No. 615,732. Patented Dec. 13, 1898.

W. M. MORDEY.

DYNAMO ELECTRIC MACHINE.

(Application filed Dec. 30, 1897.)

(No Model.)

Fig. 1.

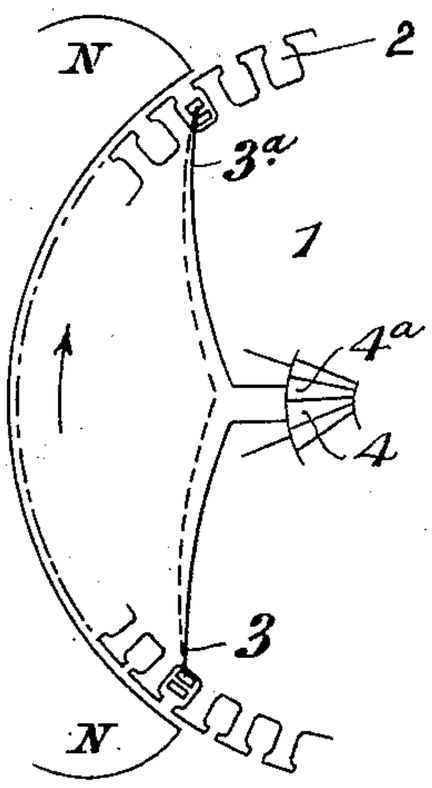


Fig. 3.

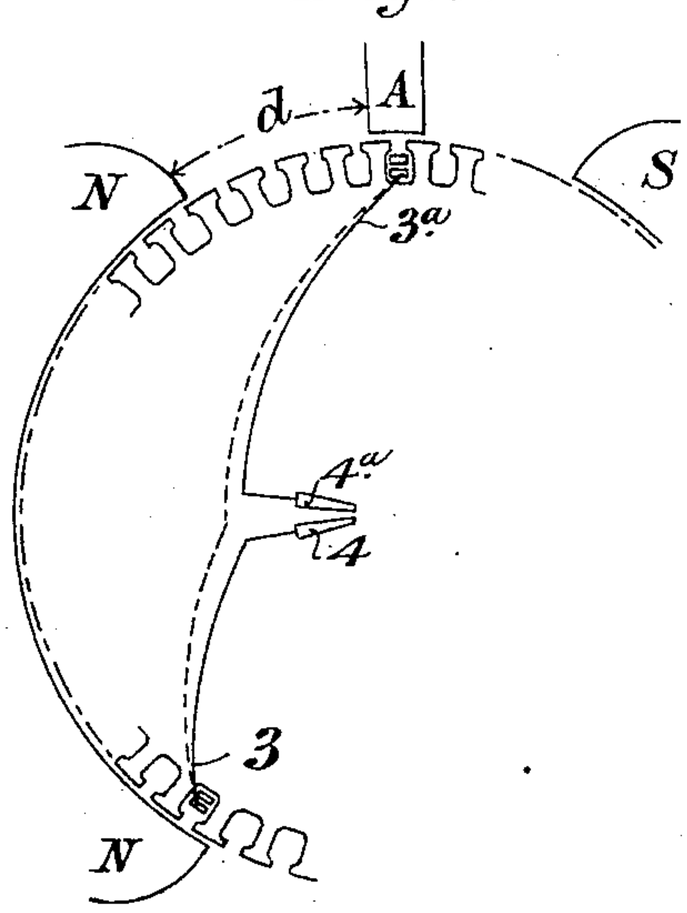
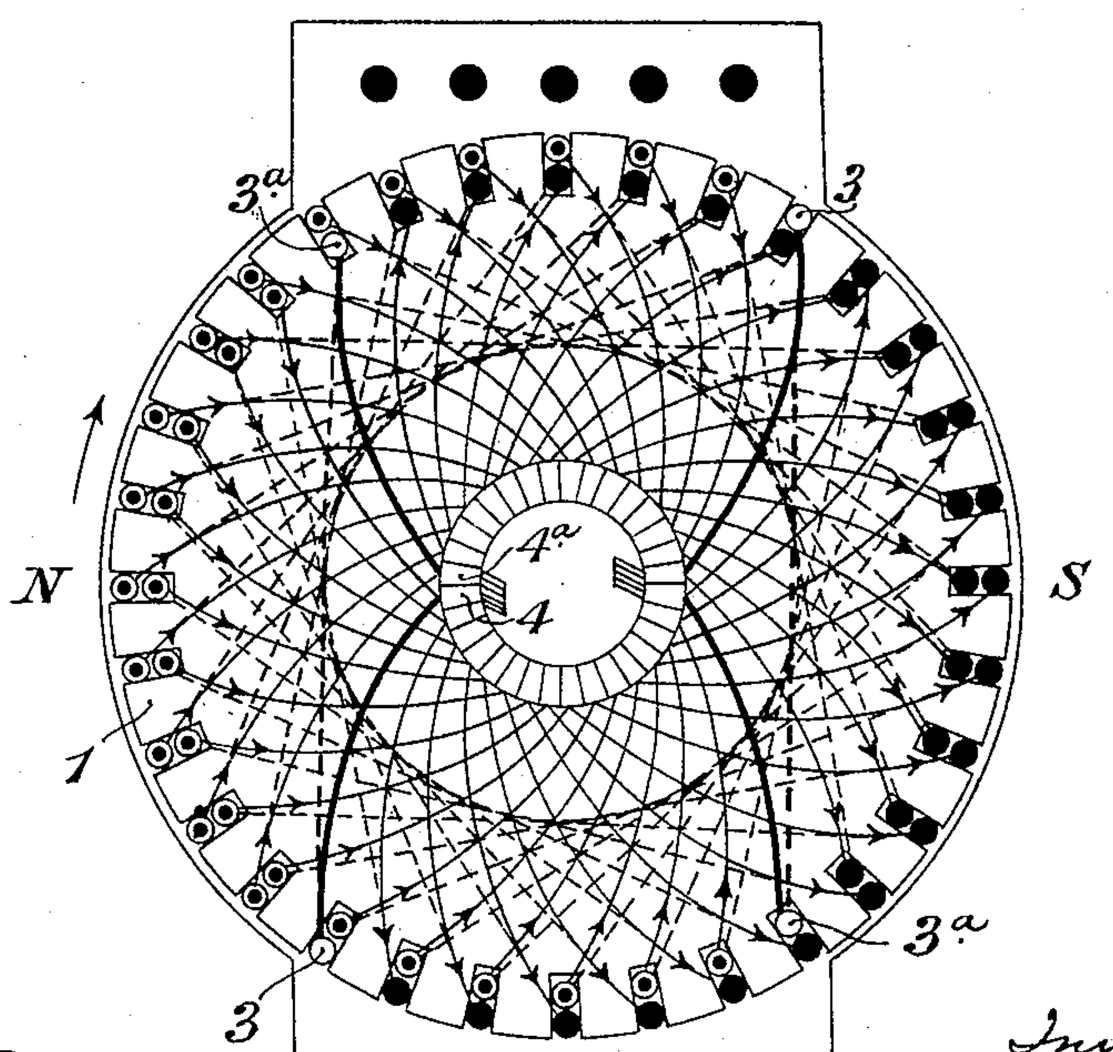


Fig. 2.



Witnesses

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UNITED STATES PATENT OFFICE.

WILLIAM MORRIS MORDEY, OF LOUGHBOROUGH, ENGLAND.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 615,732, dated December 13, 1898.

Original application filed February 15, 1897, Serial No. 623,451. Divided and this application filed December 30, 1897. Serial No. 664,767. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM MORRIS MORDEY, a subject of the Queen of Great Britain and Ireland, residing at Redholm, Loughborough, in the county of Leicester, England, have invented Improvements in Dynamo-Electric Machines, of which the following is a specification.

This application, which is a division of my application for Letters Patent of the United States, Serial No. 623,451, filed February 15, 1897, relates to an invention having for its object improvements in dynamo-electric machines constructed with drum-armatures.

In order to obtain sparkless collection and to keep the armature reaction within moderate limits, it has been customary in such machines to use smooth or untoothed armature-cores and to place the winding on the surface of the core. This arrangement has several disadvantages. The considerable distance between the field-magnet poles and the armature-core necessitate large and heavy magnet-cores and magnet-windings costly both in material and in energy. The armature-windings have to be laminated or subdivided in order to prevent excessive loss of energy by eddy-currents, and the said windings cannot be readily supported and driven mechanically, and the core, being covered by insulating material, is apt to become hot. The only incidental advantage of such a construction is that the large inter-iron space—that is to say, the space or clearance between the surface of the iron core of the armature and the adjacent surface of the iron pole—tends to reduce armature reaction, which, however, is still considerable. Such armatures are usually wound with windings passing across a diameter, or nearly so; but windings passing across a chord of the circle have also been used or proposed, either for convenience of winding or with the object of somewhat reducing the armature reaction; but this chord construction still leaves the large air-space, with its accompanying evils. Drum-armatures are also frequently made of the toothed, channeled, or slotted kind, the windings being sunk in the channels or slots. This construction, although otherwise excellent, has hitherto been subject to the objections that armature reaction and sparking have been considerably greater than with armatures of the smooth-cored type, and it has not been successfuly adopted for machines required to give large currents. Furthermore, even in the cases where it has been adopted the full advantages of the toothed type of armature have not been realized, because in order to reduce the reaction and sparking, it has been found necessary to use considerable air-spaces and to work the teeth at magnetic densities much exceeding the magnetic densities that are economical.

The object of my invention is to overcome these difficulties, to obtain the sparkless collection associated with smooth cores, together with the advantages of economy of material and of energy which are inherent to toothed armatures, but which have not hitherto been fully realized in practice. For this purpose I combine with a toothed or slotted or channeled drum-armature core a chord-winding so arranged on the drum that opposing electromotive forces are produced in the two halves of each element of the winding at the moment of commutation, but that during the greater portion of the revolution of the drum mutually-aiding electromotive forces are produced in the respective elements of the winding. In other words, the winding is across a chord, and the angle of chord is such that at the moment of commutation both the forward part of the element and the rearward part of the element have electromotive forces generated in them; but these electromotive forces are in opposite directions. I may attain this result either by having these different portions of the winding simultaneously under the influence of one and the same pole of the field-magnet during commutation or by having one portion under the influence of a field-magnet pole while another portion is under the influence of a small auxiliary pole placed between the ordinary field-magnet poles. By an "element" is meant so much of the winding as lies between any point of connection to the commutator and the next following point of connection, or so much as is involved in the process of commutation between adjoining sectors of the commutator.

Figure 1 of the accompanying drawings is

a diagram showing part of a dynamo in which are combined a slotted drum-armature with chord-winding arranged as just described. Fig. 2 is a diagrammatic view showing a dynamo with complete two-pole slotted armature with my improved winding. Fig. 3 is a view similar to Fig. 1, showing a modification.

Referring first to Fig. 1, 1 is the armature-core, formed at its periphery with slots or channels 2, in which are wound the elements of the winding, only one of which is shown. 3^a is the forward part of the element of the chord-winding, and 3 the rearward part thereof, these two parts being directly connected together and to the adjacent strips 4 4^a of the commutator, and are arranged at such a distance apart that both of them at the moment of commutation are under the same magnetic pole, one only of which, N, is shown.

In attaining the object of my invention above set forth in a series-wound multipolar drum-armature with a toothed, slotted, or channeled core instead of spacing the directly-connected parts of an element at equal angular distances apart I space them so that the electromotive forces in any one element of the winding oppose one another during the moment of commutation, but aid one another during the greater part of the revolution. There are several ordinary ways of winding multipolar armatures, any of which may be modified according to my invention by applying the principle of the invention as explained above.

Fig. 2 is a diagram showing a complete two-pole slotted armature with winding arranged according to my invention, the two elements that are undergoing commutation being shown in thickened lines. The black circles and the dotted circles on the armature show, respectively, the two directions of current in the armature-conductors, and the larger black and dotted circles show, diagrammatically, the directions of the magnetizing-currents on the fields.

Fig. 3 is a diagrammatic view of part of one of my improved drum-machines with interposed small auxiliary pole A, arranged as above described and having the same polarity as the pole N in rear of it, there being a gap *d* between the two poles.

My improvements are applicable to dynamos, whether used as generators or as motors. It will also be obvious that they are applicable to alternators, (generators or motors,) whether used with or without commutators, for the commutation of the whole or a portion of the current.

What I claim is—

1. In a dynamo-electric machine, the combination with a suitable field-magnet, of a slotted, toothed or channeled armature, having a winding composed of several elements, commutator-segments to which said elements are connected, one side of each element being at the moment of commutation in such relation to a magnet-pole as to produce therein a current in one direction, and the other side of each element being at the same time in such relation to a magnet-pole as to generate opposing currents, and the sides of said elements between moments of commutation being in such relation to a magnet-pole as to produce coöperating currents.

2. In a dynamo-electric machine, the combination of a toothed or slotted or channeled drum, and a chord-winding, the angle of chord of said winding being such that at the moment of commutation the forward part of the element of the winding undergoing commutation and the rearward part of said element are both under the influence of a magnetic pole of the same polarity, the one coming into it before the other leaves it, as set forth.

3. In a dynamo-electric machine the combination of a toothed or slotted or channeled drum and a chord-winding, the angle of chord of said winding being such that at the moment of commutation one portion of the element of the winding is under the influence of one pole while the other portion, or another portion, of the said element is under the influence of an auxiliary pole as set forth.

4. A multipolar dynamo-electric machine provided with a drum-armature having a toothed, slotted or channeled core and a winding the coils of which composing each element are so arranged as to oppose one another during the moment of commutation but to aid one another during the greater part of each revolution, substantially as described.

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

WILLIAM MORRIS MORDEY.

Witnesses:
PERCY E. MATTOCKS,
WM. O. BROWN.