(No Model.)

T. H. HICKS.

ALTERNATING CURRENT MOTOR.

No. 479,187. Patented July 19, 1892.

Fig. 1.

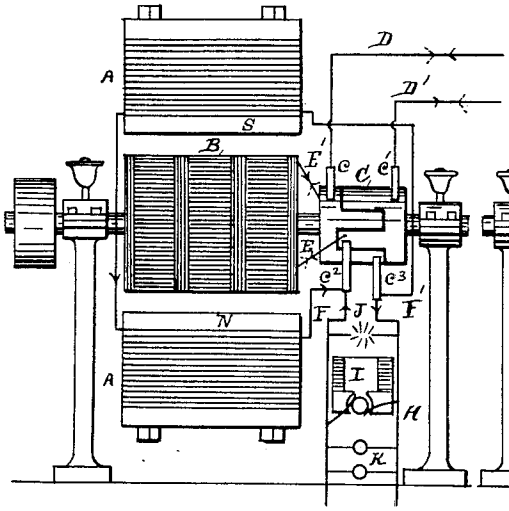


Fig. 3.

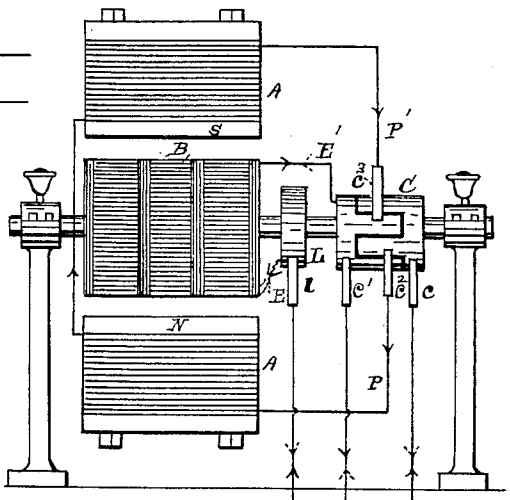
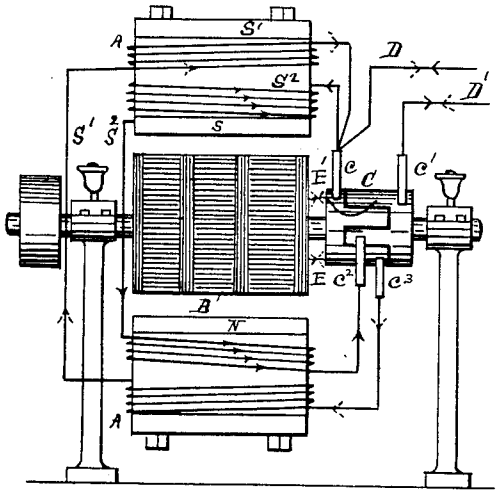
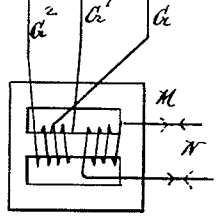


Fig. 2.





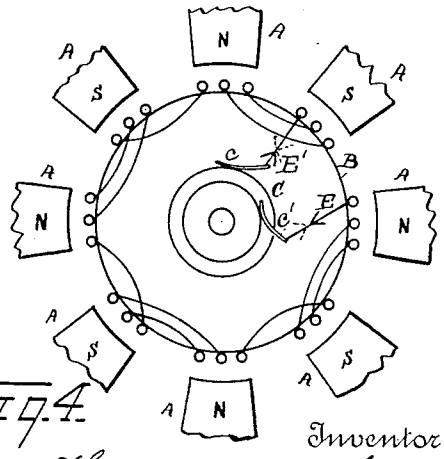


Fig. 4.

Witnesses
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John F. Miller.

Inventor
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By his Attorney
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UNITED STATES PATENT OFFICE.

THOMAS H. HICKS, OF DETROIT, MICHIGAN, ASSIGNOR OF ONE-HALF TO H. L. OBETZ, OF SAME PLACE.

ALTERNATING-CURRENT MOTOR.

SPECIFICATION forming part of Letters Patent No. 479,187, dated July 19, 1892.

Application filed March 9, 1891. Serial No. 384,292. (No model.)

To all whom it may concern:

Be it known that I, THOMAS H. HICKS, a subject of the Queen of Great Britain, residing at Detroit, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Alternating Motors; and I 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, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to certain new and useful improvements in alternating motors, and has reference more particularly to the construction and arrangement of mechanical parts whereby constant field-polarity can be maintained while alternating currents are continuously flowing through the armature conductor or conductors.

To these ends my invention consists of the devices and appliances, their combinations and arrangements, as hereinafter described and claimed, and illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation disclosing the armature, two of the field-magnet coils and poles, and a commutator device for straightening the alternating current to charge the field-magnets or for any other purpose requiring a continuous current, together with leads for conveying an alternating current to the commutator. Fig. 2 is a similar view showing a modification of the means for maintaining constant polarity of the field-magnets by the same commutating device. Fig. 3 is a similar view to Fig. 1, but showing a modification wherein an additional collecting-ring, brush, and converter are provided for supplying the armature-circuit with a high-voltage current, while the field-current, which is commutated, can be supplied at a lower pressure. Fig. 4 is an end elevation showing the end of the armature and arrangement of the field-poles around the armature.

In the drawings the circuits through which alternating currents flow are marked by full arrow-heads and dotted arrow-heads pointing in an opposite direction. The circuits marked with full arrow-heads only indicate continuous-current circuits.

The best form of alternating-current dynamos makes the best form of an alternating-current motor when my invention is applied thereto.

My invention refers, chiefly, to a commutator or a current-shifting device rotatable with the armature of any well-constructed alternating dynamo, the commutator being supplied with an alternating current and made to either shift the current impulses through two separate field-circuits, as shown in Fig. 2, or else straighten the current for a single circuit, the "single" and "two separate field-circuits" being shown in Figs. 1 and 2, respectively, while the armature is supplied with an alternating current unchanged in direction. In this way I only require to straighten about five per cent. of the current used in the motor, inasmuch as about ninety-five per cent. is used in the armature.

A represents field-poles.

In constructing the motor I employ radial field-poles of opposite signs alternately arranged around the armature in a similar manner to any of the well-known multipolar alternating machines.

B denotes the armature. For the armature I prefer an ordinary drum appropriately wound; but an armature having radial poles similar to the field-poles could be used, although not with such good results. An armature giving the best results must set up little counter-electro-motive force other than that due to rotation in the magnetic field of force, and such desired results are only accomplished by laying the conductors as nearly as possible on the circumference of the iron drum and not over the end.

C denotes the commutator, and c c' c^2 c^3 are the brushes.

D D′ denote the alternating-current circuit leading from an alternating-current dynamo or other source to the brushes c c', supplying the alternating current to the commutator-rings which are the terminals of the armature-conductor.

E E′ represent the alternating-current conductors connecting the commutator to the armature.

The brushes c^2 c^3, it will be perceived, take off from the commutator-currents of one di-

rection when the motor is in synchronism. These brushes are connected by conductors F F′ to the field-coils in Fig. 1.

It will be apparent to all skilled in the art that the armature-current reversals must be simultaneous with the alternations in the direction of the current which supplies the motor.

Another great advantage in having the motor running synchronously with the generator is that alternating currents can be straightened out by the same or another motor-commutator rotatable with the armature for other uses—such as shown, for example, in Fig. 1, where a continuous current H is also taken off from the brushes c^2 c^3, in which are placed a motor I, arc lamp J, and incandescent lamps K. The continuous current commutated from the alternating-current impulses thus supply, also, the field-magnets.

Instead of using a commutator C alone, as shown in Figs. 1 and 2, I can use an additional ring L and an extra brush *l* in connection therewith, as shown in Fig. 3. This modification is for the purpose of supplying the armature-circuit with a high-voltage alternating current, while the field-circuit, which is commutated, can be supplied with a lower pressure. The difference in the electric pressure in the two circuits is effected by the well-known principle of conversion, including all of the induction-coils of the converter in the armature-circuit, while only a portion of said coils is included in the field-circuit, the electro-motive force of the inductor-circuit increasing with each additional convolution of wire thrown into its circuit in a manner well understood. Accordingly M denotes a converter. N in this instance is a main alternating-current circuit supplying an alternating current to the converter. From the converter the converted current is led through two circuits having different potentials, the lower potential circuit (marked G G′) ending in the rings of the commutators, the other circuit of higher potential (marked G′ and G^2) terminating in the ring L and in one of the rings of the commutator, and from which the armature is supplied with an alternating current. The current from the lower potential circuit G G′ is made continuous by being commutated, and from which the field-coils are supplied through the conductors P P′.

In Fig. 2 I show the field-coils wound with two circuits S′ S^2, the pulsations of one direction being directed through one circuit, and the pulsations of an opposite direction being directed through the other circuit by a current-shifting device, rotatable with the armature. In this case I do not commutate the alternating current. One circuit is cut out by being closed upon itself through the shifting device *c*, while the other circuit is receiving current. The two circuits of course are cut out in succession, being closed alternately with each other. When two field-circuits are used in this way, a very much higher voltage-current can be applied to the field-circuits without sparking at the brushes, especially until the armature reversals are synchronous with the generator. The modification, however, shown in Fig. 3, shows equivalent good results.

It will be readily understood that independent commutator-rings can be used to supply the armature with an alternating current; but this of course would necessitate the use of more brushes. Therefore I prefer to use no more than necessary, as in the constructions shown.

What I claim as my invention is—

1. In an alternating-current motor, an armature provided with conductors traversed by alternating currents, said armature rotatable between field-magnet poles, each wound with two distinct conductors, one conductor traversed by current impulses of one direction and the other conductor traversed by current impulses of an opposite direction, and a commutator rotatable with the armature-shaft to separate said current impulses, substantially as described.

2. The combination, with an alternating-current motor, of a converter having its primary coil in circuit with an alternating current, all its secondary coils in circuit with the armature of the motor, and a part of said secondary coils in circuit with the field-magnet coils of the motor through a commutating or current-shifting device rotatable with said armature, substantially as set forth.

In testimony whereof I sign this specification in the presence of two witnesses.

THOMAS H. HICKS.

Witnesses:
N. S. WRIGHT,
JOHN F. MILLER.