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C. F. SCOTT.

METHOD OF ROTATING THE FIELD MAGNETS OF ALTERNATING  
CURRENT GENERATORS.

APPLICATION FILED JUNE 30, 1904.

NO MODEL.

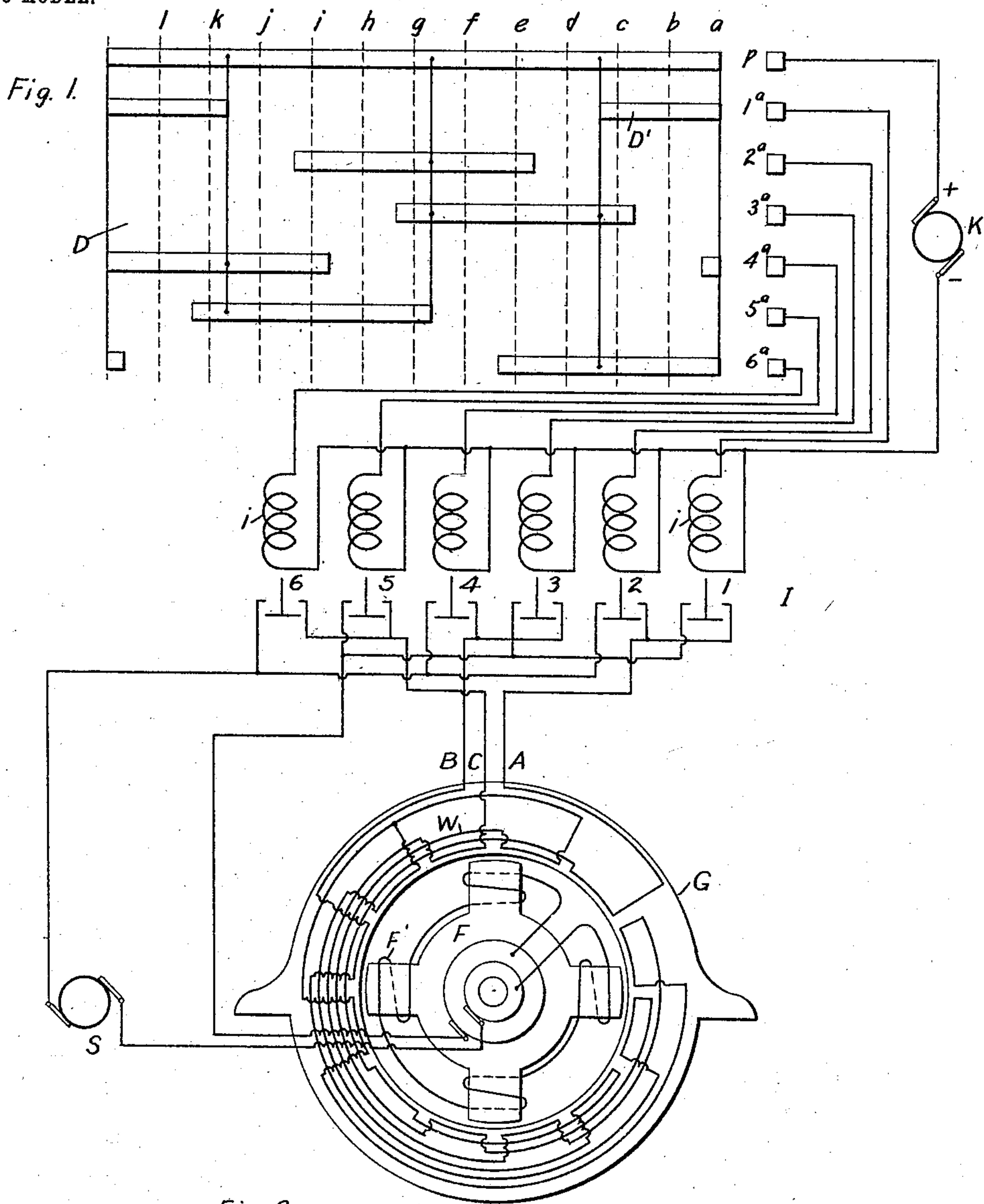
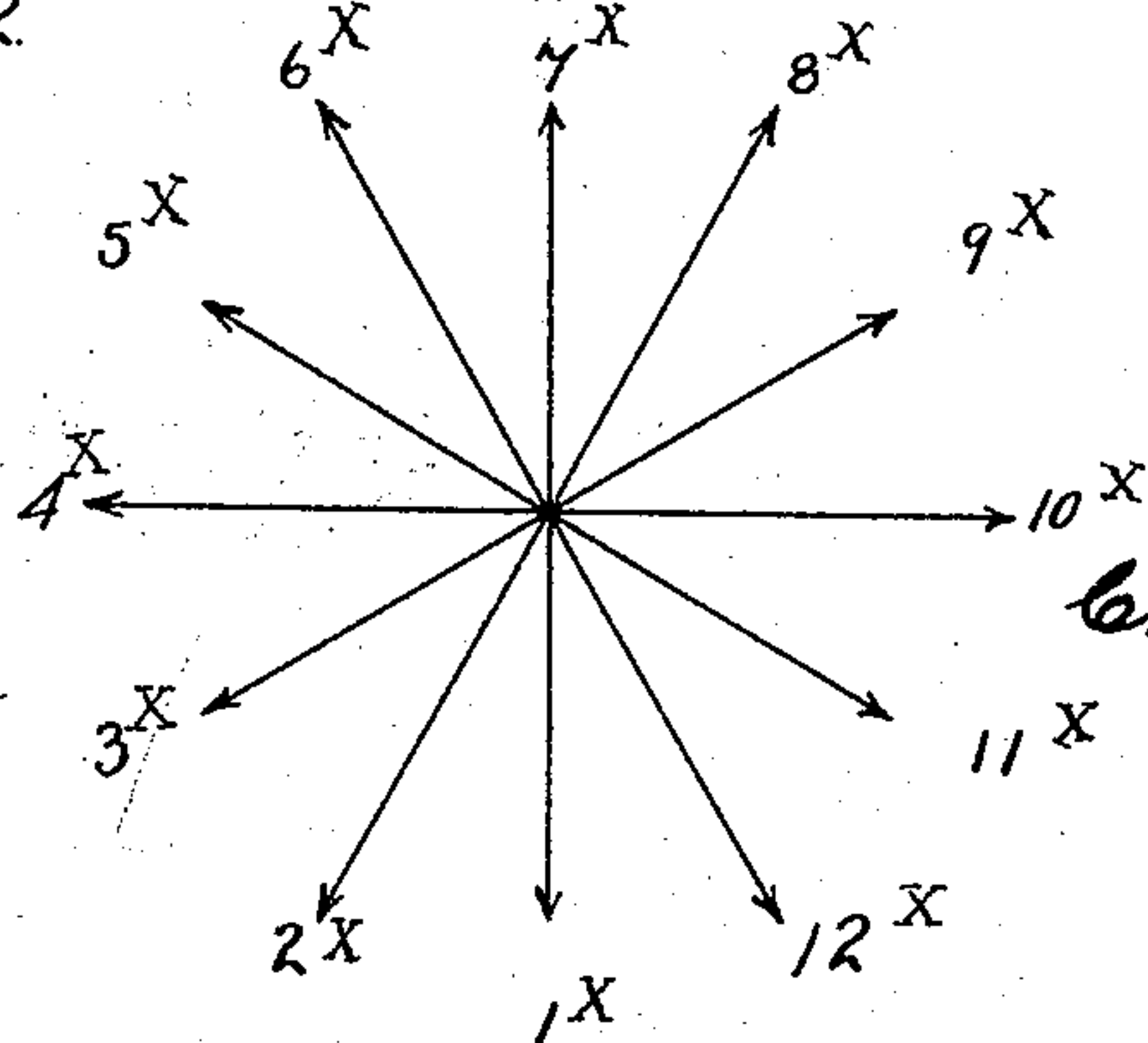


Fig. 2.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

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METHOD OF ROTATING THE FIELD-MAGNETS OF ALTERNATING-CURRENT GENERATORS.

SPECIFICATION forming part of Letters Patent No. 774,956, dated November 15, 1904.

Application filed June 30, 1904. Serial No. 214,816. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES F. SCOTT, a citizen of the United States; and a resident of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Methods of Rotating the Field-Magnets of Alternating-Current Generators, of which the following is a specification.

My invention relates to a special operation of dynamo-electric machines that are directly connected to the engines by which they are normally driven; and it has for its object to provide a method of rotating the field-magnets of such machines at slow speeds and either continuously or intermittingly in order to adjust the driving-engines with reference thereto.

In the process of installing a large poly-phase generator and its driving-engine it is generally found necessary to carefully adjust the engine so that the operation when final connection is made will be satisfactory, and in order to effect such adjustment it is necessary to rotate the field-magnet of the generator at a slow speed and under such control that it may be readily started and stopped when desired. This operation has heretofore generally been effected by means of an electric motor and suitable gearing between the same and the generator field-magnet. This has been found to be an expensive and not altogether satisfactory method, since the operating-motor must be coupled to the field-magnet by means of heavy gearing, and it is not convenient to arrange the motor so that it may be readily connected and disconnected.

In a prior application, Serial No. 172,481, filed September 16, 1903, I have set forth a desirable method of effecting a slow and controlled rotation of generator field-magnets, which consists in controllably supplying direct currents to the armature-windings in such amounts and in such order as will insure the direction and speed of rotation desired by the inductive action between the armature thus energized and the field-magnet. While I have set forth and claimed my said invention

broadly in the application referred to, the specific illustration and description of the method is directed to the utilization of the several armature-windings corresponding to the different phases successively. While this is specifically an operative and a satisfactory method, I have devised a modification in which the armature-windings corresponding to the several phases are energized in a different order and in such manner as to provide a more evenly adjusted rotative effect, and this method is illustrated in the accompanying drawings, in which

Figure 1 is a diagram showing a three-phase generator and the various instrumentalities employed for practicing the method, including a source of direct-current energy and controlling apparatus for applying the same to the armature-windings of the generator in accordance with my invention. Fig. 2 is a diagram illustrating the number and strengths of the various rotative effects imparted during one complete rotation of the generator field-magnet.

The generator G is provided with a three-phase star-connected armature-winding W, the outer terminals A, B, and C of which will for convenience be used to designate the winding itself.

The field-magnet F of the generator G is provided with a winding F', that is excited by direct current from a suitable source S, and, as here indicated, the armature-windings W are energized from the same source, though an independent generator for this purpose might be employed, if desired.

The current from the generator S is supplied to the armature-winding leads A B C in the proper order and relation by means of a set of switches I, severally designated as switches 1, 2, 3, 4, 5, and 6. These switches are severally operated by means of magnet-coils *i*, the current to which is supplied from a suitable generator K through contact-fingers *p*, 1<sup>a</sup>, 2<sup>a</sup>, 3<sup>a</sup>, 4<sup>a</sup>, 5<sup>a</sup>, and 6<sup>a</sup>, and contact strips or pieces D' on a rotatable drum D. The several operating positions of the drum D are designated as *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*, *i*, *j*, *k*, and



l, and the positions of the switches I and the corresponding armature-circuits of the generator G corresponding to the several positions of the drum are as follows:

5 In position *a* switches 1, 4, and 6 are closed and the armature-circuit is  $+A - B - C$ .

In position *b* switches 1 and 6 are closed and the armature-circuit is  $+A - C$ .

10 In position *c* switches 1, 3, and 6 are closed and the armature-circuit is  $+A + B - C$ .

In position *d* switches 3 and 6 are closed and the armature-circuit is  $+B - C$ .

In position *e* switches 2, 3, and 6 are closed and the armature-circuit is  $-A + B - C$ .

15 In position *f* switches 2 and 3 are closed and the armature-circuit is  $-A + B$ .

In position *g* switches 2, 3, and 5 are closed and the armature-circuit is  $-A + B + C$ .

20 In position *h* switches 2 and 5 are closed and the armature-circuit is  $-A + C$ .

In position *i* switches 2, 4, and 5 are closed and the armature-circuit is  $-A - B + C$ .

In position *j* switches 4 and 5 are closed and the armature-circuit is  $-B + C$ .

25 In position *k* switches 1, 4, and 5 are closed and the armature-circuit is  $+A - B + C$ .

In position *l* switches 1 and 4 are closed and the armature-circuit is  $+A - B$ .

30 The strengths of the several rotative effects corresponding to the different positions of the controller-drum and the corresponding armature-circuits are represented in Fig. 2 and are severally designated by the characters  $1^x$ ,  $2^x$ ,  $3^x$ , and so on.

35 The instrumentalities employed in practicing my invention may of course be varied widely as regards structure and arrangement of parts, the means herein shown and described being set forth merely for the purpose of demonstrating the practicability of the method and not as limiting it to the use of any one specific means.

I claim as my invention—

45 1. The method of rotating the field-magnet of a polyphase alternating-current generator which consists in energizing the field-magnet and alternately energizing, by direct currents, first, three portions of the armature-winding with two of the said three portions connected in parallel with each other, and second, two portions of the said winding connected in se-

ries and continuing such operation progressively around the armature.

2. The method of rotating the field-magnet of a three-phase alternating-current generator 55 which consists in energizing the field-magnet and progressively and alternately energizing, by direct currents, first, the armature-windings corresponding to the three phases with the portions corresponding to two of the 60 phases connected in parallel, and second, the windings corresponding to two of the phases connected in series.

3. The method of rotating the field-magnet of a polyphase alternating-current generator 65 which consists in energizing the field-magnet and first supplying direct current to two portions of the armature-winding connected in series and then to said portions and a third portion connected in parallel with one of the 70 first two portions.

4. The method of rotating the field-magnet of a polyphase alternating-current generator which consists in energizing the field-magnet and progressively energizing the armature- 75 windings by supplying direct currents alternately to two portions of the armature-winding connected in series and then three portions of said winding, one of which is connected in parallel with one of the first two and continu- 80 ing such operation so long as rotation is desired.

5. The method of rotating the field-magnet of an alternating-current generator having phases A, B and C which consists in energiz- 85 ing the field-magnet and energizing, by direct currents, the armature-windings corresponding to all of said phases with the windings corresponding to phases B and C connected in parallel, then energizing the windings corre- 90 sponding to A and C connected in series, then energizing all of said winding with the windings corresponding to phases A and B connected in parallel and so on alternately and progressively as the desired extent of rotation 95 may require.

In testimony whereof I have hereunto subscribed my name this 25th day of June, 1904.

CHAS. F. SCOTT.

Witnesses:

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BIRNEY HINES.