

No. 820,890.

PATENTED MAY 15, 1906.

A. W. SCHRAMM.
ALTERNATING CURRENT MOTOR.
APPLICATION FILED MAY 20, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

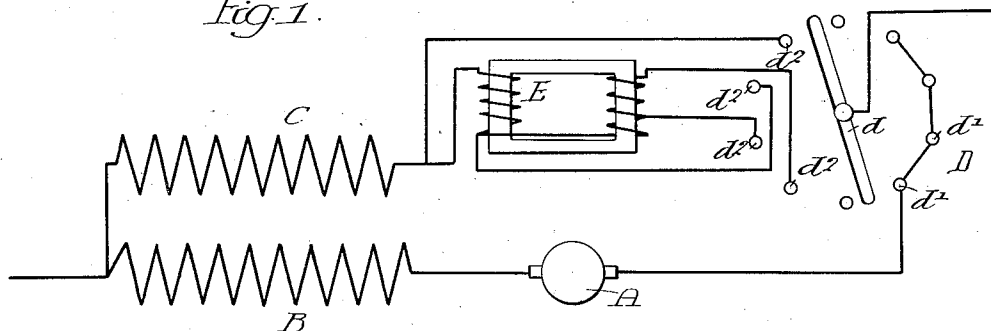


Fig. 2.

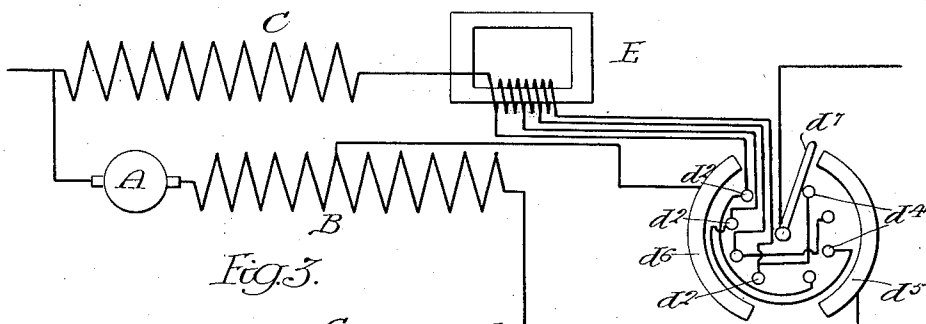


Fig. 3.

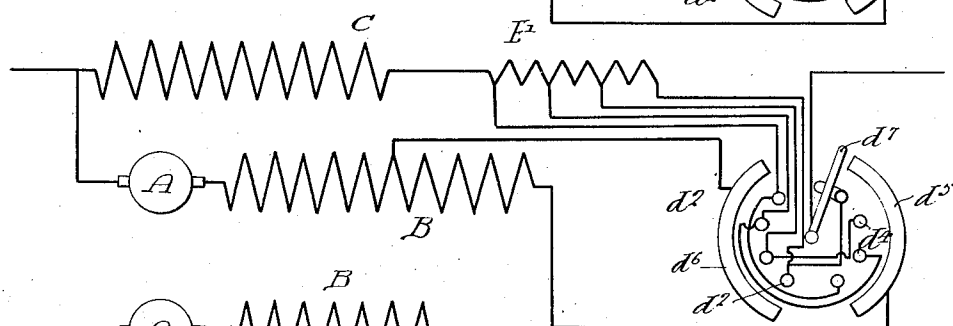
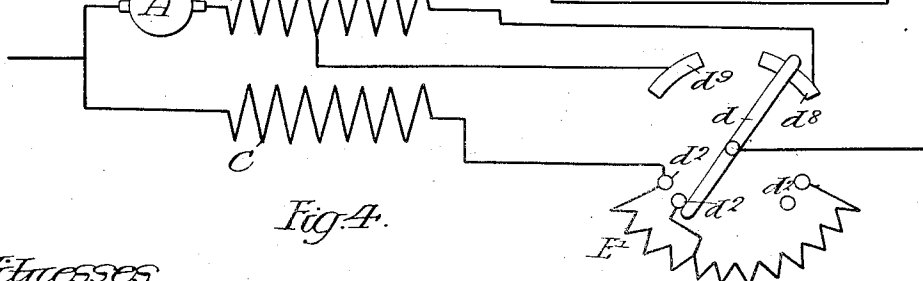


Fig. 4.



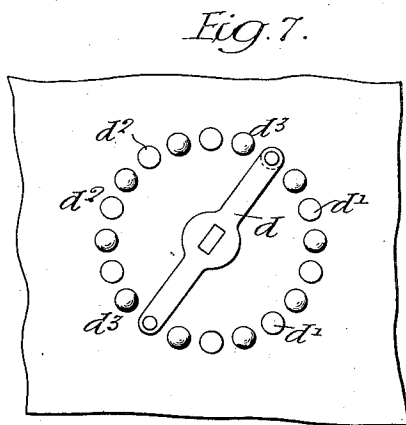
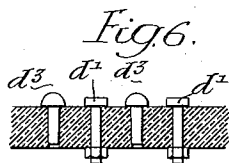
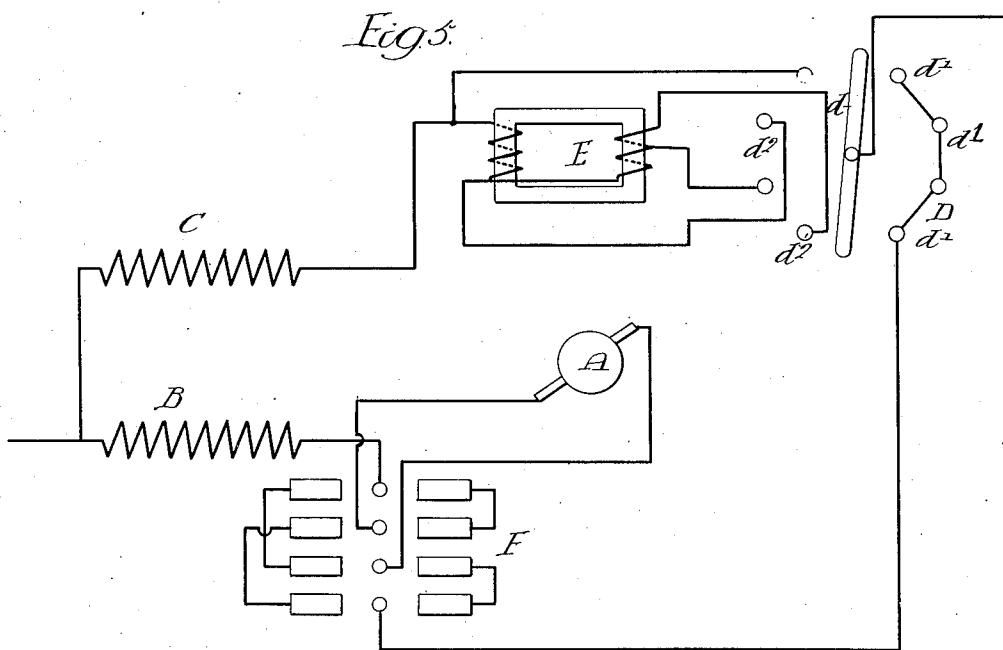
Witnesses
Titus H. Ross.
Augustus Koppes

Inventor:
Adolph W. Schramm.
by his Attorneys:
Howson + Howson

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2 SHEETS—SHEET 2.



Witnesses:
Augustus L. Oppen
Walter F. Pullinger

Inventor
Adolph W. Schramm
by his Attorneys,
Howson & Howson.

UNITED STATES PATENT OFFICE.

ADOLPH W. SCHRAMM, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR
TO ELECTRO DENTAL MANUFACTURING COMPANY, OF PHILADEL-
PHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

ALTERNATING-CURRENT MOTOR.

No. 820,890.

Specification of Letters Patent.

Patented May 15, 1906.

Application filed May 20, 1905. Serial No. 261,381.

To all whom it may concern:

Be it known that I, ADOLPH W. SCHRAMM, a citizen of the United States; residing in Philadelphia, Pennsylvania, have invented certain Improvements in Alternating-Current Motors, of which the following is a specification.

One object of my invention is to provide a single-phase alternating-current motor having zero torque at definite speed points and whose torque shall rise rapidly as the revolution of its armature-shaft is retarded, as by the application of a load.

Another object of the invention is to provide a motor having the above-noted characteristics, with suitable means for varying its speed, the construction of the motor being such that it shall be reversible, have large starting torque, and practically no sparking at its brushes.

These objects I attain as hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is a diagram illustrating one form of my improved motor and the connections therefor. Fig. 2 is a special form of the invention, illustrating an arrangement of parts whereby the number of available speeds at which it is possible to operate the motor may be increased. Figs. 3 and 4 are diagrams illustrating the use of non-inductive instead of inductive resistance in connection with my motor. Fig. 5 is a diagram illustrating the connections for operating my motor as a reversing-machine, and Figs. 6 and 7 are respectively a plan and a vertical section illustrating the detail construction of a portion of the preferred form of controller for use with the motor shown in the other figures.

In carrying out my invention I provide a commutator-motor with two windings, which I shall respectively term the "main" and the "corrective" field-windings, the number of turns in the latter of these being properly proportioned relatively to those of the main winding in order to obtain the desired speed torque characteristic and the function of this corrective winding being to set up a magnetomotive force which changes the magnitude and phase of the field flux.

The drop in voltage in the corrective cir-

cuit is the resultant of the impressed or line voltage, the electromotive force induced by the field flux and the electromotive force due to the reactance of the inductive resistance, this latter being preferably equal to zero for the lowest speed of the motor. The speed and power of the motor will be dependent upon the main field-winding, and while said speed may be varied between certain limits by varying the amount of inductive resistance in circuit still further variations may be obtained by varying the number of main field-turns in circuit.

Referring to Fig. 1 of the above drawings, A is the armature of the motor, of which B is the main field-winding, and C the corrective field-winding. D is the speed-controller, preferably consisting of a lever d , which may be turned in any direction to engage any of the contact-buttons d' and d^2 . Said contact-lever is permanently connected to one of the current-supply mains and is of such dimensions that it simultaneously engages, and thereby connects to, said supply-main opposite pairs of the contacts d' and d^2 . These contacts preferably have between them projecting buttons d^3 , as shown in Figs. 6 and 7, which are usually of greater height than said contacts and so placed that as the lever d is turned it is first forced to break contact with one pair of the contacts d' and d^2 by being raised to pass over the adjacent pairs of buttons d^3 . It is then free to move down into engagement with the next pair of contacts and may either be of resilient material or constructed in any other manner, so as to be free to move toward and from the surface upon which the contacts and insulating-buttons are mounted. This construction prevents short-circuiting any of the windings and is further designed for the purpose of providing a definite stop for each speed point and also for compelling a quick passage from one speed point to the next.

E represents a body of inductive resistance connected at different points of its length to various ones of the contacts d^2 of the controller D. The contacts d' of said controller are connected together and to one terminal of the armature A, whose second terminal is, as shown, connected to one end of the main field-winding B. Both main and corrective

windings are connected to the second supply-main.

While the motor is not in use, the contact-lever rests upon a pair of dead contacts, as shown in Fig. 1, and when said lever is moved into engagement with a pair of the contacts d' and d^2 the motor will operate at a definite speed, which will be varied as said lever is moved into engagement with other pairs of said contacts.

As above noted, if a greater number of speed variations be desired, or if it be desired to vary the speed between wider limits, the special arrangement of the motor shown in Fig. 2 may be employed. In this case, as in that illustrated in Fig. 1, the winding E is connected at various points of its length to the four contacts d^2 of the controller D', and each of these contacts is respectively connected to other contacts d^4 , arranged in an arc of the same circle as that defined by the contacts d^2 .

Upon arcs of a concentric circle are placed two segmental contact-pieces d^5 and d^6 , of which one is connected to one end of the main field-winding B, while the second is connected to some point in the length of the same winding, depending upon the characteristics of the particular motor to be operated and the speed variation desired. The opposite end of the main field-winding is connected to the armature A, which with one end of the corrective field-winding C is connected to a supply-main. As before, the second supply-main is connected to a contact-lever d' , which is of such dimensions as to simultaneously engage any one of the contacts d^2 or d^4 and the adjacent contact-segments d^5 or d^6 , as the case may be.

Under operating conditions it will be seen that the speed of the motor can be varied within the limits possible in the case illustrated in Fig. 1 by moving the lever d' into engagement with the various contacts d^2 and contact-segment d^6 . In addition the motor may be made to operate through a second series of speed variations by moving said handle into engagement with the contact d^4 and the contact-segment d^5 .

As shown in Fig. 3, I may employ non-inductive resistance E' in place of the inductive resistance E, if this should for any reason be found desirable, the same change being made in that arrangement of my system shown in Fig. 4, in which the number of turns of the main winding is altered simultaneously with the change of resistance in series with the corrective winding. This end is secured by providing two segmental contacts d^3 and d^6 , arranged concentrically with the contacts d^2 , and so placing them in relation to the contact-lever d' that it is possible for said lever to engage but two of said contacts d^2 while it is in engagement with the segment d^3 , the remaining two segments d^2 being engaged by

the lever, and hence connected to the supply-main as long as it is in engagement with the segment d^3 .

Since the brushes are ordinarily placed at the neutral point, the motor may be operated as a reversing-machine, and with this arrangement the same flux distribution is secured for both directions of rotation. Any desired form of reversing-switch may be employed, such as is shown diagrammatically at F in Fig. 5.

I claim as my invention—

1. An alternating-current motor having main and corrective field-windings, and means for varying the speed of the motor, said means including a device for varying, through a number of steps, the current-flow in the corrective field-circuit, and for varying the number of turns of the main field-winding in circuit, substantially as described.

2. An alternating-current motor having main and corrective field-windings and means for varying the speed of the motor, said means including a device for varying, through a number of steps, the current-flow in the corrective field-circuit for each of a plurality of arrangements of the main field-winding, substantially as described.

3. An alternating-current motor having a main field-winding in series with its armature, a corrective winding placed to vary the magnitude and phase of the flux set up by said main field-winding, current-modifying means in series with the corrective winding, and a controlling device having connections for varying the number of turns of the main field-winding and the amount of the current-modifying means in circuit, substantially as described.

4. An alternating-current motor having a main field-winding in series with its armature, a corrective winding connected in parallel to the armature and main field-winding, and placed to vary the magnitude and phase of the flux set up by said main field-winding, an inductive winding in series with the corrective winding, and a controlling device having connections for varying the number of turns of the main field-winding and of the inductive winding in circuit, substantially as described.

5. An alternating-current motor having a main and a corrective field-winding, current-modifying means, and a controller connected to vary the amount of the main field-winding and also the amount of the current-modifying means in circuit, substantially as described.

6. An alternating-current motor having main and corrective field-windings, current-modifying means in circuit with the corrective winding, and a controller for governing the amount of said means in circuit, said controller including a rotatably-supported arm connected to a current-supply main, a series

of contacts connected to different points on the current-modifying means, and a second series of contacts connected to the main field-winding of the motor, substantially as described.

5 7. An alternating-current motor having main and corrective field-windings, current-modifying means in circuit with the corrective winding, and a controller for governing
10 the amount of said means in circuit, said controller including an arm and contacts whereby both the main and corrective field-circuits may be simultaneously connected to a current-supply main or simultaneously broken,
15 substantially as described.

8. An alternating-current motor having a main and a corrective field-winding, current-modifying means in circuit with the corrective winding, a controller having certain
20 contacts connected to different points of the main field-winding, other contacts connected to different points on the current-modifying means, and an arm for simultaneously connecting successive pairs of said contacts to a
25 current-supply main, substantially as described.

9. An alternating-current motor having main and corrective field-windings, a controller having an arm connected to a current-
30 supply main, two sets of contacts for the controller, current-modifying windings connected at various points of their length to one set

of contacts, and the main field-winding having a plurality of connections respectively to the other set of contacts, substantially as described. 35

10. An alternating-current motor having a main and a corrective field-winding, an inductive resistance in circuit with said corrective field, and a controller for varying the
40 amount of said resistance in circuit, said controller having a number of contacts, and having pieces placed to cause one contact or set of contacts to be disengaged before the circuit can be completed through another contact or contacts to prevent short-circuiting
45 of successive contacts, substantially as described.

11. An alternating-current motor having a main and a corrective field-winding, current-modifying means in circuit with the corrective winding, and a device for varying the
50 amount of said means in circuit, said device including pieces for simultaneously breaking the circuits of the main and corrective windings between successive positions, substantially as described. 55

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ADOLPH W. SCHRAMM.

Witnesses:

WILLIAM E. BRADLEY,
JOS. H. KLEIN.