No. 859,350. PATENTED JULY 9, 1907.

E. THOMSON.

UNIPOLAR GENERATOR.

APPLICATION FILED SEPT. 28, 1905.

2 SHEETS—SHEET 1.

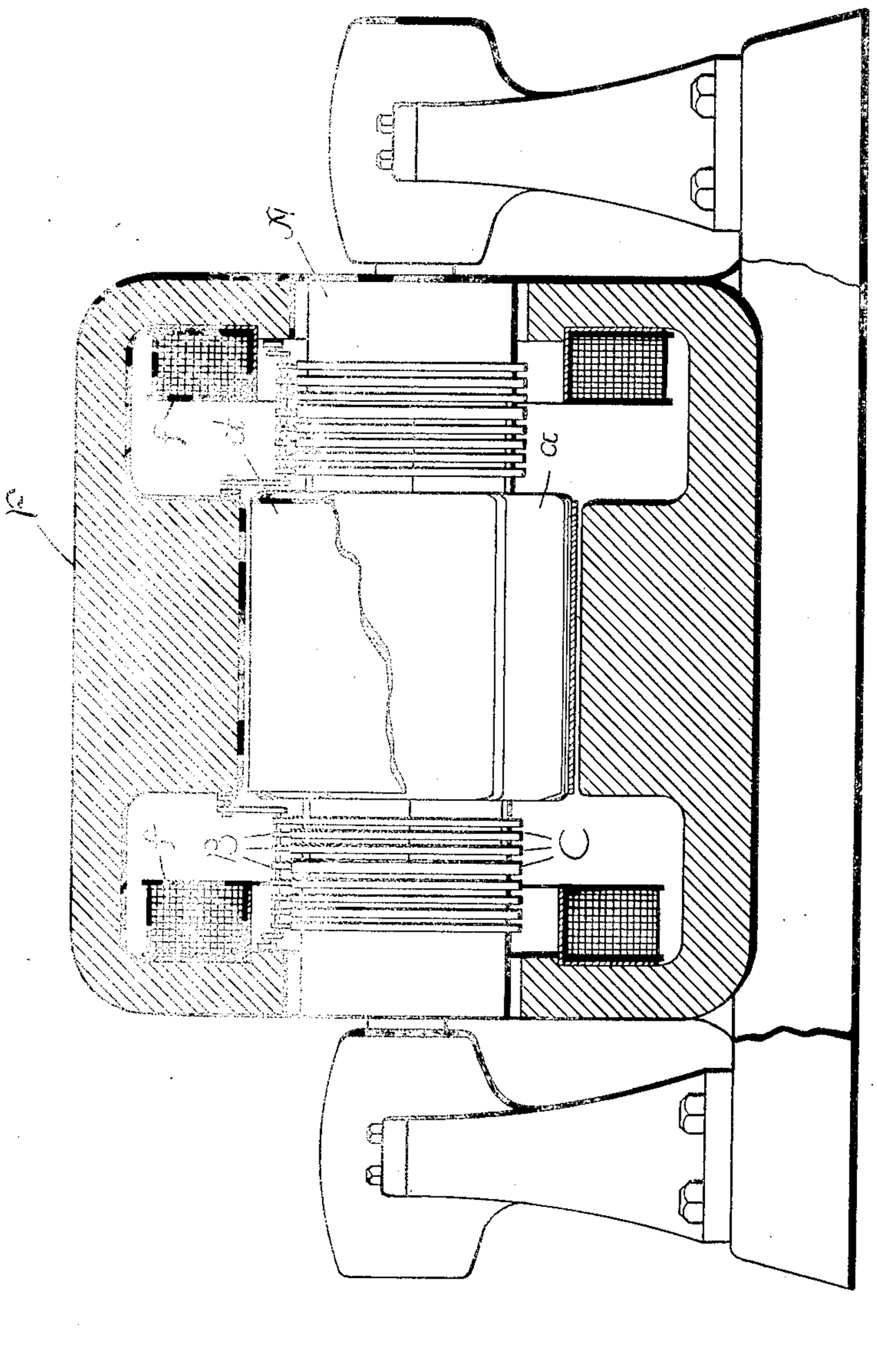

Fig. 1.

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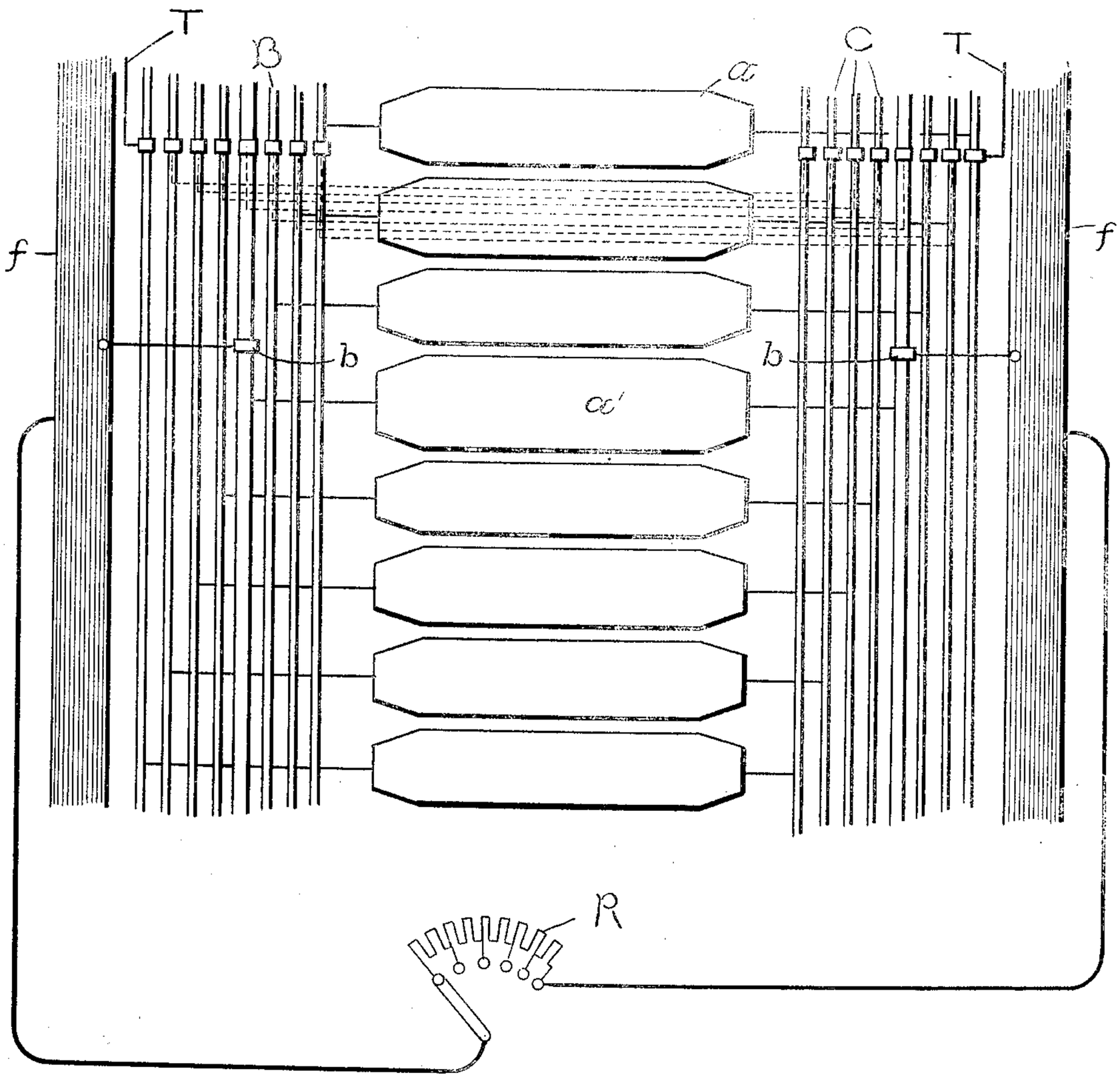
2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF SWAMPSCOTT, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

UNIPOLAR GENERATOR.

No. 859,350. Specification of Letters Patent. Patented July 9, 1907.

Application filed September 28, 1905. Serial No. 280,526.

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, residing at Swampscott, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Unipolar Generators, of which the following is a specification.

My invention relates to dynamo-electric machines of the unipolar type, and its object is to improve the regulation of such machines. In this type of generator each armature conductor is separately connected to collector rings, and the several conductors are placed in series with each other by means of brushes bearing on the collector rings and connections between brushes at opposite ends of the machine. The armature circuit consequently includes a large number of sliding contacts and the brush contact resistance is considerable. In fact the ohmic drop at the brush contacts forms a large part of the full-load voltage drop in the machine. Furthermore the brush resistance is somewhat variable and unstable. If the field winding of the generator is connected across the machine terminals in the usual manner, the ohmic drop at the brush contacts as the load increases results in a decrease in the voltage impressed upon the field terminals, and consequently impairs to a certain extent the regulation of the machine.

My invention consists in supplying the field winding from auxiliary brushes independent of the armature circuit. With this arrangement the current passing through the brushes supplying the field winding is constant for all loads of the machine and the excitation of the machine is unaffected by the ohmic drop in the armature circuit due to brush contact resistance. The auxiliary brushes are preferably placed on collector rings connected to opposite ends of a single conductor. This conductor may be one of the conductors connected in the armature circuit, in which case it may be given a somewhat greater cross-section than the other conductors in order to enable it to carry the exciting current without over-heating, or a separate conductor may be employed for supplying the field winding.

My invention will best be understood by reference to the accompanying drawings, in which

Figure 1 shows a unipolar generator of a type to which my invention is applicable; and Fig. 2 shows a development on a plane surface of the armature conductor rings and connections.

In the drawing F represents the field structure, which is arranged to produce a unipolar field at its central portion, and is provided with the exciting coils *f*.

A represents the armature carrying a plurality of conductors *a* within the unipolar field. These conductors are preferably broad and flat so as to form a practically continuous sheet of current-carrying material surrounding the armature, and are held in place by any suitable means, such as a thin steel cylinder *a'* shrunk over the conductors. The armatures carries at each end a plurality of collector rings C, each armature conductor being connected at its opposite ends to a pair of collector rings.

B represents brushes bearing on the collector rings by which the armature conductors may be connected in series with each other and to the external circuit.

In the type of machine shown in Fig. 1 the field flux may be considered as passing radially inward from the central portion of the field F through the armature conductors, then outward axially toward both ends of the armature and then radially outward into the outer ends of the field magnet. This arrangement of magnetic circuit produces an efficient machine, but it will be understood that my invention is not limited to the particular type of machine shown.

Now referring to Fig. 2 the several armature conductors *a* are shown developed on a plane surface, each conductor being connected at opposite ends to a pair of collector rings C. By means of the brushes B the several armature conductors may be connected in series with each other and to the external circuit.

For the sake of simplicity the brushes are shown all in a single line, but in practice they would be more or less distributed around the armature. The connections between the brushes at opposite ends of the machine are shown in dotted lines, and the machine terminals are indicated at T T.

b b represent auxiliary brushes which are not included in the armature circuit and which bear on a pair of collector rings connected to opposite ends of an armature conductor a_1. These brushes are connected to the field coils *f f* in circuit with which is shown diagrammatically a field rheostat R.

As shown in Fig. 2 the conductor a_1 and the collector rings to which it is connected are made slightly wider than the other armature conductors and collector rings in order to enable them to carry the current for the field winding without over-heating. If preferred, the conductor a_1 may be left out from the armature circuit entirely and would then serve simply for supplying the field current.

What I claim as new, and desire to secure by Letters Patent of the United States, is,—

1. In a dynamo-electric machine, a unipolar field structure, a field winding, an armature, a plurality of armature conductors each connected at its opposite ends to collector rings, collecting brushes and connections for connecting a plurality of armature conductors in series, and auxiliary brushes connected to the field winding.

2. In a dynamo-electric machine, a unipolar field structure, a field winding, an armature, a plurality of armature conductors each connected at its opposite ends to collector rings, collecting brushes and connections for connecting a plurality of armature conductors in series, and a pair of auxiliary brushes connected to the field winding and bearing on rings connected to opposite ends of one armature conductor.

3. In a dynamo-electric machine, a unipolar field structure, a field winding, an armature, a plurality of armature conductors each connected at its opposite ends to collector rings, one of said conductors being of greater cross-section than the others, collecting brushes and connections for connecting the armature conductors in series, and a pair of auxiliary brushes connected to the field winding and bearing on rings connected to the armature conductor of greatest cross-section.

4. In a dynamo-electric machine, a unipolar field structure, a field winding, an armature, a plurality of broad flat conductors each connected at its opposite ends to collector rings and one of said conductors being of greater width than the others, collecting brushes and connections for connecting the armature conductors in series, and a pair of auxiliary brushes connected to the field winding and bearing on rings connected to the widest armature conductor.

5. In a unipolar machine, a pair of collecting brushes independent of the brushes carrying the main armature current connected to the field winding and bearing on a pair of collector rings connected to opposite ends of a single armature conductor.

6. In a unipolar machine, an armature provided with a plurality of conductors and collector rings and collecting brushes, and a field winding provided with and supplied through auxiliary brushes independent of the brushes carrying the main armature current and bearing on a pair of collector rings connected at opposite ends to a single armature conductor.

In witness whereof I have hereunto set my hand this twenty-fifth day of September, 1905.

ELIHU THOMSON.

Witnesses:

JOHN A. MCMANUS, Jr.,

HENRY O. WESTENDARP.