(No Model.) 3 Sheets—Sheet 1.

C. J. VAN DEPOELE.

DYNAMO ELECTRIC MACHINE.

No. 300,535. Patented June 17, 1884.

Fig. 1.

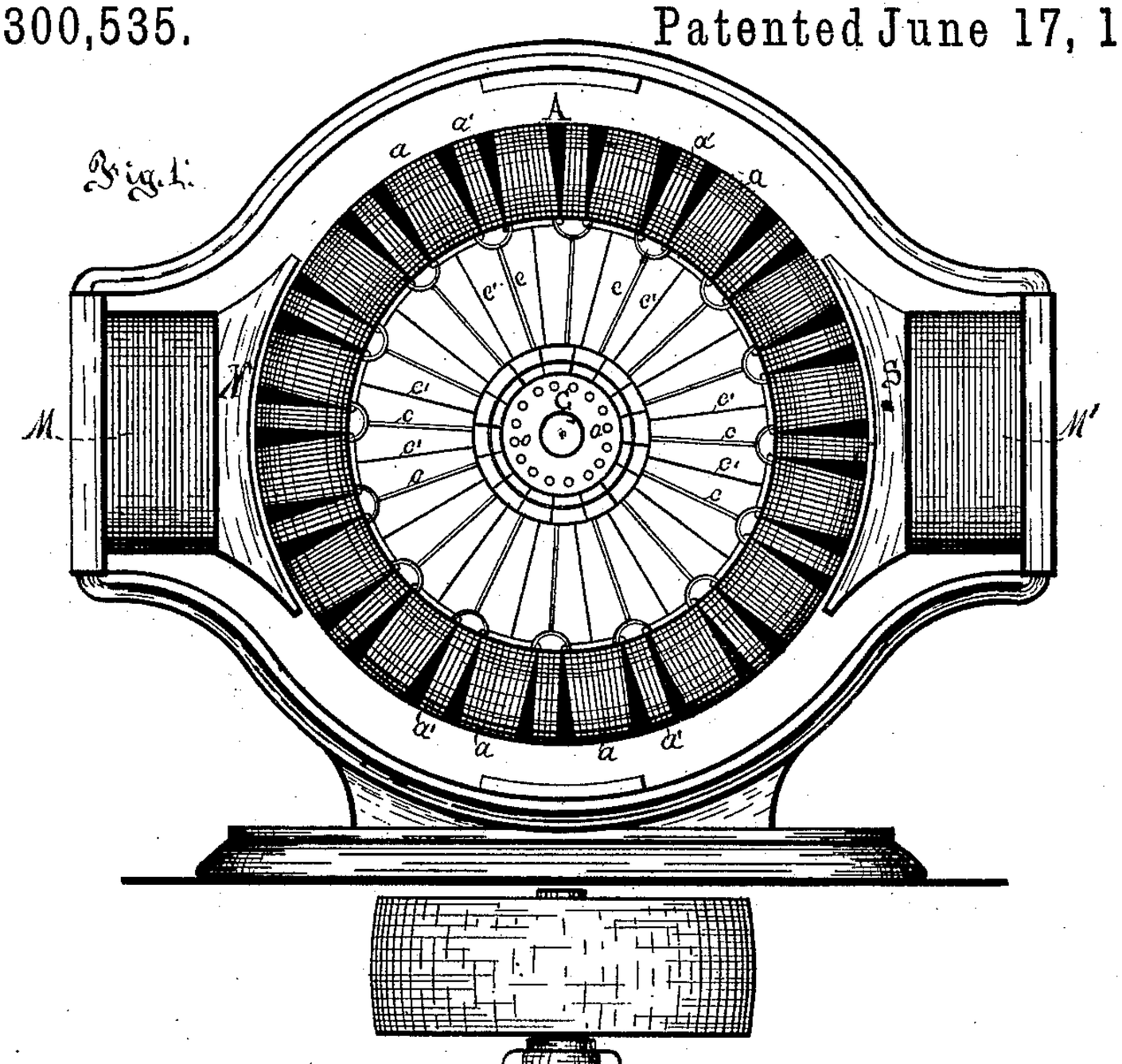

Fig. 2.

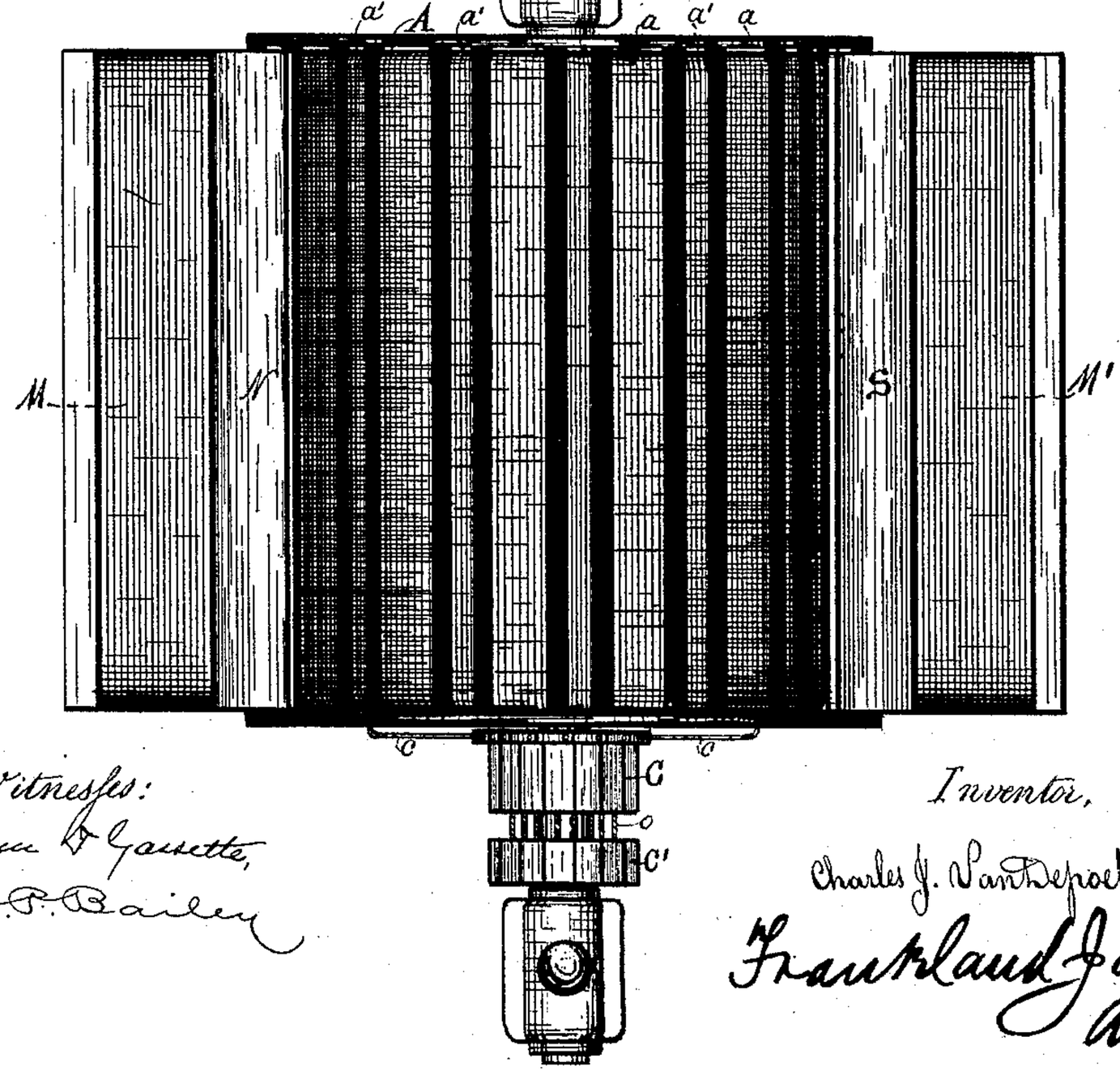

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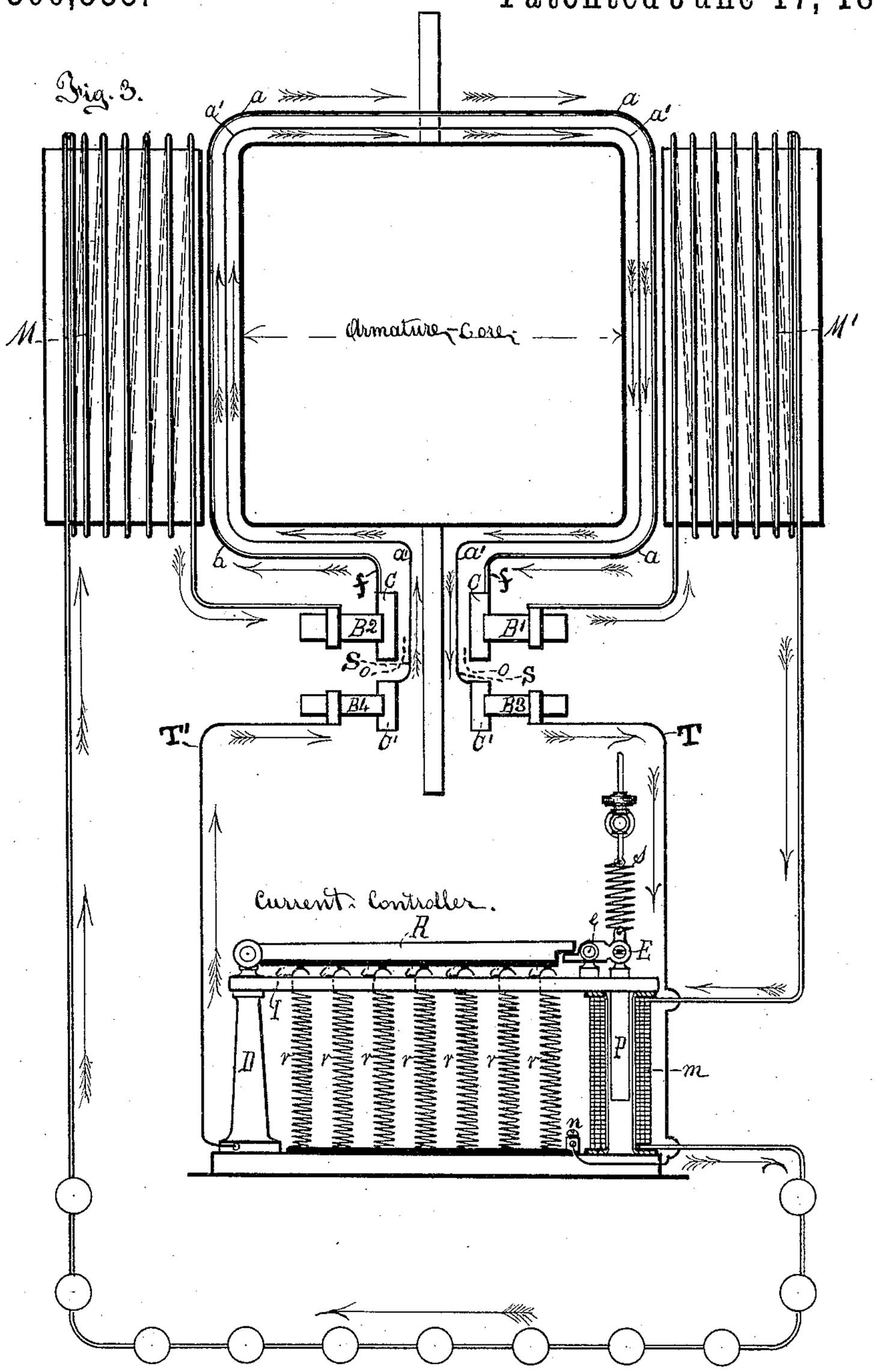
Fig. 3.



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(No Model.) 3 Sheets—Sheet 3.

C. J. VAN DEPOELE.

DYNAMO ELECTRIC MACHINE.

No. 300,535. Patented June 17, 1884.

Fig. 4

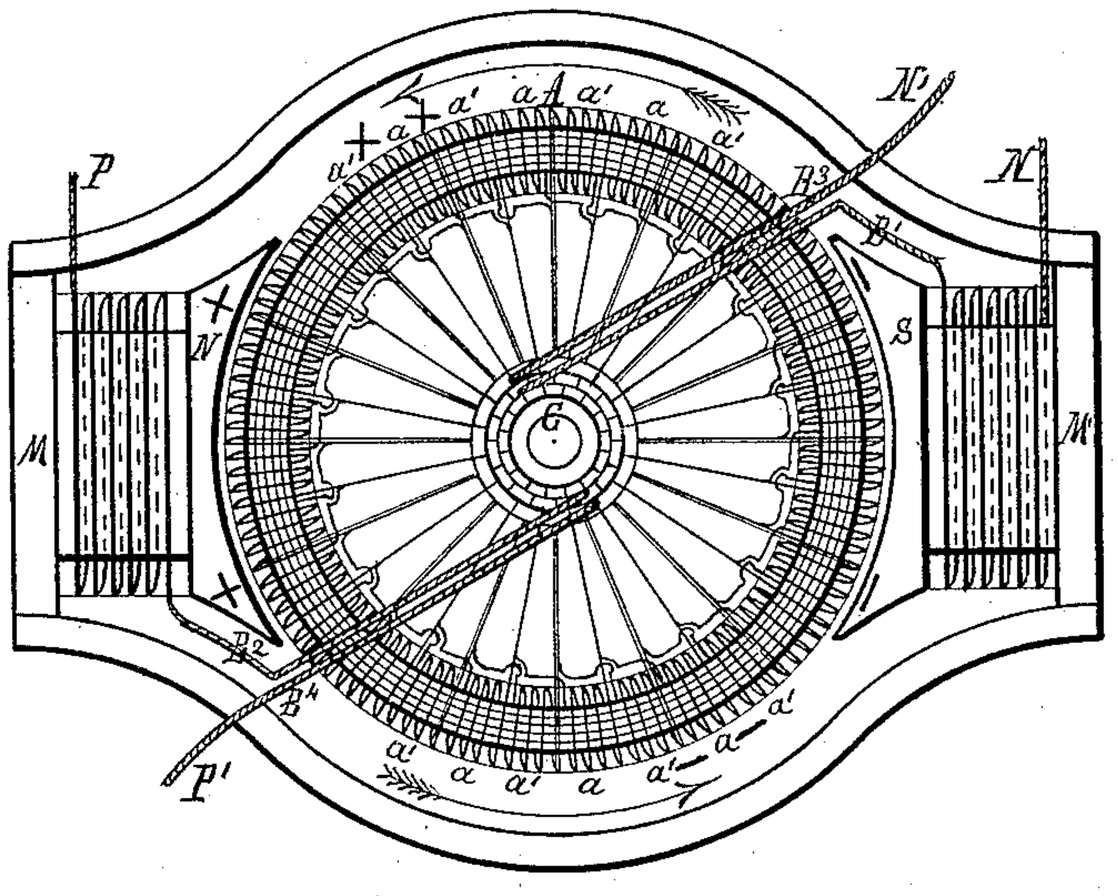
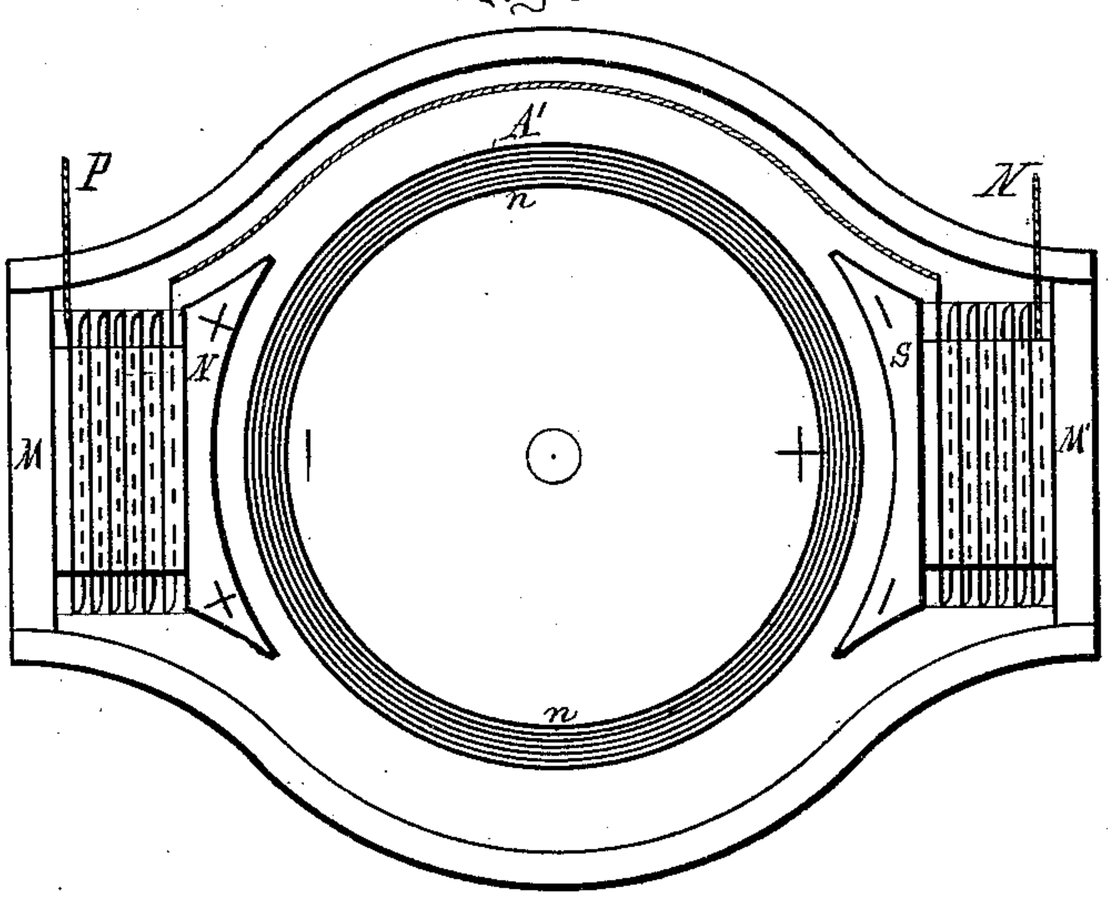


Fig. 5



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UNITED STATES PATENT OFFICE.

CHARLES J. VAN DEPOELE, OF CHICAGO, ILLINOIS.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 300,535, dated June 17, 1884.

Application filed October 19, 1883. (No model.)

To all whom it may concern:

Be it known that I, CHARLES J. VAN DEPOELE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Dynamo-Electric Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to new and useful improvements in dynamo-electric generators, as herein fully described, reference being had to the annexed drawings, forming part of this specification.

My aim in the present invention has been to produce a dynamo or generator in which the field-magnets are very materially reduced in weight as compared with those ordinarily employed, the induction in the armature being only contributed to by diminutive field-magnets, while the main induction is produced directly on the armature itself by coils wound upon its core, the sole office of the same being to magnetize said core with more or less strength, and thus to react upon the coils set apart on said armature to do the work outside of the generator.

The following is a clear description of my invention, as illustrated in the annexed drawings:

Figure 1 is a front elevation of the generator, showing the armature and its coils, and also the disposition of the field-magnets and commutator. Fig. 2 is a horizontal view of the machine with its top or cover removed, showing the armature and field magnets, as also its two commutators. Fig. 3 is a diagram of the different circuits, exhibiting clearly the principle upon which the operation of the machine is based, showing also the current-controller intended to vary the power of the current produced.

In the different figures similar letters indicate like parts.

A is the armature, wound with two sets of coils, one set, *a a*, being in circuit with the field-coils and the external circuit, the second set, *a' a'*, not in common with the external or working circuit, but purposely placed around the armature-core to energize the latter with more or less strength. This set of coils, as will be seen, is provided with a commutator, C', upon which the circuit is straightened and further closed upon itself by the intervention of a current-controlling device, as shown in Fig. 3.

B' B² represent the brushes bearing upon the main commutator C.

B³ B⁴ are brushes bearing upon the auxiliary commutator C'.

S S are conducting-wires leading from the coils *a' a'* to the commutator C', passing through openings *o o* in commutator C, being perfectly insulated from the latter.

f f are conducting-wires leading from the coils *a a* to the commutator C.

M M' are the field-magnet coils.

N and S are the north and south poles of the field-magnets.

Fig. 3 shows the armature-core with its two independent circuits, *a* and *a'*. The current for the working-circuit being collected from the commutator C by brush B', is sent around the field-coil M' to electro-magnet *m*, thence to lamps or other circuit and resistance into second field-coil, M, and by brush B² completes circuit upon the commutator C. The current follows the direction indicated by the arrows. The second circuit around the armature-core is *a'*, and by wires S S, properly connected to commutator C'. The brush B³ is in connection with a current-controller, the current entering at the post *n*, to which all the resistances *r r*, &c., are connected in multiple arc. The current passes through all said resistances by means of contacts *i i* to a hinged bar, R, from whence the current passes over to metallic post D, and by means of proper conductor to brush B⁴, closing the second or auxiliary circuit of the armature. The direction of current is further indicated by the arrows.

Fig. 4 represents a diagram of circuits, showing the respective polarity of the field-magnets, &c., also the polarity induced by the main and auxiliary armature-coils *a* and *a'* in the core of said armature when in operation, and revolving in the direction indicated by the arrows. P and N are the positive and negative terminals of one circuit, while P' and N' are the terminals of the other circuit. By making either one or the other circuit preponderate in proportion one can be made the main and the other the auxiliary, respectively.

In this figure both sets of armature-coils are of the same size, one being intended to be in circuit with the main or working circuit, the other to act as auxiliary by magnetizing more or less the armarture-core. It will be understood that the field-coils can be included in the auxiliary circuit, instead of being in the working-circuit; but in all cases the main action is expected from the auxiliary coils of the armature energizing the core A′ with more or less strength.

Fig. 5 represents the magnetic frame or the field-magnet with its poles N and S, as also the armature-core A′. The polarity induced in the core A′ by the field-magnets is as shown here by the signs — and +. This will be the case as long as the armature is stationary, or even when revolving without the helices; but the moment the armature is revolved between its field-poles and the circuits closed the polarity of the core will be placed, as shown in Fig. 4, by the signs + + and — —, *n* and *n* being the neutral points. By displacing the brushes the polarity will be displaced accordingly, corresponding with the place where the current enters and leaves the commutator by the said brushes.

The current-controller works on the same principle as the one patented by me January 9, 1883. The current enters all the resistances at the bottom by a heavy conductor, while their free ends pass through a wooden bar on the top. Said free ends are connected to contact-points *i i*, &c., and upon these contact-points bears a conducting-bar, R, in connection with the brushes B^3 and B^4 by proper conductors T T′, leading thereto. Whenever the bar R presses upon all the contacts *i i*, &c., at once the current has free passage from one brush of the auxiliary circuit to the other; but the moment the bar R is raised from contact with some of the points *i i*, &c., the current meets with a corresponding resistance and diminishes the flow of current in the auxiliary circuit. The fewer resistances in circuit the more resistance the current will meet on its passage back to the armature-coils *a′ a′*, they, the resistance-coils *r*, being arranged so as to be connected in multiple arc only.

Having described the different parts of my generator, I will now explain the same while in operation. The principal advantage I gain by the peculiar construction of this generator is to do away, if not wholly, at least partly, with the cumbersome field-magnets, which are very expensive in material and make the machines exceedingly heavy. I have reduced the field-magnets as much as possible, the poles of the same being merely used to determine the polarity with regard to the revolving armature, and serve also to start up the current. As will be seen, I have greatly enlarged the armature, and placed upon its core two sets of coils, one set being used to excite the field-magnets and do the outside work, the other set being merely intended to energize the armature-core, and thus to induce a larger or smaller amount of current in the working-coils, according to the strength of current circulating in the auxiliary set of coils, this being determined by the current-controller placed in its circuit, as shown in Fig. 3. On starting up the machine and placing proper resistance in its working-circuit, the field-magnets are magnetized, as is well known, on the principal of mutual accumulation; but the armature is of such proportions that its field-magnets are not sufficiently large to bring the current up to its maximum strength without the aid of the auxiliary set of coils, which, instead of sending their current around the field-magnets, send the current simply back around the armature-core, thus strengthening its magnetism, which, reacting upon the main or working coils, will thus raise the current strength in the same, and the latter will also raise the energy in the field-magnets by the increase of current passing through their coils. In a generator where it is intended to keep up at all times the same strength of current, the auxiliary set of coils around the armature should be so proportioned that its current can be closed upon itself without overheating its coils. If this proportion is larger, then working-resistances can be put in the circuit of the auxiliary. However, where it is necessary that the power or current strength in the generator should be variable, a current-controller can be inserted in the circuit of the auxiliary coils, which can be made to modify the amount of current circulating in said auxiliary, and thus vary the power of current strength in the main circuit by magnetizing the armature-core to a higher or lower degree. This arrangement is shown in Fig. 3. The main current is circulating through the solenoid *m*, the latter being provided with a core or plunger, P, suspended from a spring, S, which is so adjusted that when the machine is working normally, the core will remain stationary; but whenever some lamps or other devices are cut out of circuit, the resistance in the main circuit diminishing will excite the solenoid to a higher degree and draw in the core P, thus tripping E and raising the contact-bar R from some of the contacts *i i*, &c. The current in the auxiliary coils will be correspondingly diminished and so will the magnetism in the armature A. The less resistance in the main line the more will the core P be drawn in *m*, thus cutting more and more of the resistances *r r r*, &c., out of circuit until the auxiliary circuit is entirely broken, when the main armature-coils will only be acted upon by the field-magnets M and M′, and the machine do its minimum duty. The two sets of commutator-brushes are normally arranged as indicated in Fig. 3—viz., in similar positions on both commutators—and the current in the auxiliary coils can be raised and lowered to a great extent by simply shifting its brushes around the commutator, thus reacting upon the main coils of the armature,

although some work can be placed in the external circuit of the auxiliary coil. It is not, however, intended to do so.

In all dynamos made up to this date the main induction upon the armature has been derived from the field-magnets. Consequently these had to be made exceedingly large in order to get good results, whereas in the present case the comparatively small field-magnets are simply made use of so as to determine the lines of force in the armature, and by making the latter larger in proportion, I find extra room to place around its core a set of coils, the function of which is to magnetize said core to a higher degree than the field-magnets can do combined with the helices or coils of the armature working the outside circuit. Thus I produce a direct induction in the armature-coils doing the outside work, since I am enabled to magnetize the core up to any degree independent of the influence of the field-magnets.

I do not confine myself to the pattern of field magnet here shown, as any other disposition may answer the purpose, influencing the armature of the machine; nor do I confine myself to use only two sets of coils, one for the main and the other for the auxiliary circuit, since I can equally well place around the core of said armature two or more sets of coils doing outside work, and two or more auxiliary sets of coils to energize the armature core independent from the field-magnets, without departing from the spirit of my invention.

It will also be apparent that I may reverse the positions of the coils shown by utilizing the larger ones for magnetizing and the smaller ones for supplying the working-circuit.

Having described my invention and its operation, I claim as new and desire to secure by Letters Patent—

1. In a dynamo-electric machine, an armature provided with two sets of coils, one of said sets being arranged and connected so as to excite the field-magnets and feed the external circuit, the other set being arranged and connected so as to react directly upon and to intensify the magnetism of said armature-core, so as to strengthen the current produced in the coils connected to the working-circuit, substantially as described.

2. In a dynamo-electric machine, an armature provided with two sets of coils, one set—the main—being in circuit with the field-magnets of said dynamo and with the outside work, the other set—the auxiliary—being set apart and so connected as to impart to the armature-core a higher degree of magnetism than that due to the action of the field-magnets, thus strengthening the current produced in the main coils of said armature, substantially as set forth.

3. In a dynamo-electric machine, an armature provided with two sets of coils and connections, whereby one set is adapted to be used to keep up the magnetic field and do the work outside of the machine, while the other set is used to energize the armature-core with more or less strength independent from the field-magnets influencing said armature, in order to regulate the current produced in the main coils to the work demanded from the same, substantially as described.

4. In a dynamo-electric machine, an armature provided with two or more sets of coils or circuits, one or more of said sets of coils being connected and arranged to do work outside of the armature, the remaining set of coils being utilized to directly energize said core to modify the current produced in the armature-coils doing the outside work, substantially as described.

5. In a dynamo-electric machine, an armature-core carrying independent sets of coils arranged to be partly influenced by its field-magnets and partly by an auxiliary circuit including a portion of the coils wound thereon, in combination with a current-controller arranged in circuit with the coils acting directly on the armature, and adapted to regulate the flow of current in the said auxiliary circuit in order to regulate the production of current in the main coils of the armature, substantially as set forth.

6. In a dynamo-electric machine, an armature wound with two or more sets of coils, one or more of said sets being employed to feed the external circuit and magnetize the field-magnets of the machine, and the remainder being so disposed and connected that they will react directly upon the armature-core, in combination with means for controlling and regulating the amount of current circulating in the latter set of coils, in order to regulate the production of current in the machine, substantially as described.

7. In a dynamo-electric machine, the combination, with the main or working coils of its armature, of an auxiliary set of coils adapted to energize the core of said armature independent from the field-magnets of said machine, as set forth.

8. In a dynamo-electric machine, the combination, with field-magnets of such proportions compared with its armature that the former is incapable of bringing the latter up to its maximum efficiency, of the outside or working coils of its armature, and a set of coils disposed around said armature-core, the sole office of which is to surexcite the armature-core by re-enforcing the action of the field-magnets thereon to bring it up to its maximum, as set forth.

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

CHARLES J. VAN DEPOELE.

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