice. The figure in the drawing shows, partially in diagram, an organization of circuits and apparatus for carrying out the invention, and if taken in connection with this specification will serve to disclose the principles of the invention and the manner of practicing the same.

Referring to the figures, A represents a

field-magnet for establishing the field of force for two armatures B′ B², carried upon a shaft B. The armature B′ revolves in the field *n s*. It is wound with coils *c′*, in which currents are generated for exciting the field-magnet. For this purpose the coils *c′* may be connected with a commutator D in any convenient well-understood manner for rendering the currents generated therein continuous in direction. The commutator-brushes *d′ d²* are connected with the terminals of the field-magnet coils *a*. The armature B′ may be of the drum or cylinder type, or a Gramme ring or other suitable well-known construction, it being essential only that currents be generated therein by its revolution between the poles of the field-magnet. The circuit-connections and the construction and operation of the commutator will be sufficiently evident to those skilled in the art without further explanation.

The second armature B² is mounted upon the shaft B, together with the armature B′, and revolves in the field N S. It may be of any suitable well-known character. That here shown consists of a so-called "drum-armature" wound with coils *c²*. The current required for supplying a work-circuit, to which the conductors L′ L² are supposed to lead, are derived from the armature B². For this purpose the terminals of the coils *c²* are connected with two contact-rings E′ E², and the conductors L′ L² are connected with suitable contact-brushes *e′ e²*, pressing against the respective rings. A suitable commutator may replace the rings E′ E² when continuous currents are desired upon the work-circuit.

It is apparent that unless further provision were made the field of force established by the field-magnet would remain approximately the same, whatever variations might occur in the current delivered to the work-circuit L′ L² from the armature B². It is frequently desired, however, to cause the field of force to vary in some manner dependent upon the variation of current required by the work-circuit. Thus when the load upon the work-circuit increases, requiring more current, it may be desired to correspondingly increase the field of force. To accomplish this a second winding *c³* is applied to the armature B′ and connected in series with the coils of the armature B², so that the current which passes to the work-circuit passes through the supplemental coils of the armature B′. This winding is so applied to the armature B′ that it tends to polarize the core of the armature B′ in a certain definite direction with reference to the armature B². The current traversing the coils *c³* will consist of a succession of impulses alternating with reference to the conductor itself, but constant in direction with reference to the direction of polarization. This will be evident from the fact that with each alternation there will be a reversal in the position of the coils *c³* with reference to the field-magnet, so that the resultant compensating polarization will always be in the same direction. By properly locating the coils these impulses may be made to occur at such moments that the polar-line established will pass through the field-magnet poles, thus increasing the lines of force *n s* cut by the coils *c′*, thereby increasing the electro-motive force of the current delivered by these coils to the field-magnet. The field of force N S is thus increased proportionally, and a consequent higher electro-motive force is obtained on the part of the armature B². It is evident that as the current flowing from the coils *c²* through the coils *c³* to the work-circuit increases the compensating polarization will be increased in value accordingly, and as the current flowing decreases the compensating polarization will decrease. By properly proportioning the amount of winding and its position the variation in difference of potential thus obtained may be made to assume any required amount within certain limits, so that a rising potential, a falling potential, or a constant difference of potential may be obtained at the terminals, as desired.

The direction of the compensating polarization with reference to the position of the armature B² when delivering an impulse of maximum value may be made to variously modify the effect of the supplemental coil.

As already observed, various modifications of the organization of apparatus and the method of constructing and winding the armatures may be resorted to without departing from the spirit of my invention; but that which I have already described will serve to disclose the nature of the invention and the method of practicing the same, the principle being essentially the same, whatever be the character of the armature employed.

I do not herein claim an electric generator in which both sets of armature-coils are wound upon one and the same core, nor the method of generation, wherein both systems of lines of force are developed in the same longitudinal portions of the field.

I claim as my invention—

1. The combination, with the field-magnet of an electric generator and an armature adapted to revolve within the field of force established by currents delivered by its coils, of a second armature delivering currents to a work-circuit, and a second coil applied to the first-named armature and connected in series with the coils of the second armature.

2. The combination, with the field-magnet of an electric generator, of an armature revolving within a field of force, a second armature producing currents by revolution in a field of force established by currents delivered by the first-named armature, and coils applied to the first-named armature connected in series with the coils of the second armature, through which electric currents are delivered, producing a polarization on the part

of the first-named armature approximately fixed in direction with reference to its own field of force.

3. The combination, with a field-magnet, of an armature revolving in the field of force established thereby, a second armature, coils for establishing a field of force therefor receiving currents from the first-named armature, and supplemental coils wound upon the first-named armature and revolving therewith, receiving currents from the second armature.

4. The combination, with a field-magnet, of an armature delivering currents continuous in direction to the coils of said field-magnet, a second armature revolving in unison with the first-named armature, and a second coil applied to the first-named armature and connected in series with the coils of the second armature, the position of the second coils being such as to establish lines of force for the first-named armature supplementing the normal field of force in which such armature revolves.

5. The combination, with a field-magnet and two armatures revolving within the field of force established thereby, of a commutator through which currents are delivered from one armature to the coils of the field-magnet for exciting the same, a supplemental coil applied to said armature and receiving currents from the first-named armature, and a commutator or collector constituting the terminals of the coils of the second armature.

6. In a self-exciting self-regulating electric generator, the combination of two armatures, one serving to excite the field-magnet of the generator, the other to deliver currents to the work-circuit, and supplemental coils applied to the exciting-armature and connected in circuit with the other armature, whereby currents traversing said supplemental coils tend to establish lines of polarization for the exciting-armature in value dependent upon the current derived from the second armature, and in direction dependent upon the relative position of said supplemental coils and the coils of the second armature.

7. The combination, with the field-magnet of an electric generator and an armature adapted to revolve within the field of force established by currents delivered to its coils, of a second armature delivering currents to a work-circuit, and a supplemental coil applied to the first-named armature, connected in series with the coils of the second armature, the position of said supplemental coils being such with reference to the first-named coil as to develop lines of force passing through the first-named coils.

8. The combination, with the field-magnet of an electric generator, of an armature revolving within a field of force, a second armature producing currents by its revolution in the field of force established by currents delivered by the first-named armature, and coils applied to the first-named armature connected with the coils of the second armature, through which electric currents are delivered, producing polarization on the part of the first-named armature approximately fixed in direction with reference to its field of force, but having their circuit complete independently of said field-magnet.

9. The combination, with two armatures, of coils for establishing fields of force therefor, receiving currents from one of the armatures, and supplemental coils connected with the coils of the other armature, and so located with reference to the first-named armature as to develop lines of force which traverse the main coils of said first-named armature.

10. In a self-exciting compensating electric generator, the combination of two armatures, one serving to excite the field-magnet of the generator, the other to deliver currents to the work-circuit, supplemental coils applied to the exciting-armature and connected in circuit with the other armature, and so located with reference to the main coils of the first armature as to establish lines of polarization through the main coils of the first-named armature in value dependent both upon the current delivered from the second armature and the strength of the field of force for the first-named armature, and in direction dependent upon the relative positions of the supplemental coils and of the second armature.

11. The hereinbefore-described method of generating and controlling electric currents, which consists in exciting a field-magnet by currents generated in a portion of its own field of force, generating alternating currents in another portion of the field of force, modifying the effective value of the first portion of the field of force by the alternating currents developed in the second portion of the field of force, and thereby modifying the value of the second portion of the field of force.

12. The hereinbefore-described method of governing the generation of electric currents, which consists in maintaining a field of force by currents developed in a portion of said field of force, developing other currents in another portion of said field of force, establishing by the last-named currents a compensating polarization through the first portion of the field of force, and thereby varying the resultant lines of force determining the value of the first-named currents.

In testimony whereof I have hereunto subscribed my name this 23d day of January, A. D. 1889.

OLIVER B. SHALLENBERGER.

Witnesses:

W. D. UPTEGRAFF,

CHARLES A. TERRY.