(No Model.)

C. D. HASKINS & C. M. LUNGREN.

DYNAMO ELECTRIC MACHINE.

No. 260,866. Patented July 11, 1882.

Fig. 1.

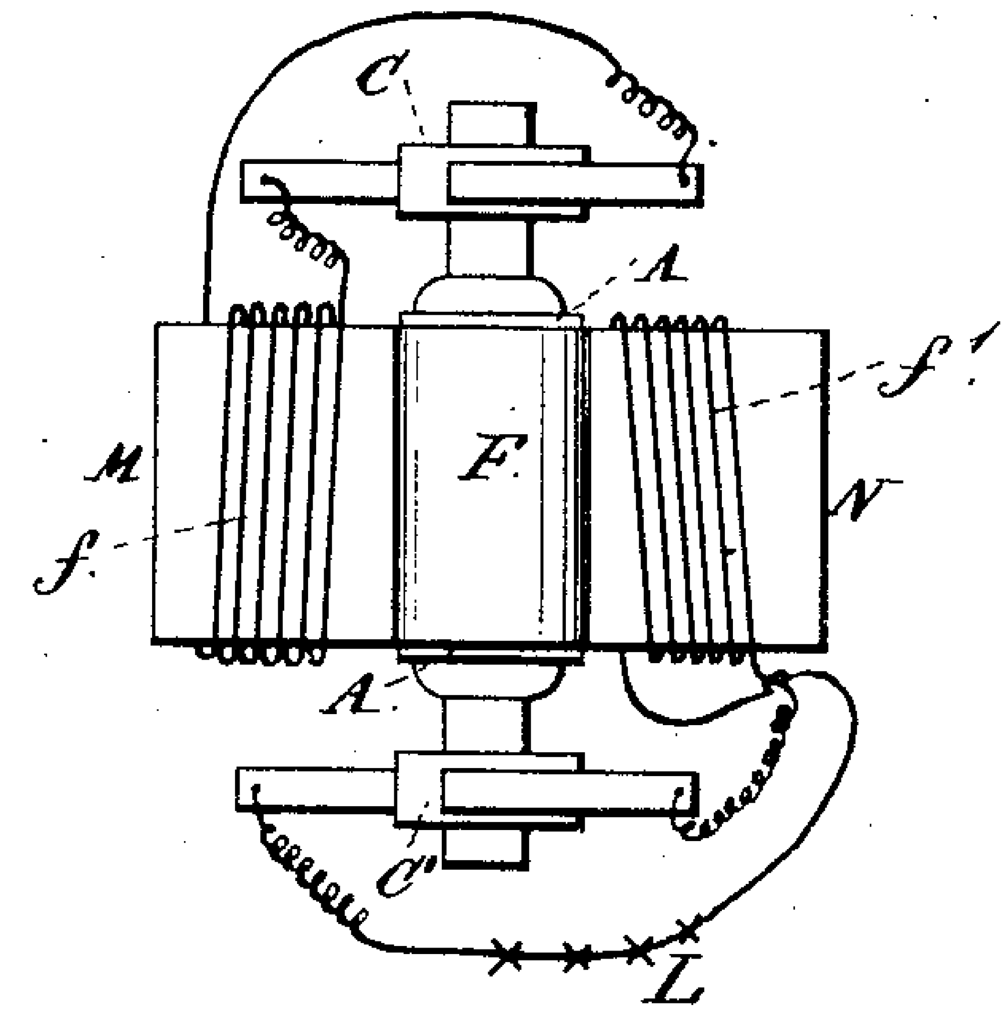


Fig. 3.

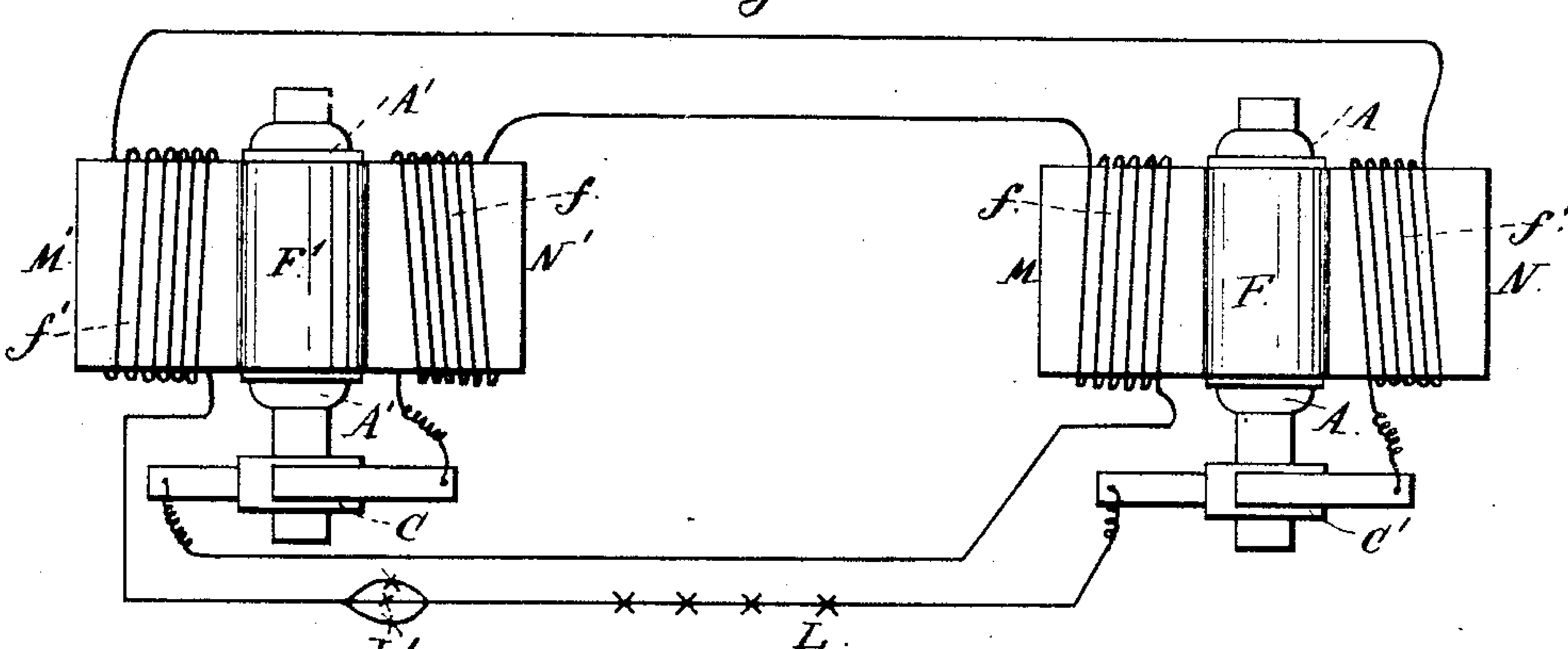
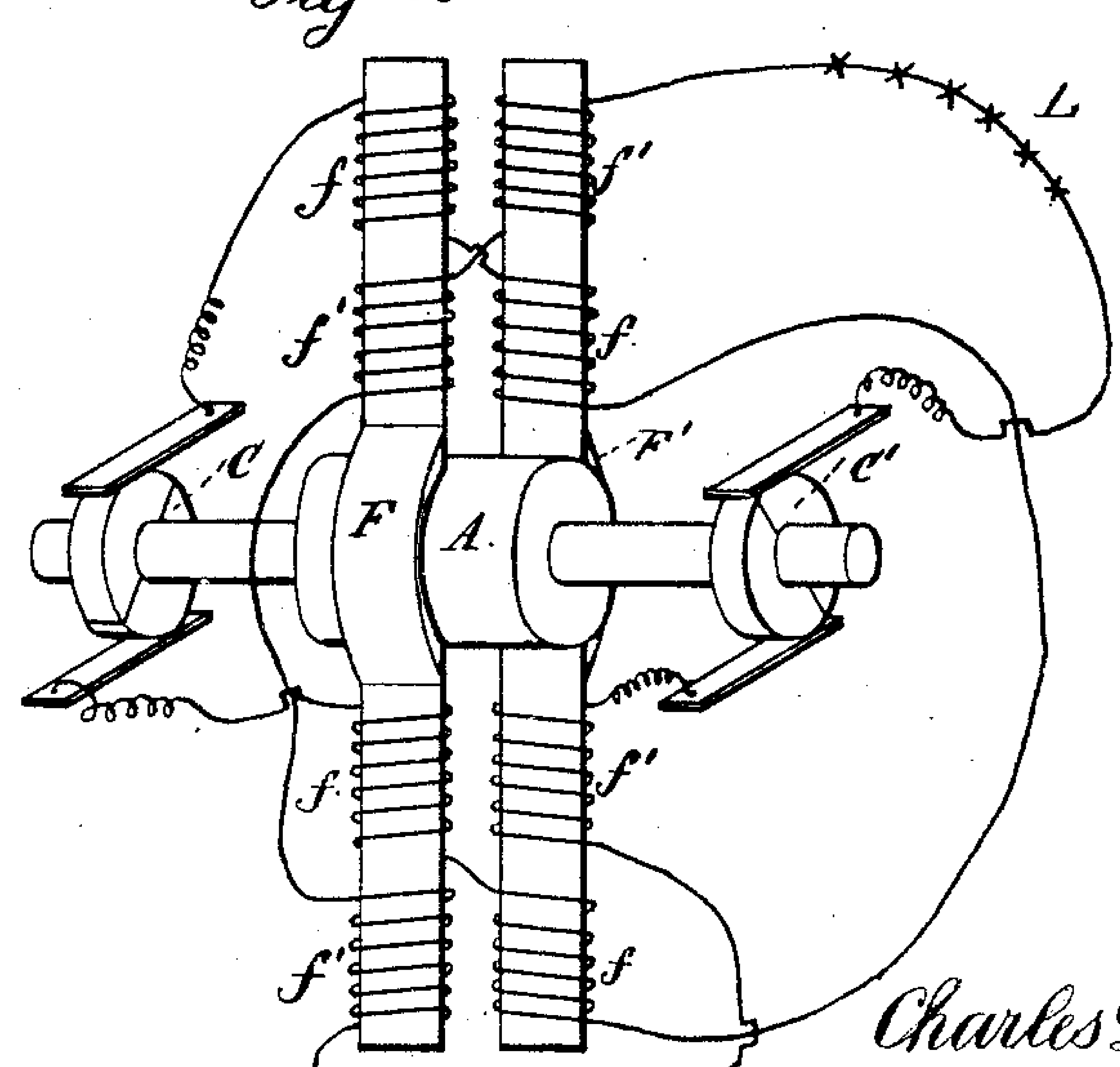


Fig. 2



Witnesses

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DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 260,866, dated July 11, 1882.

Application filed April 17, 1882. (No model.)

To all whom it may concern:

Be it known that we, CHARLES D. HASKINS and CHARLES M. LUNGREN, of the city and State of New York, have invented an Improvement in Dynamo-Electric Machines, of which the following is a specification.

It is the object of our invention to provide a dynamo-machine which will automatically respond to a variable resistance in the external circuit, so that the power required to drive the machine will be proportioned to the resistance to be overcome. With the ordinary dynamo machines used to overcome an external resistance, arranged in series, as a number of arc-lamps placed in a single circuit, one after another, such a response to variations in resistance not only will not take place, but will occur in a way opposed to that which is desired, the current becoming stronger as the external resistance decreases and weaker as it increases. In such an arrangement the field-magnet coils are, like the lamps, placed in series, so that the current leaving the commutator traverses them and then the lights or other resistances in succession and returns to the machine. The removal of a light, therefore, causes an increase of current through the coils. This increases the magnetism of the field, and this, again, increases the current induced in the armature, and which is sent through the field-coils. The effect is therefore just the reverse of what it should be in order that the power may be proportioned to the useful resistance in the external circuit. If, however, the external resistance be in multiple arc, the ordinary machine will respond to a varying resistance in a proper way, as then the removal of lamps increases the resistance and proportionally cuts down the field. Our invention therefore has reference to machines with an external resistance in series, or to a resistance that is varied in the way in which a series resistance varies. For instance, we may, instead of stringing one lamp after another on a wire, arrange groups or bunches of lamps in this way, as seen at L′, Fig. 3. The removal or insertion of a bunch then affects the external circuit in the same manner as the removal or insertion of a single lamp in a simple series.

We accomplish our object by providing two distinct circuits around the cores of the field-magnets, the currents in which tend to magnetize the field with opposite polarity, and thus neutralize the effect of each other. One of these circuits is always closed, and constitutes one of the magnetizing-coils of the field. The other includes the lights or other working devices and the opposing field-helices, and tends to cut down the magnetism in the field developed by the other with a force varying inversely with the external resistance. The effective field is always, therefore, the difference of magnetism developed according to the relative strengths of the opposing currents. The maximum field is that produced when the external resistance in the working circuit is greatest, the minimum that produced when the opposed magnetic effects are equal in consequence of the resistance in one external circuit being removed.

Our invention may be applied to one machine provided with two commutators and separate coils on the armature, or to two machines coupled, so that each one supplies the field of the other.

Figure 1 is a diagram showing this construction as applied to a machine provided with two commutators, and Fig. 2 illustrates another form, in which the coils are wound differentially on the cores of the field-magnets in the same machine. Fig. 3 shows the application to two machines arranged so as to constitute one generator.

In Fig. 1, F represents the pole portion of the U-magnets M N. A is the armature, and C and C′ the commutators. One coil or helix on the armature A is led to the commutator C and the other to the commutator C′. The current generated in the former is passed through the coils *f* around the legs M of the magnets, and that in the latter through the coils *f′* around the legs N of the magnets. The lights or other working devices L are placed in the latter circuit. Now, it is evident that if the number of convolutions and the resistance of these coils *f* and *f′* are equal, and if one-half of the total current generated passes through each, there will be no magnetism in the field F when there is no external resistance in the circuit of which the coils *f′* form a part. The power then required to drive the machine will simply be that to overcome the mechanical friction, resistance of the air, &c. With the introduction of lamps L in this latter circuit, however, the balance between the two circuits is destroyed, and the field will then be magnetized by the coils *f* in exact proportion to the introduction of the external resistance, L. As the whole object of these separate coils on the field-magnet is to produce opposite polarities, the winding of the coils may be in any way that will produce this result. The coils of each circuit may be wound over both legs of each magnet in the usual way, but differentially with regard to each other, or they may be wound in various other ways.

In Fig. 2 is illustrated a form of differential winding which effects the aforesaid operations. Now, it will be observed that while the two circuits are electrically distinct they have the same armature and field, and are therefore subject to the same conditions as regards these elements. These conditions can be readily realized in two machines coupled together by joining the fields of each machine in such a way that they (the fields) are common to both, and therefore subject to exactly the same conditions. Such an arrangement is shown in Fig. 3. The current generated in the armature A′ is passed around both field-magnets, and that generated in the armature A of the light-circuit is likewise passed around both field-magnets. The behavior of these two coupled machines will then be precisely the same as that of the one machine with two commutators.

We are informed that a method of regulating a dynamo by the use of two distinct circuits opposed to each other has been devised; but it differs essentially from ours. In this previous arrangement two machines are used—one (the secondary) to furnish the current for the external circuit and the other (the primary) to maintain the field of the secondary. The primary machine is, however, quite distinct from the secondary. Its field-coils are traversed only by the current generated by its own armature. As the resistance of its circuit is always the same and the magnetic relation of its field and armature likewise constant, (when it is driven at a constant speed, of course,) the current generated by it is constant, being entirely uninfluenced by changes in the resistance of the circuit of the secondary machine. It (the primary) requires, therefore, as much power to drive it when the circuit of the secondary machine has no lights in it as when this circuit contains its maximum resistance, and there is an unnecessary expenditure of power on the primary. In our arrangement, on the other hand, no current is induced in the primary circuit when the secondary circuit is free from resistance, and the only power required to drive the machine is therefore that necessary to overcome simply the mechanical resistance. The power is thus at all times exactly in proportion to the electrical work to be overcome.

We claim as our invention—

In a dynamo-electric machine, two circuits, both of which pass through the field-helices differentially and through armature-helices, and one circuit of which includes resistance—such as lights or other working devices arranged in series, substantially as specified—so that the electric energy in both circuits and the effective magnetism in the field are mutually developed in proportion to the resistance in one of the circuits, substantially as set forth.

Signed by us this 4th day of April, A. D. 1882.

CHARLES D. HASKINS.
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Witnesses:
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