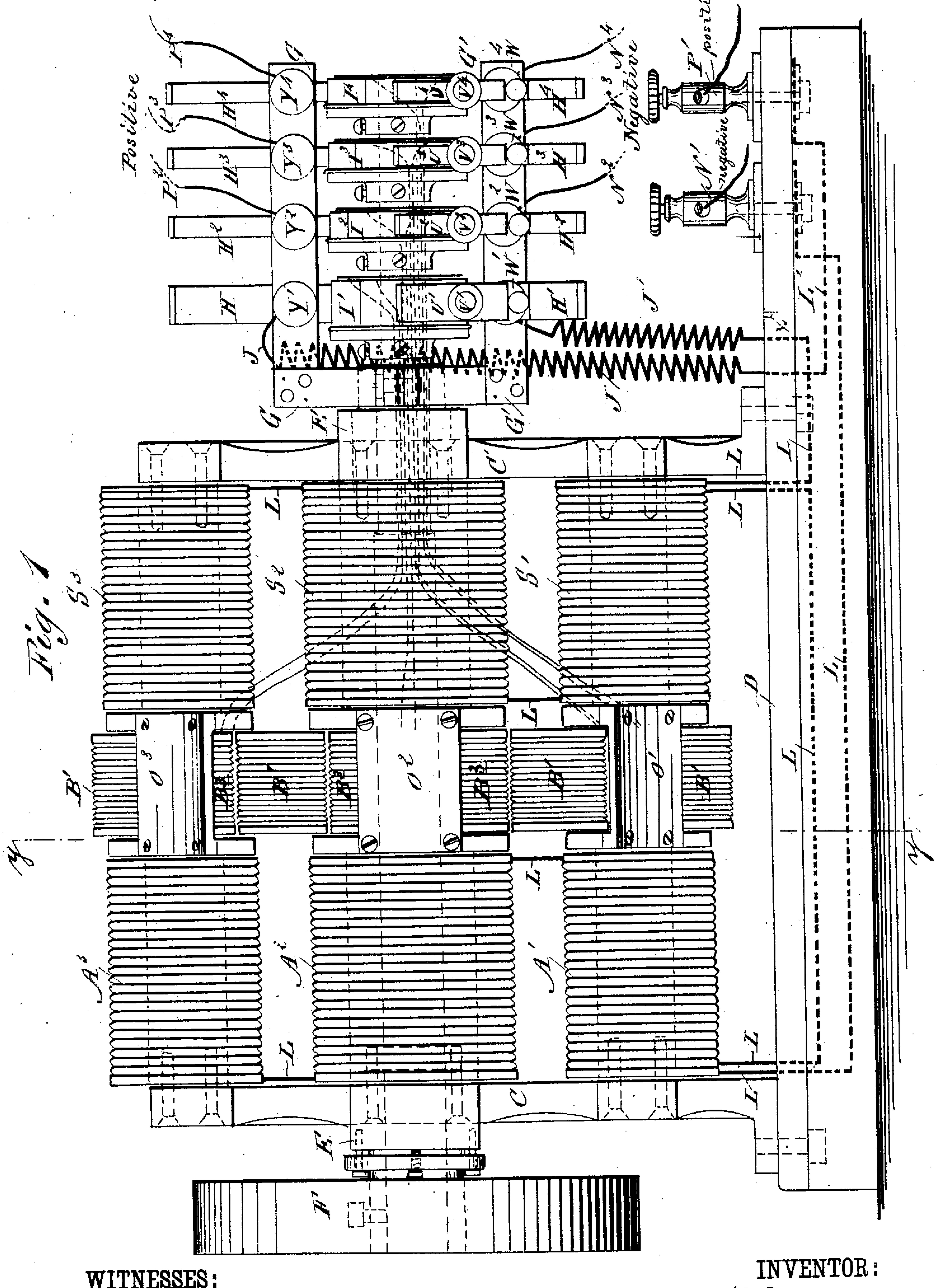
(Model.) 2 Sheets—Sheet 1.

H. J. MÜLLER.

Dynamo Electric Machine.

No. 241,054. **Patented May 3, 1881.**



WITNESSES:

C. Neveux

C. Sedgwick

INVENTOR:

H. J. Müller

BY Munn & Co

ATTORNEYS.

N. PETERS, Photo-Lithographer, Washington, D. C.

(Model.)

2 Sheets—Sheet 2.

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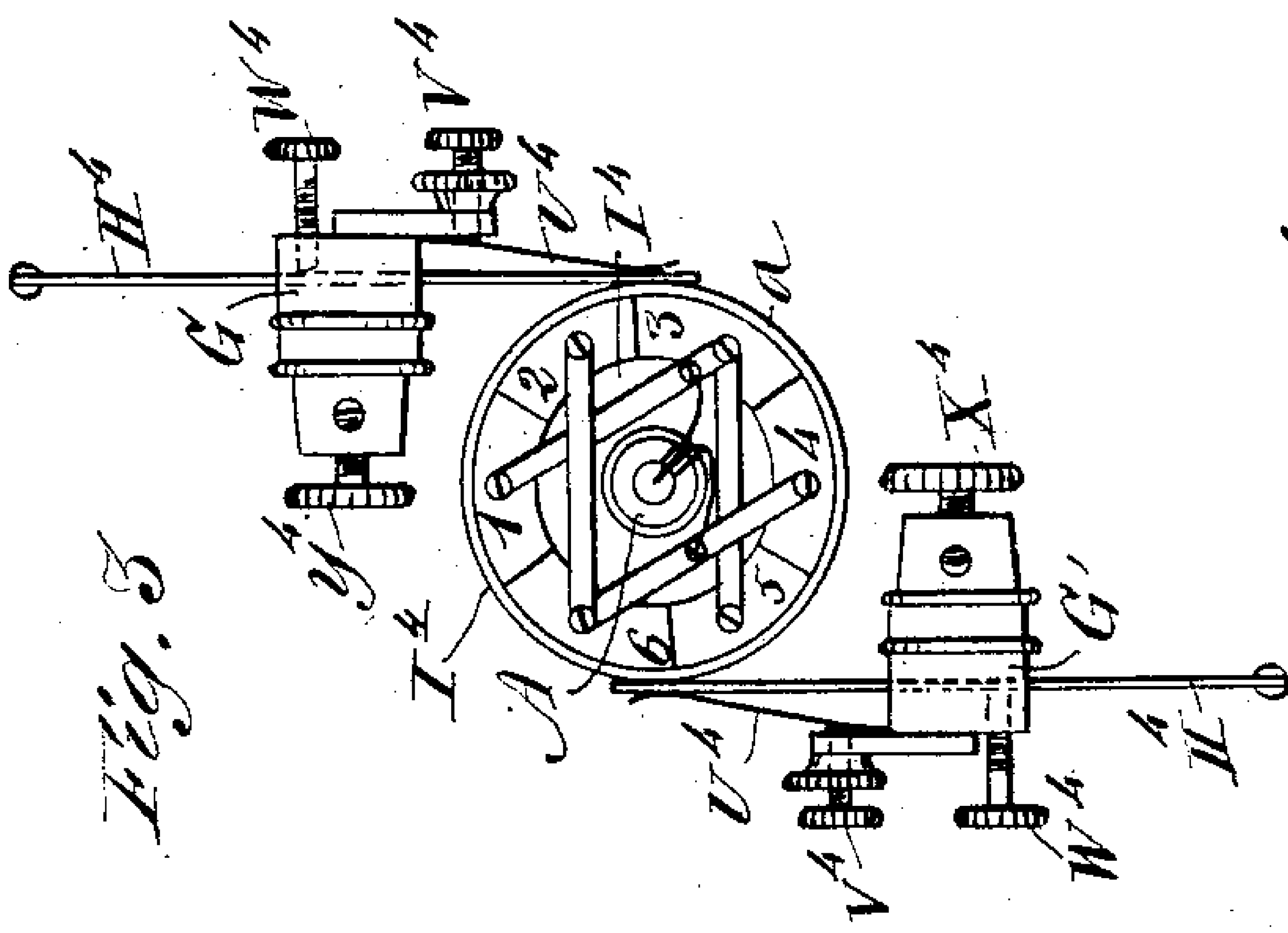

Fig. 3

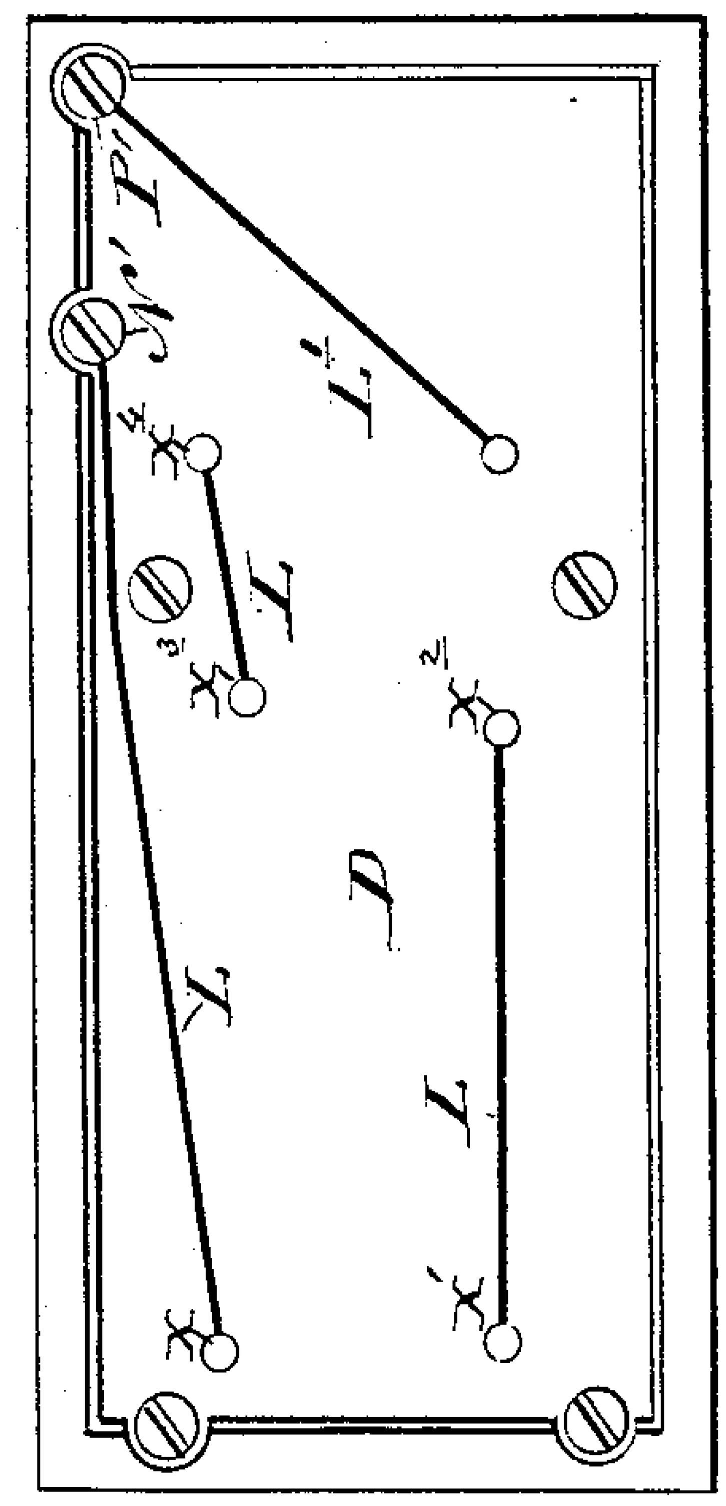

Fig. 4

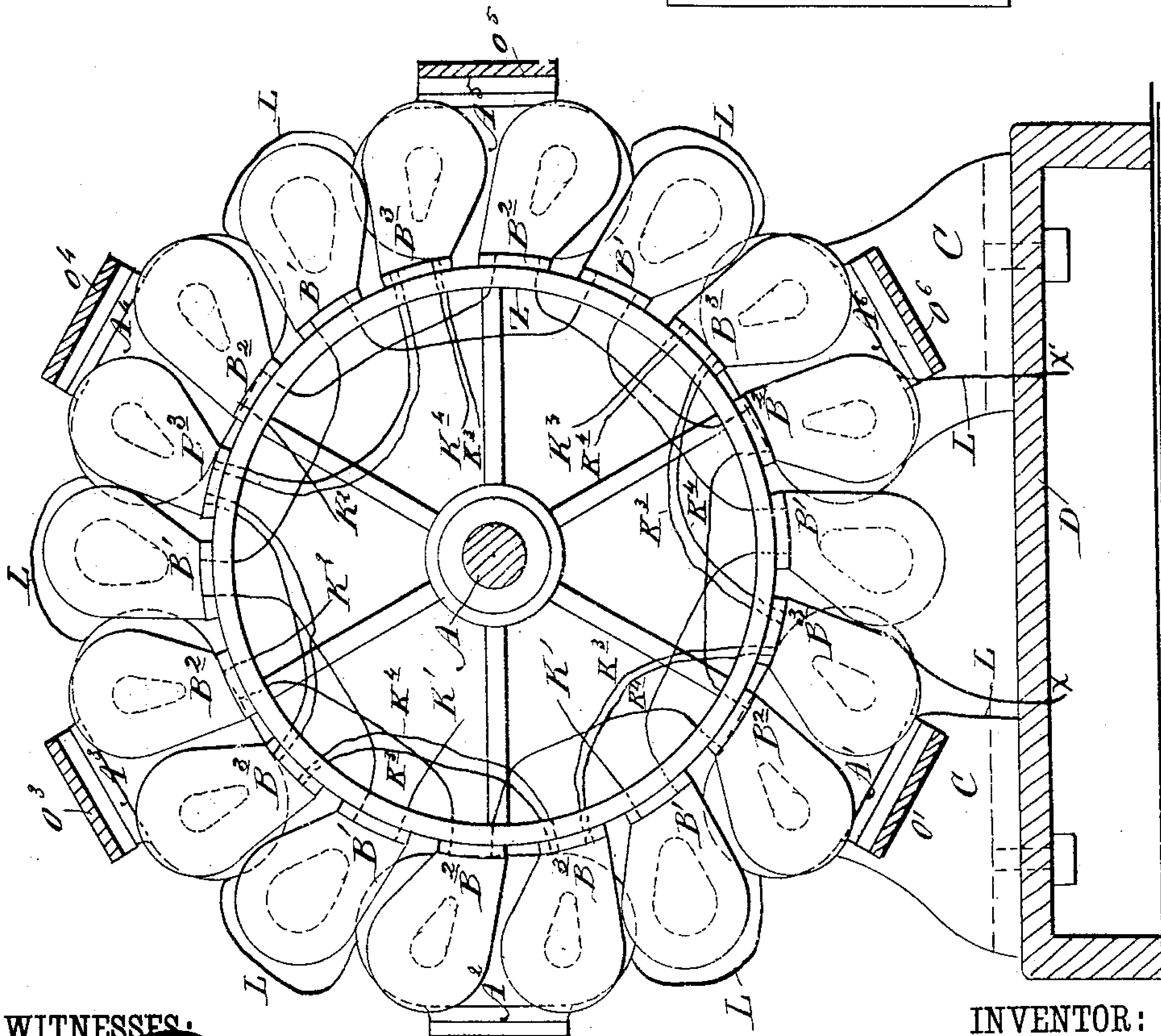

Fig. 2

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UNITED STATES PATENT OFFICE.

HANS J. MÜLLER, OF NEW YORK, N. Y., ASSIGNOR TO HIMSELF AND ALEXANDER LEVETT, OF SAME PLACE.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 241,054, dated May 3, 1881.

Application filed October 13, 1880. (Model.)

To all whom it may concern:

Be it known that I, HANS J. MÜLLER, of the city, county, and State of New York, have invented a new and Improved Dynamo-Electric Machine, of which the following is a specification.

The object of my invention is to provide a new and improved dynamo-electric machine which is so constructed that a series of separate and independent currents can be produced, of which one is used to excite the field-magnets and at the same time perform work in the external circuits, whereas the other currents perform work in the external circuits only.

The invention consists in the construction and combination of parts hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a longitudinal elevation of my improved dynamo-electric machine. Fig. 2 is a cross-sectional elevation of the same on the line *y y*, Fig. 1, showing a side elevation of the armature. Fig. 3 is a front elevation of the commutator and the brushers. Fig. 4 is a plan view of the under side of the base of the machine, showing the arrangement of the connecting-wires.

Similar letters of reference indicate corresponding parts.

There are two series of fixed field-magnets (six in each series) arranged concentrically with a shaft, A, on which the armature revolves. The two series are so placed relatively to each other that a pole of each magnet of one series is opposite a pole of a magnet of the other series. The armature-wheel revolves between the two series, and thereby generates electro-motive force.

The letters A′ to A^6, inclusive, Figs. 1 and 2, indicate the six magnets of one series, and the letters S′ S^2 S^3, Fig. 1, three opposing magnets of the other concentric series. The magnet-cores are connected by brass plates O′ to O^6, inclusive, and are attached to and supported by vertical standards C C′, which are fastened to a horizontal base-plate, D. Such field-magnets are all connected in one circuit by means of a wire, L, which proceeds from binding-post N′ along the under side of the base-plate D, ascends at *x* to the outer end of magnet A′, and is wound thereon from left to right. From the inner or right-hand end of said magnet it passes to the inner end of magnet A^2, and from the outer end of the latter to the outer end of magnet A^3, and so on until it leaves the outer end of magnet A^6, and, passing down through the base-plate D at x', Fig. 4, reascends through the same at x^2, and is wound successively on the six magnets of the right-hand series S′ S^2 S^3, &c., passing next through the base-plate D at x^3, then up through the plate at x^4, and in the form of a coil, J′, to the binding-screw W′ of the brush H′ of the first or inner commutator, I′, Fig. 1. From the binding-screw Y′ of the other brush, H, of the same commutator a coiled wire, J, leads down through the base D and extends to the binding-post P′, which is located contiguous to the post N′. To these respective posts are attached the negative and positive wires, which form the external circuit for maintaining a light or doing other work.

The shaft A is journaled in the journals E E in the standards C C′, and upon one end of this shaft a belt-pulley, F, is mounted, whereas a series of commutators, I′, I^2, I^3, and I^4, are mounted on the other end.

Two bars, G and G′, are attached to the standard C′ in some suitable manner, and project from the same parallel to the shaft A. The brushers H′, H^2, H^3, and H^4 are held to these bars by the binding-screws W′, W^2, W^3, and W^4, and are suitably insulated at the point of contact. Each brush is provided with a pressure-spring, U′, U^2, U^3, and U^4, the tension of which can be adjusted by means of the set-screws V′ to V^4. The binding-screws X′ X^4 and Y′ Y^4 serve to bind the positive and negative wires of the external circuits to the corresponding brushers.

In some cases I may wind the coils of the different groups with more than one wire, so that different currents may be derived from one group, a separate commutation being in such case provided for each wire. In this instance the coils B^3 are wound with two wires, k^3 k^4. The coils B′ B^2 B^3 are connected with commutators I′ I^2 I^3 I^4 by wires k' k^2 k^3 k^4, respectively, which pass through and are insulated in the hollow shaft A. The dynamo-machine is thus divided into four sections, which are entirely independent of one another. The commutators I′, I^2, I^3, and I^4 are composed of six segments—that is, as many as there are field-magnets—which are held together by a flanged ring, *a*. As can be seen in Fig. 3, the segments 1, 3, and 5 are connected with each other, and the segments 2, 6, and 4 are connected with each other. In a like manner, the wire *k*′ is connected with the segments 1 3 5 of the commutator I′, passes through the coils of section B′, and the return-wire *k*′ is connected with the segments 2 6 4 of the commutator J′. The wire k^2 is attached to the segments 1 3 5 of the commutator I^2, passes through the coils of the section B^2, and returns to the segments 2 6 4 of the commutator I^2, and in the same manner the wires k^3 and k^4 are connected with the commutators I^3 and I^4, respectively.

Each group of armature-coils must contain as many coils as there are field-magnets, and each commutator must have as many segments as there are field-magnets. The sides of the armature-coils are so arranged that in the moment when they leave one field-magnet one-eighth of their cross-section covers the next adjoining magnet, as is shown in Fig. 2, *b*, for instance, where one-sixteenth of the width of the end or cheek of the coil overlaps each of the adjoining field-magnets A′ and A^6. Consequently, if the armature cheek or end leaves the magnet A^6 altogether, one-eighth of its width overlaps the magnet A′. The coils are arranged in this manner for the following reasons: When the coils leave the heads of the magnets a short interruption of the main current takes place, and in consequence of this an extra curren is developed, which has the same direction as the main current; but as a certain armature-coil leaves the magnet at precisely the same time that the corresponding commutator-segment leaves the brusher, the extra current will discharge itself into the next commutator-segment in the direction of the preceding main current, consequently in the reverse direction of the succeeding current, and thus when these two currents unite they produce a spark at the commutator, and these sparks destroy the commutator and brusher very soon; but if the armature-coils overlap the next magnet before leaving the former one, as described above, the following main current will be strong enough to counterbalance the extra current without affecting the preceding main current, if the armatures are not too broad.

While I specify a lap of one-eighth as that which will produce the best effect, yet fair results may be obtained with a lap varying somewhat therefrom.

The coils of the group B′ contain more iron than the other coils, for a certain quantity of iron is required in the coils in proportion to the magnet to produce an induction-current that is sufficient to excite the magnets, and also to produce the required reactive effect, for the field-magnets in turn excite the armature-cores and also their coils, and thus produce induced currents in the same.

As heretofore usually constructed, the armature-coils of dynamo-machines did not contain a sufficient mass of iron to enable a small group of them to properly energize the field-magnets; hence, as a rule, all the groups had to be employed for such purpose. But in order to obtain a current of small quantity and great intensity for maintaining a series of lights, a certain length of wire must be employed—that is to say, intensity of current is what is required, and with a wire of great length a current of minimum quantity and maximum intensity may be produced. With thick cores but a comparatively short length of wire can be employed, for the coils can occupy only a limited space.

In practice I have found that while, with thick coils and the necessarily short length of wire (No. 16) that could be wound thereon, I can produce only one light of fifteen hundred candle-power, yet with small cores and the much greater length of wire which may be wound thereon I can maintain two such lights. In other words, by my mode of constructing and winding of the armature-cores and connecting them in the internal and external circuits, I can produce twice the effect usually produced by the ordinary method or arrangement.

The currents generated in the machine have the following circuits: The current from the first group, B′, of the armature-coils, and which is the only one used to excite the field-magnets and also do work in the external circuit, passes to segments 1 3 5 of commutator I′, then through brush H and coil J to binding-post P′, and to the work in the external circuit. The return current enters at binding-post N′, passes through wire L to magnet group A′ to A^6, then through magnet group S′ to S^6 and coil J′ to brush H′, segments 2 6 4 of the same commutator I′, and return-wire *k*′ back to the coils B′, which completes the circuit. Another current passes from the armature-coils of group B^2, through wire k^2, to segments 1, 3, and 5 of the second commutator, I^2, through brush H^2, binding-screw y^2, wire P^2 to the light in the external circuit. The negative currents from such light returns through wire N^2, binding-screw X^2, brush H^2, segments 2 6 4 of the same commutator I^2, and the return-wire k^2 back to the coils B^2. The two currents from the group of coils B^3, which are wound double, take a similar course through the respective commutators I^3 and I^4 and their respective brushes Y^3 X^3 and Y^4 X^4 and external circuit-wires, P^3 N^3 and P^4 N^4, as will be readily understood. One of these wires wound on the coil B^3 derives its current mainly by induction from the other wire as well as by induction from the iron core.

I am aware that it is not broadly new to arrange a series of armature-coils so as to overlap more or less the field-magnets with which they coact; but I believe myself to be the first to have conceived and practically carried out such definite arrangement of said parts as will produce the desired effect—namely, prevent sparks at the commutator; and I do not claim, broadly, the division of armature-coils into groups or sections from which different currents are produced, as described in Varley's English Patent No. 4,905, A. D. 1876.

I do not here claim the inclination of the armature-coils, since that has been made the subject of a separate application.

What I claim is—

1. The combination, with a series of field-magnets and two or more commutators, of two or more groups of armature-coils having independent circuit-connections, whereby one group may be employed independently for doing work in the external circuit and also charging the field-magnets, and the other group or groups solely for doing work, substantially as specified.

2. The combination, with two or more commutators and a series of field-magnets, of two or more groups of armature-coils, one group of which has larger iron cores, and is employed both to excite the field-magnets and do work in the external circuit, and the rest of the coils solely for doing work, substantially as specified.

3. The combination, with commutators and series of field-magnets, of an amature-wheel having two or more different series of coils, the coils B′ of one series having larger iron cores than those of the rest and being wound with a less length of wire, and such larger cores being connected with a commutator and the magnets, and the other series of coils wound with a greater length of wire, which leads to the second commutator, as shown and described, the current from the coils having the larger iron cores being used to excite the magnets and the current from the others exclusively to do work in the external circuit, as and for the purposes specified.

4. The combination, with a commutator and a series of field-magnets concentrically arranged, of an armature-wheel having a series of coils the width of whose cheeks exceeds by about one-eighth the distance between such magnets, so that they will overlap the latter, as shown, for the purpose of preventing sparks at the commutator, substantially as specified.

5. In a group of coils of the armature of a dynamo-electric machine, the combination, with one or more coils, B^2 or B^3, of a coil, B′, having a larger iron core than the other coils, substantially as herein shown and described, and for the purpose of producing more magnetism for exciting the field-magnets in these coils B′ than in the rest.

6. In the armature of a dynamo-electric machine, the combination, with a series of coils in number equal to a multiple of the number of field-magnets, of coils which have a larger iron core than the rest of the coils and are equal in number to the field-magnets in the machine, substantially as herein shown and described, and for the purpose of exciting the field-magnets of the machine with a number of coils not greater than the number of field-magnets, so that the other coils can be used independently for work in the external circuit.

HANS J. MULLER.

Witnesses:
OSCAR F. GUNZ,
C. SEDGWICK.