(No Model.) 2 Sheets—Sheet 1.

O. A. MOSES.

SELF EXCITING ALTERNATE CURRENT ELECTRIC GENERATOR.

No. 378,456. Patented Feb. 28, 1888.

Fig. 1,

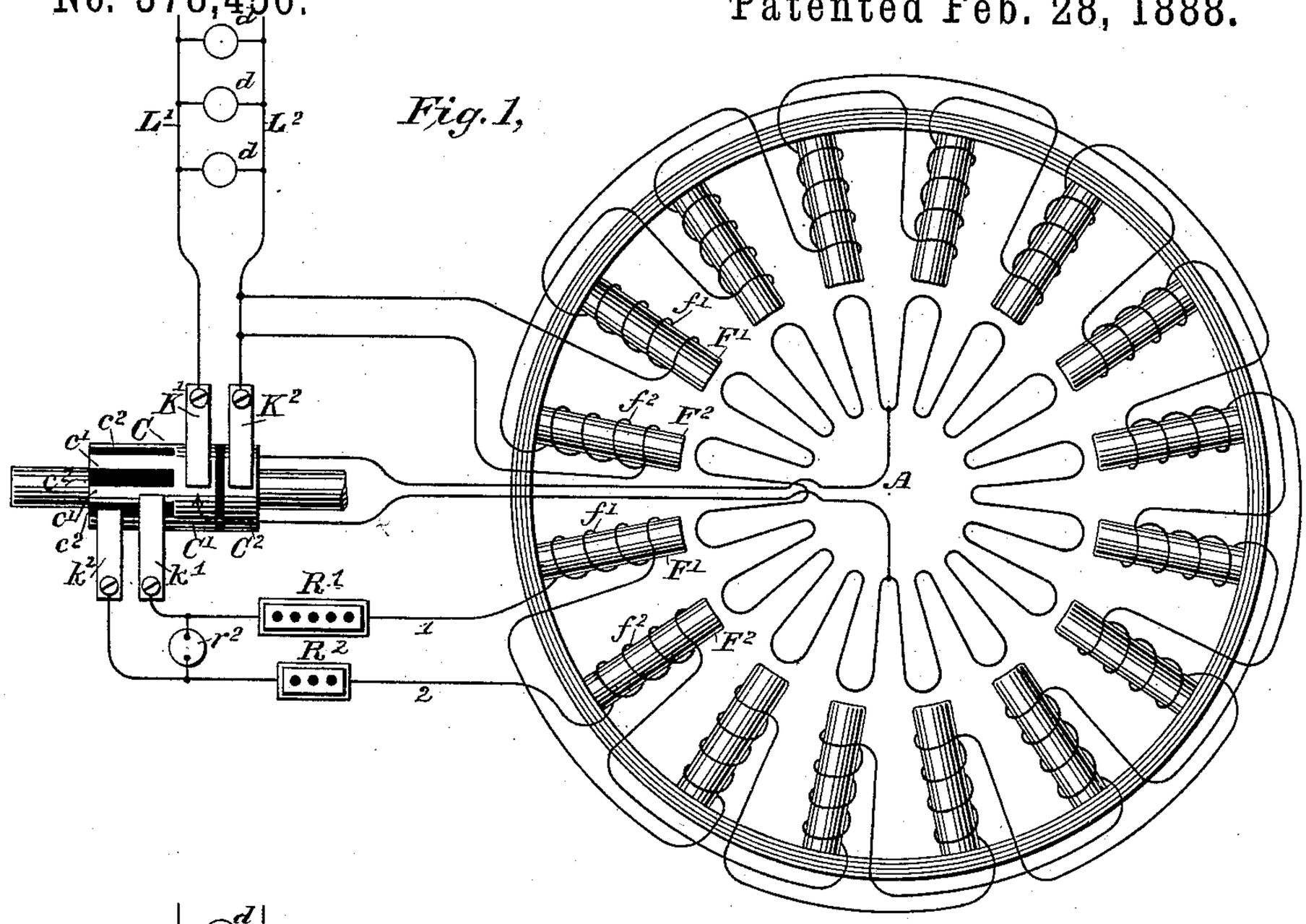
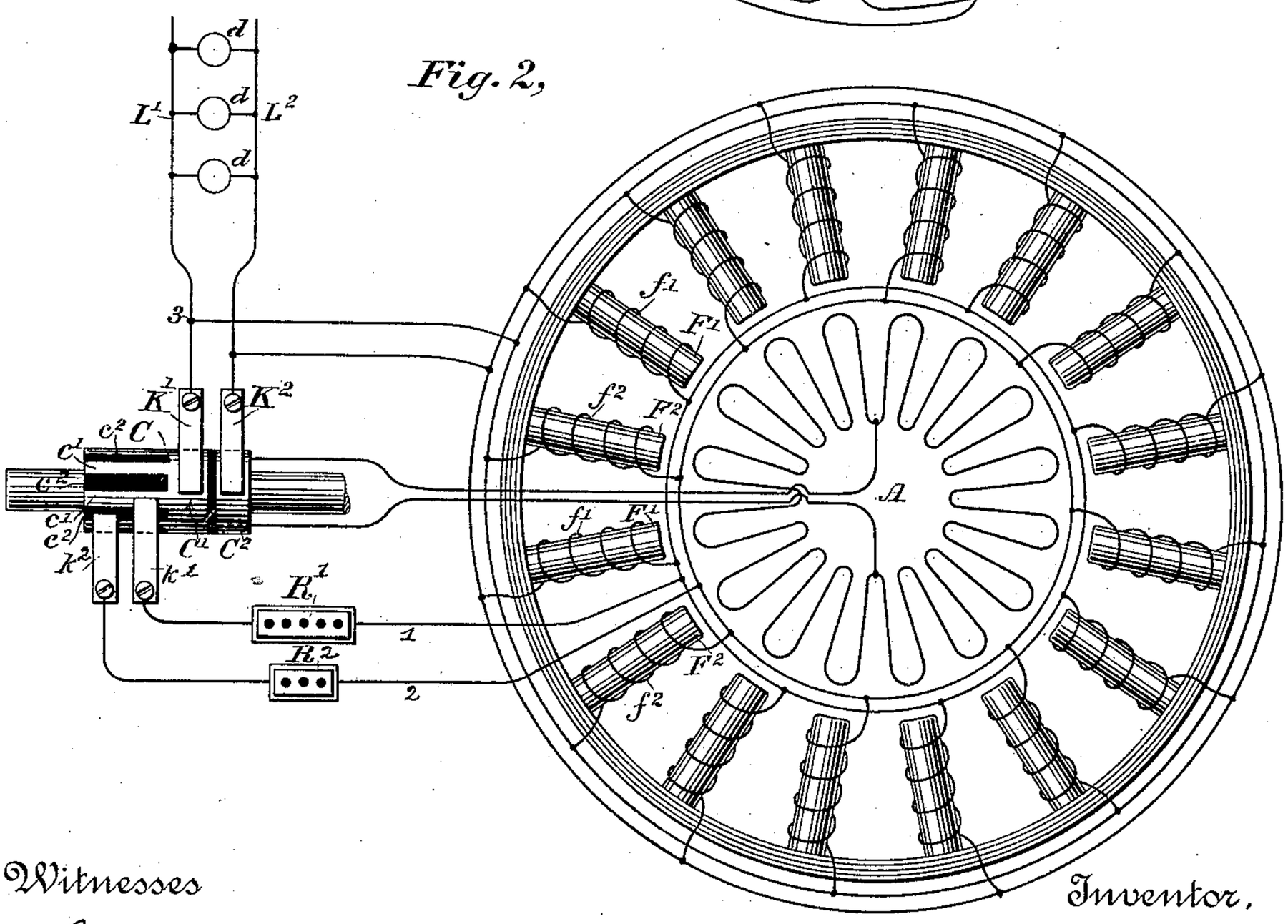


Fig. 2,



Witnesses

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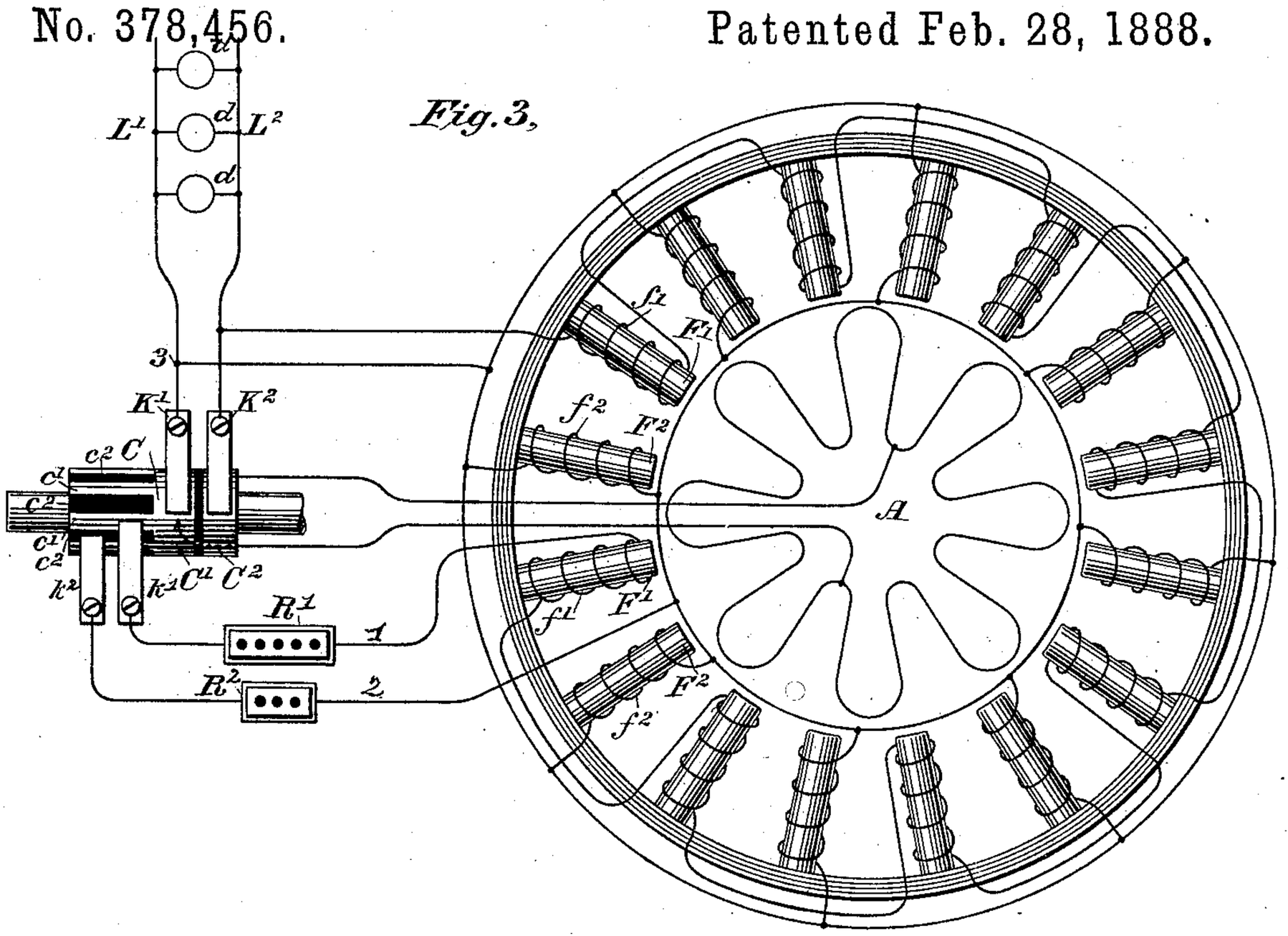
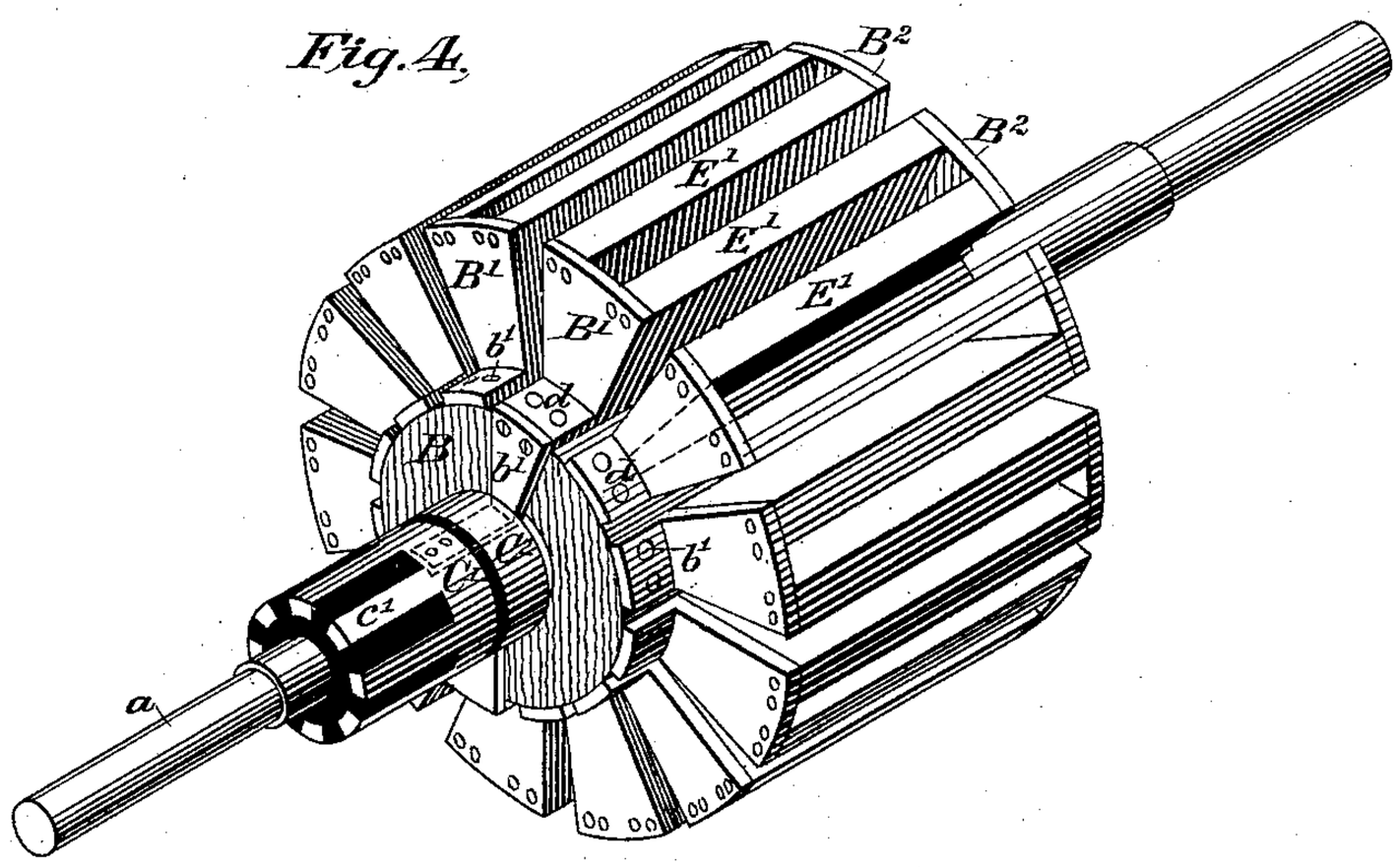


Fig. 3.

Fig. 4.



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UNITED STATES PATENT OFFICE.

OTTO A. MOSES, OF NEW YORK, N. Y., ASSIGNOR TO THE WESTINGHOUSE ELECTRIC COMPANY, OF PITTSBURG, PENNSYLVANIA.

SELF-EXCITING ALTERNATE-CURRENT ELECTRIC GENERATOR.

SPECIFICATION forming part of Letters Patent No. 378,456, dated February 28, 1888.

Application filed March 28, 1887. Serial No. 232,627. (No model.)

To all whom it may concern:

Be it known that I, OTTO A. MOSES, a citizen of the United States, residing in New York, in the county and State of New York, have invented certain new and useful Improvements in Self-Exciting Alternate-Current Electric Generators, of which the following is a specification.

The invention relates to the construction of alternate-current electric generators and to the organization of circuits therefor.

The object of the invention is to provide a generator which, while delivering alternate electric currents, shall be adapted to employ such currents or a portion of the same for exciting its field-magnets.

The invention consists, in general terms, in deriving alternate impulses from the armature, transmitting a portion of each impulse of a given polarity through a set of magnetizing-coils applied to the field-magnets and connected in a shunt upon the main line or work-circuit, while the balance of such impulses are transmitted directly to the main line, and in transmitting the impulses of the opposite polarity through a divided circuit, one division constituting a direct circuit to the main line, while the other circuit is through a second set of magnetizing-coils operating to assist the magnetizing effects of the first-named set.

The invention also involves a novel construction of the armature.

In the accompanying drawings, Figure 1 is a diagram illustrating a general organization of circuits adapted to carry out the invention. Figs. 2 and 3 illustrate modifications in the organization of the circuits. Fig. 4 illustrates the construction of the armature.

Referring to Fig. 1, A represents an armature, of any suitable character, adapted to be moved in the field of force established by field-magnets, the cores of which are represented at F′ F′ and F² F². The cores F′ and F² have positions of alternate magnetic polarity. The currents from the armature are delivered to a commutator, C, consisting of two separate contact-rings, C′ C². The ring C′ is constructed with extensions or plates *c′ c′*, separated from each other by non-conducting surfaces *c² c²*. The distance of the plates from each other is preferably such that the reversion of the polarity of the currents will about take place when the brushes are leaving the metallic parts of the commutator, and a conducting-plate will supplant in position a non-conducting plate for each alternation in the current generated. Two collecting-brushes, K′ K², are applied to the rings C′ C², respectively, and these are connected, respectively, with the main lines L′ and L², constituting the work-circuit. There are included in this work-circuit translating devices *d d*, of any suitable character—such, for instance, as incandescent electric lamps, motors, &c.—the number of which may be varied or is liable to be varied during the operation of the system.

For the purpose of maintaining the field of force for the armature the field-magnets are wound with two sets of coils, *f′ f′* and *f² f²*. The coils in the arrangement shown in Fig. 1 are preferably constructed of fine wire and of comparatively high resistance, and the coils *f′ f′* are applied to the cores F′, while the coils *f² f²* are applied to the cores F² F². The coils may be considered as all being wound in the same direction.

The conducting plates or fingers *c′* make alternate contact with two contact-brushes, *k′ k²*, respectively connected through conductors 1 and 2 with one end of the series of coils *f′* and *f²*. The remaining ends of these series are connected with the main line L². The brushes *k′* and *k²* are so arranged with reference to the contact-fingers that either one or the other of the brushes will be in contact at any given time with one of the conducting-plates *c′*; but the two will not be in contact at the same time for any relatively considerable length of time.

When the brush *k′* is in contact with a finger *c′*, a shunt-circuit around the work-circuit will be established through the coils *f′*. The current which will traverse this circuit will depend upon the comparative resistance of this circuit and the work-circuit. As the resistance of the latter decreases, the current through the coils *f′* will diminish; but the parts are so constructed that under a normal load the current traversing the coils will produce a magnetic saturation on the part of the field-magnets. Therefore a considerable fluc-

tuation may take place without materially changing the value of the field. When the armature has moved forward and placed the brush k' against a non-conducting surface c^2 and the brush k^2 against a conducting-finger c', then the circuit through the coils f' will be interrupted. The coils f^2 will now be in circuit, but the current traversing these coils will be in the opposite direction from the preceding current. As the coils f' and f^2 are wound in the same direction, this will produce alternate poles at the inner ends of the alternate cores. The rapid succession of currents of the same polarity through each series of coils will secure a constant magnetization of the cores. An adjustable resistance, R', is preferably inserted in the conductor 1, and a similar resistance, R^2, in the conductor 2 for controlling the flow of current therethrough. An additional resistance, r^2, consisting of adjustable coils, may also be placed between the conductors 1 and 2. The resistance r^2 is inserted to take up the spark.

In Fig. 2 the coils f' and f^2 are represented as being connected in multiple-arc circuit between the brush k' and the line L^2 and the brush k^2 and the line L', respectively. In this instance the coils f^2 are of coarse wire and low resistance. The cores F' will be excited by the currents traversing the shunt upon the translating devices *d d;* but there will be two paths by which the currents may pass from the ring C' to the main line L'—one directly by way of the brush K' and the other by way of the brush k^2, conductor 2, including the coils f^2, to the point 3, at which the latter coils are connected with the line L'. The coils f^2 are of very low resistance, and a proportionate current will traverse these coils. As the resistance of the work-circuit decreases by reason of more lamps—*d*, for instance—being included in multiple arc, more current will tend to flow to line, and therefore the value of that traversing the coils f^2 will be increased. The lowering of the resistance of the work-circuit, however, tends to decrease the current through the coils f', and the increase of current through the coils f^2 will tend to regulate the field of force and maintain the current constant.

In Fig. 3 the coils f' are represented as connected in series, as in Fig. 1, and the coils f^2 as connected in multiple arc, as in Fig. 2.

An armature well adapted to the purpose of this invention is illustrated in Fig. 4. In this figure, *a* represents a shaft, of any suitable character, upon which there is mounted a block of wood or other suitable non-magnetic and non-conducting material, B, or it may be an insulated iron core or made of iron disks. This carries at one end a series of radiating-plates, B' B', and a similar series, B^2 B^2, at the other end. These plates are secured to the block *b* in any convenient manner—as, for instance, by having their inner ends, *d*, bent parallel to the axis and curved to fit the block or hub B. The plates are then screwed or bolted to the block, as shown at *b' b'*. A series of plates or bars, E' E', of soft iron, are then placed between the plates B' B^2. Thus one plate connects from one side of one plate B' across to the opposite edge of a plate B^2 at the opposite end of the hub B, it being understood that the plates B' and B^2 are placed in different radial lines. In this manner a continuous metallic circuit of soft iron is formed through the bars and end plates of the armature. Upon the shaft there are carried the two insulated collecting-rings C' and C^2, which are respectively connected with two of the plates B', which are opposite each other. From these rings currents may be collected and employed in the manner above described, or in any well-known manner.

When the armature is revolved within a suitable field, the passage of the bars E' across the poles or the lines of force established by the field-magnets will cause currents of electricity to be generated in the bars.

It should be remarked that an armature constructed upon this principle may be placed with its periphery very near to the poles of the field-magnets, and therefore currents of comparatively-high potential may be developed.

I claim as my invention—

1. The combination, with the armature of an electric generator, of a series of field-magnets for the same and circuit-controlling devices connecting the alternate coils in circuit with the armature alternately.

2. The combination, with the armature of an electric generator, of field-magnet coils for the same arranged in two sets and circuit-controlling devices connecting alternate sets of the coils alternately in circuit.

3. The combination, with the armature of an electric generator, of field-magnet coils arranged in two sets and circuit-controlling devices therefor connecting one of said sets of coils in circuit with the armature during the production of currents of one polarity and the other set during the production of currents of the opposite polarity.

4. The combination, with the armature of an electric generator, of field-magnet coils arranged in two sets, the members of one of which sets are between one terminal of the armature-coils and its other terminal during the production of currents of a given polarity, and devices for connecting the other coils in circuit during the production of currents of the other polarity.

5. The combination, with the armature of an electric generator, of field-magnet coils arranged in two sets, the members of one of which sets are between one terminal of the armature-coils and its other terminal during the production of currents of a given polarity, and devices for connecting the other coils in circuit with the armature in multiple arc during the production of currents of the other polarity.

6. The combination, with the armature of an

electric generator, of two sets of alternately-arranged field-magnet cores and their respective coils, the coils of each set being arranged in multiple arc with each other, collecting-rings connected with the respective terminals of the armature-coils, contact-brushes respectively making alternate contact with one of said rings and respectively connected with one terminal of said sets of coils, and conductors respectively connecting the remaining terminals of said sets of coils with the contact-rings.

7. The hereinbefore-described method of maintaining the field of force of an alternate current electric generator, which consists in establishing by successive currents of one polarity lines of magnetic force at certain points and by currents of the other polarity lines of force at other points.

8. The hereinbefore-described method of maintaining the field of force of an alternate-current electric generator, which consists in transmitting successive currents of one polarity through one circuit and successive currents of the other polarity through another circuit, and in causing such currents by their combined action to induce such field of force.

In testimony whereof I have hereunto subscribed my name this 11th day of March, A. D. 1887.

OTTO A. MOSES.

Witnesses:
DANL. W. EDGECOMB,
CHARLES A. TERRY.