(No Model.) 3 Sheets—Sheet 1.

I. R. PRENTISS.

POLYCIRCUIT DYNAMO.

No. 594,488. Patented Nov. 30, 1897.

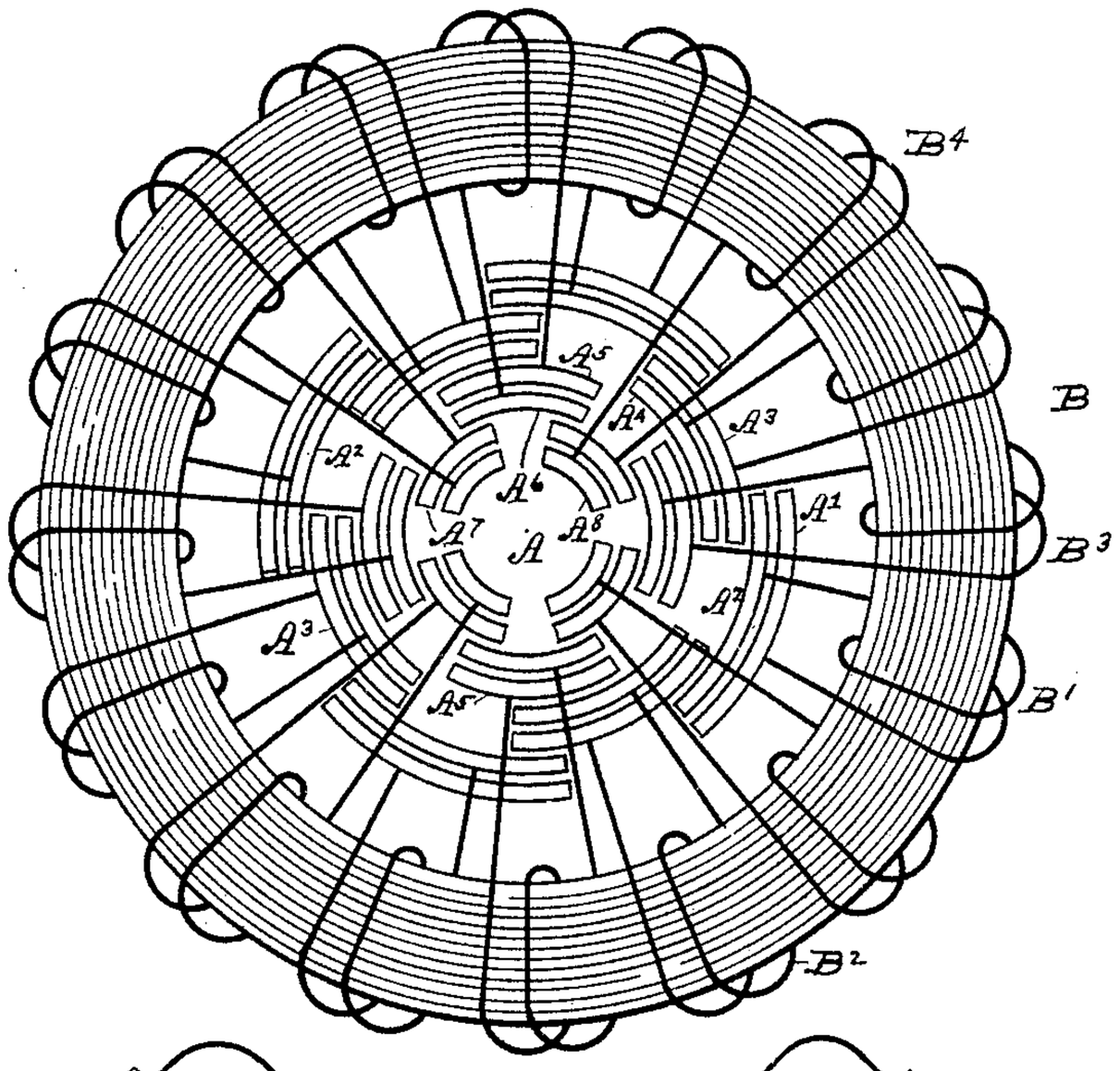

Fig. 1

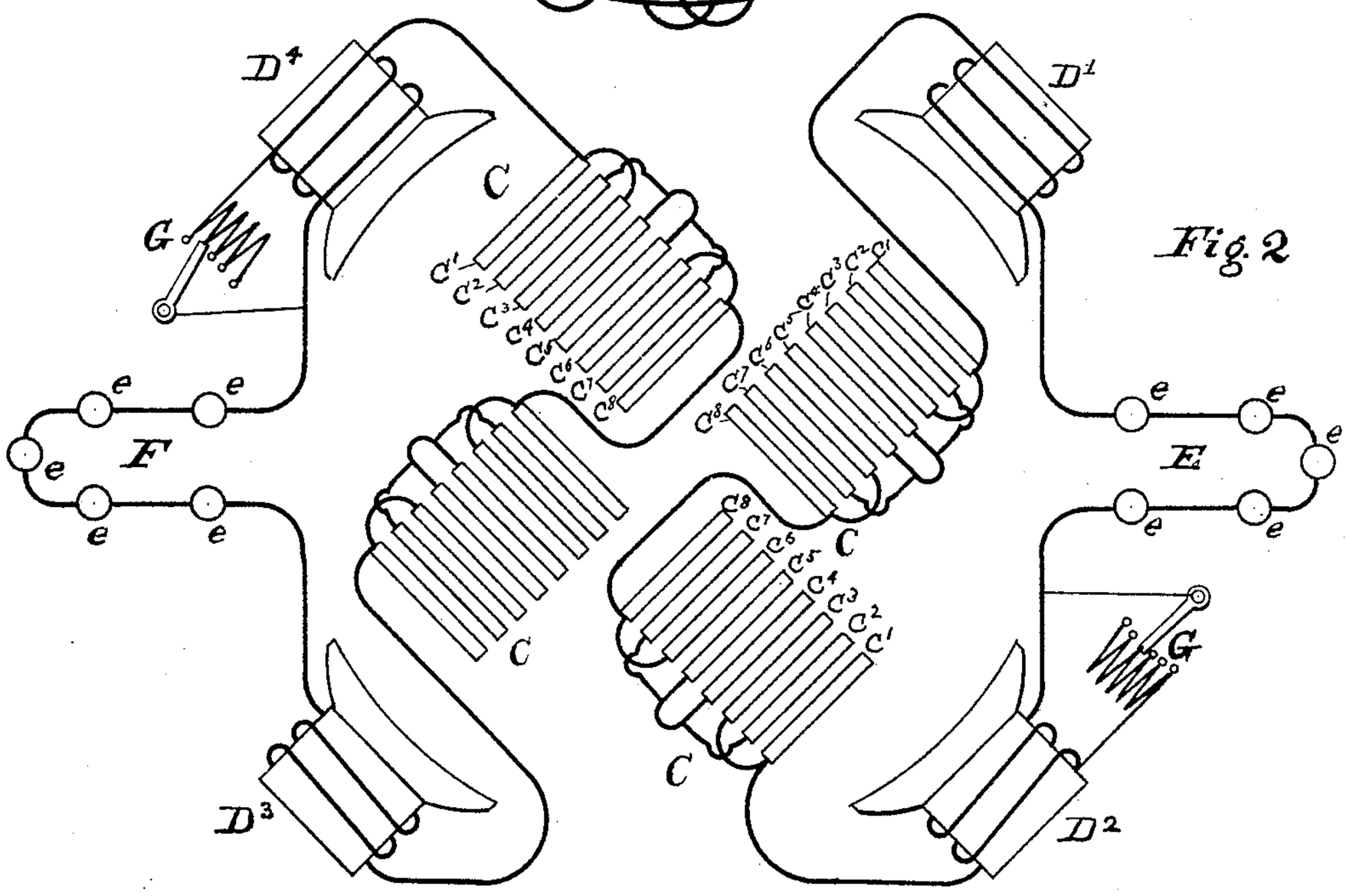

Fig. 2

WITNESSES:

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Louis Prentiss

INVENTOR,

Irving R. Prentiss

BY

C. Wm. Noyes

His ATTORNEY.

(No Model.) 3 Sheets—Sheet 2.

I. R. PRENTISS.

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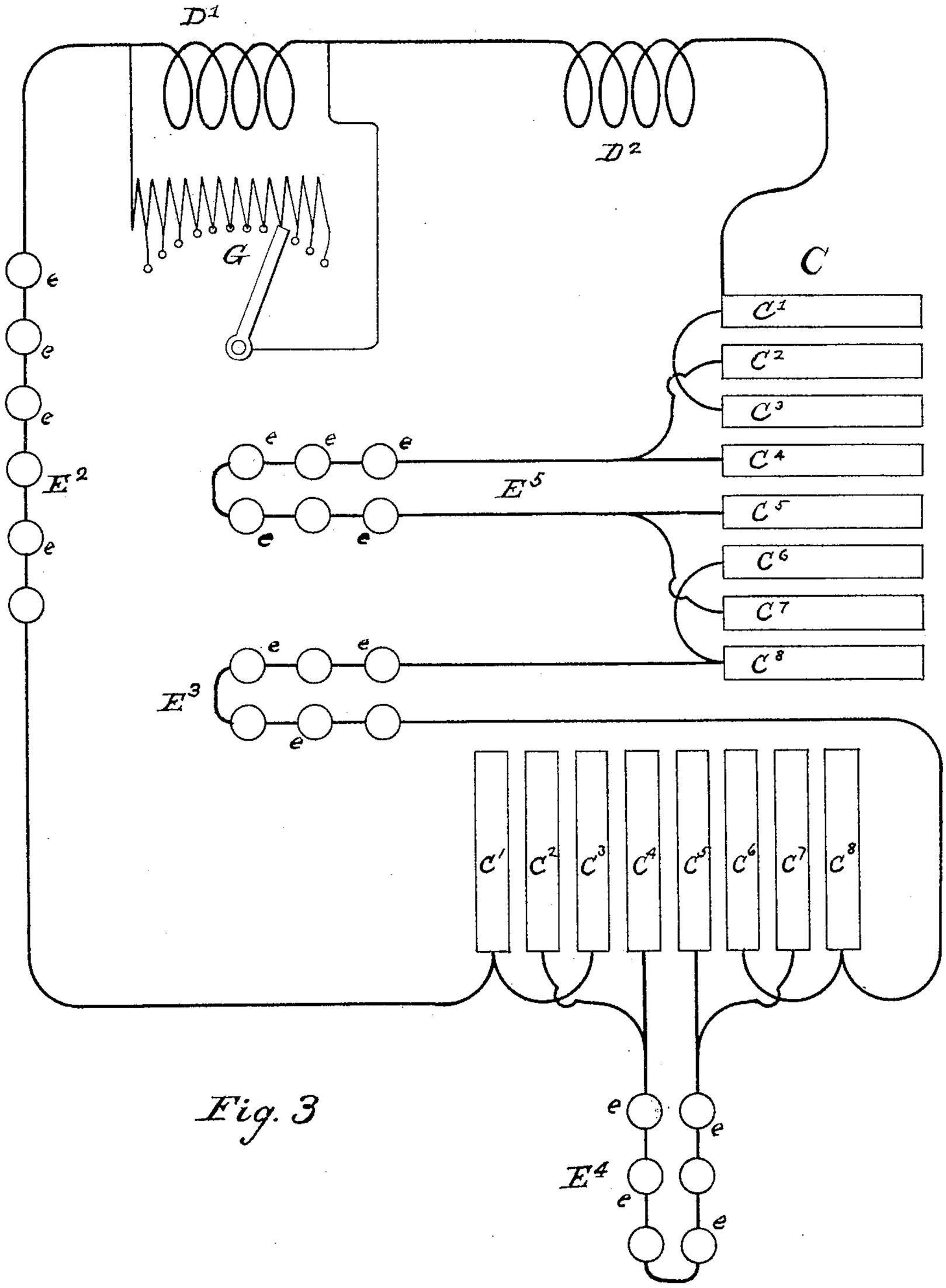

Fig. 3

Witnesses
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(No Model.)

3 Sheets—Sheet 3.

I. R. PRENTISS.

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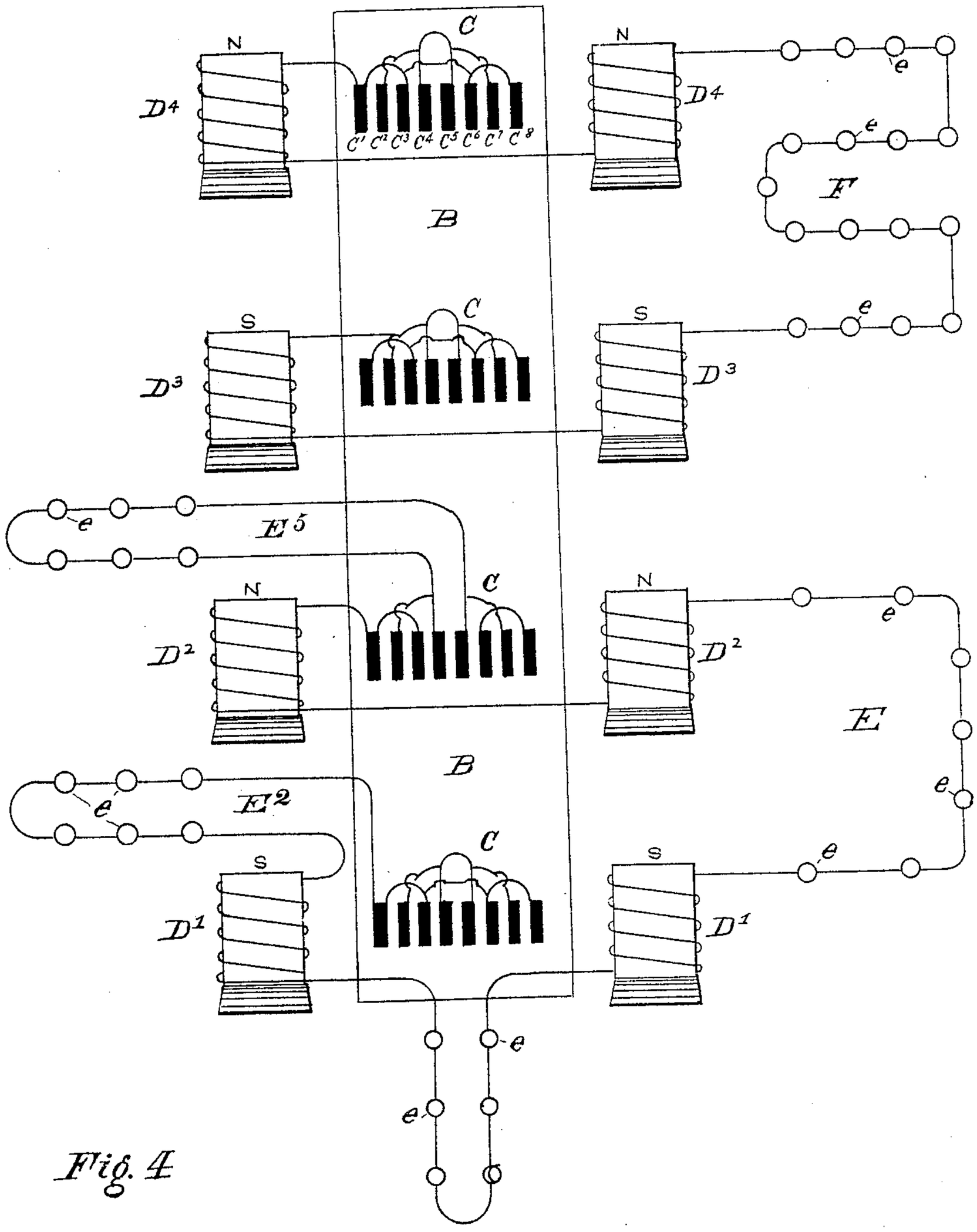

Fig. 4

Witnesses
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Irving R. Prentiss Inventor
By his Attorney
C. A. Wood

UNITED STATES PATENT OFFICE.

IRVING R. PRENTISS, OF CLEVELAND, OHIO.

POLYCIRCUIT DYNAMO.

SPECIFICATION forming part of Letters Patent No. 594,488, dated November 30, 1897.

Application filed November 9, 1896. Serial No. 611,508. (No model.)

To all whom it may concern:

Be it known that I, IRVING R. PRENTISS, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Polycircuit Dynamos; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in dynamo-electric machines and to the method of connecting the armature and field coils of a multipolar dynamo, for operating independent circuits, and the manner of regulating the machine and circuits.

The object of the invention is to enable a number of different circuits to be independently operated from the same dynamo without electrical connection between the circuits, each separate circuit being independent of the others and separately regulated and controlled within itself, and the electromotive force of the dynamo or circuits being maintained at a point not greater than that required to operate the largest of the circuits. By this means it is rendered possible to make a very large arc-dynamo capable of maintaining a much larger number than usual of arc-lamps, while allowing currents of different quantities to be operated from the same dynamo and the electromotive force to be kept at a reasonable amount.

In the art of arc-lamp lighting the usual practice is to operate all the lamps from one machine in a single circuit in series at a constant current, which requires the electromotive force to be very high. A method has also been devised of connecting the lamps in which the total number of lamps or load is divided into circuits which are interposed between the rings of the commutator, and by this arrangement the greatest electromotive force of the dynamo is that which is necessary to operate the largest circuit; but in that case all the circuits are electrically connected together in series with the commutator-rings connected in between the circuits, so that only one quantity of current can be used, although the electromotive force of each circuit may be varied. A serious objection to that arrangement is that any interruption of either of the circuits disables the dynamo and hence all the circuits.

By my invention it is made possible to operate a number of circuits from one dynamo in precisely the same manner as if each circuit was connected to and operated by a separate dynamo.

In the drawings hereto annexed, Figure 1 is a diagrammatic representation of a sixteen-bobbin open-coil armature. Fig. 2 is a diagram representing a four-pole dynamo and the arrangement of independent circuits. Fig. 3 is a diagram representing the manner in which one of the separate and independent circuits shown in Fig. 2 may be subdivided. Fig. 4 is a diagrammatic representation of a multipolar dynamo having double poles and showing in the upper part the separate circuit connected between two pairs of poles, the poles of each pair having like polarity, and in the lower part a similar independent circuit connected with two pairs of poles and subdivided in a manner similar to that represented in Fig. 3.

A four-pole dynamo has been chosen to illustrate the invention, but it is to be understood that the invention applies to a dynamo of any number of poles.

A represents the commutator; B, the armature coils or bobbins; C, the commutator-brushes; $D' D^2 D^3 D^4$, the field-coils and poles; E F, the external circuits or load, and G the variable resistance for governing the circuit. The commutator-rings are eight in number, or, as it might be said, four pairs, each ring composed of four segments insulated from each other. These rings are lettered $A' A^2 A^3$, &c.

The armature-coils $B' B^2 B^3$, &c., are connected, the inner wire of each bobbin to one segment and the outer wire of the same bobbin to the corresponding segment of another ring or to a parallel segment on the same ring insulated therefrom. The eight brushes corresponding to each pole of the machine are connected to the circuits in the manner shown in Fig. 2. Each lamp circuit or load is connected in series with two poles of opposite polarity and their corresponding groups of brushes, but there is no connection between the circuits themselves. The result of this is that the dynamo is, in effect, di-

vided into two separate machines, one supplying each circuit.

The regulation of a constant-current dynamo may be effected in various ways—as, for instance, by wiring the field-magnets in sections and varying the field strength by cuting in or out of circuits more or less of these sections; also by other forms of field-spool winding, such as compound winding, differential winding, or shunt-winding, &c.; also by shifting the brushes on the commutator, depending on the counter-electromotive force generated by the armature or by separate excitation. I prefer the shunting of current around the field-spools as a mode of regulation, as shown by G G in Fig. 2, and I apply this method to each alternate field-spool, or, where two spools of same polarity are used, to every alternate pair, the shunting of current around the spool being effected by connecting a variable resistance across the terminals of the field-coil. The shunted field-spools might be adjoining or consecutive spools or pairs of spools, but I regard the shunting of alternate spools or pairs as the better plan.

The changing of the variable resistance or the moving of the brushes or other form of regulation may be effected by hand, or preferably by any well-known or suitable automatic device for the regulation of dynamos, as the particular means used for effecting the regulation of the machine, as hereinafter described, forms no part of the present invention.

Referring to Fig. 2, E represents one of the circuits; *e e e*, the lamps or load of the circuit, and, as above stated, C′ C^2 C^3, &c., represent the brushes corresponding to the commutator-rings A′ A^2 A^3 A^4, &c., to which are respectively connected the armature-coils B′ B^2 B^3, &c., and it will be seen that circuit E is complete through the field-magnets D′ D^2, the two groups of brushes corresponding to these poles and the lamps or load *e e e*, &c., and is wholly independent of and separate from the similar circuit F. In this manner a four-pole field with a number of bobbins not less than four will operate two separate and distinct circuits. By increasing the number of bobbins in the armature more than two circuits can be operated under a decreased electromotive force by subdividing each of the separate circuits. Thus, as shown in Fig. 3, the entire load *e e e e*, &c., on circuit E may be subdivided and one division E^2 interposed between the field-magnet and pole D′ and its corresponding group of brushes, another division E^3 may be interposed between the two groups of brushes on circuit E, a third division E^4 may be interposed between two of the brushes of one group, and a fourth division E^5 could be interposed between two brushes of the second group of brushes. In such case the subdivided circuits would have the same quantity of current passing through them, but the electromotive force measured across the first and last wires of the first and last subdivided circuits will not exceed the electromotive force necessary to operate the greatest load included in either one of these subdivided circuits.

Obviously the full load on any circuit could be interposed between either pole and the brushes, or in the place occupied by either of the subdivided circuits shown in Fig. 3, and wherever placed on the circuit it is electrically between the poles.

The greatest number of separate and distinct circuits that any multipolar dynamo can operate in accordance with my invention is one-half the number of its poles, a six-pole machine being able to operate three circuits, an eight-pole machine to operate four, and so on. Each of these circuits can, however, be subdivided in the same manner as above explained, and I do not limit myself to any number of poles in the machine, or to any number of bobbins in the armature, nor to any particular number of poles included in any one circuit.

By the means above described I can operate from the single four-pole dynamo either the two separate full circuits or one separate full circuit and two, three, or four subdivided circuits together, or any number of circuits up to eight can be operated, and the circuits operated from one half of the machine could be operated separately at a different current from those operated by the other half, but the electromotive force around the dynamo will not rise in any combination of circuits higher than that required for the circuit having the greatest load, as before stated.

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

1. A multipolar dynamo-electric machine having separate independent circuits each connected with part of the poles and their corresponding brushes and disconnected from the other poles and brushes, substantially as described.

2. A multipolar dynamo having separate independent circuits each connected with two poles of opposite polarity, substantially as described.

3. A multipolar dynamo having separate independent circuits each connected with a pair of poles of like polarity and a pair of poles of opposite polarity, substantially as described.

4. A multipolar dynamo-electric machine having separate independent circuits each connected between adjoining poles, substantially as described.

5. A multipolar dynamo having separate and independent circuits, in each of which circuits two field-magnets of opposite polarity, and two or more brushes of each commutator-ring are connected in series with the load, substantially as described.

6. A multipolar dynamo having separate and independent circuits in each of which circuits two field-magnets of opposite polarity

and two brushes of each commutator-ring are connected in series with the load and a variable resistance is connected in shunt around one of the field-magnets in each circuit, substantially as described.

7. A multipolar dynamo having separate and independent external circuits in each of which are connected in series two adjoining poles of opposite polarity and that part of the armature which is directly energized by that pair of poles, substantially as described.

8. A multipolar dynamo having separate and independent external circuits in each of which are connected in series two adjoining field-magnets of opposite polarity and that part of the armature which is directly energized by said two poles, a variable resistance being connected in shunt around one of the field-magnets in each circuit.

9. In a multipolar dynamo an open-coil armature having the ends of each bobbin connected to separate parallel commutator-segments placed on the same arc of the commutator and insulated from each other.

10. A multipolar dynamo having two or more independent circuits each of which is connected between two field-magnets of opposite polarity and having one or more of such separate circuits subdivided and one or more of said subcircuits connected in series between two sets of brushes or between rings of the commutator, substantially as described.

11. A multipolar dynamo having two or more separate independent circuits each of which is connected in series with two field-magnets of opposite polarity and disconnected from all the other field-magnets, one or more of said separate circuits being subdivided into several distinct portions and one of such portions being interposed between the two groups of brushes, another portion between separate brushes of each group, and another between the field-magnet and the brushes, substantially as described.

In testimony whereof I hereto affix my signature in presence of two witnesses.

IRVING R. PRENTISS.

Witnesses:

LOREN PRENTISS,

J. P. RYDER.