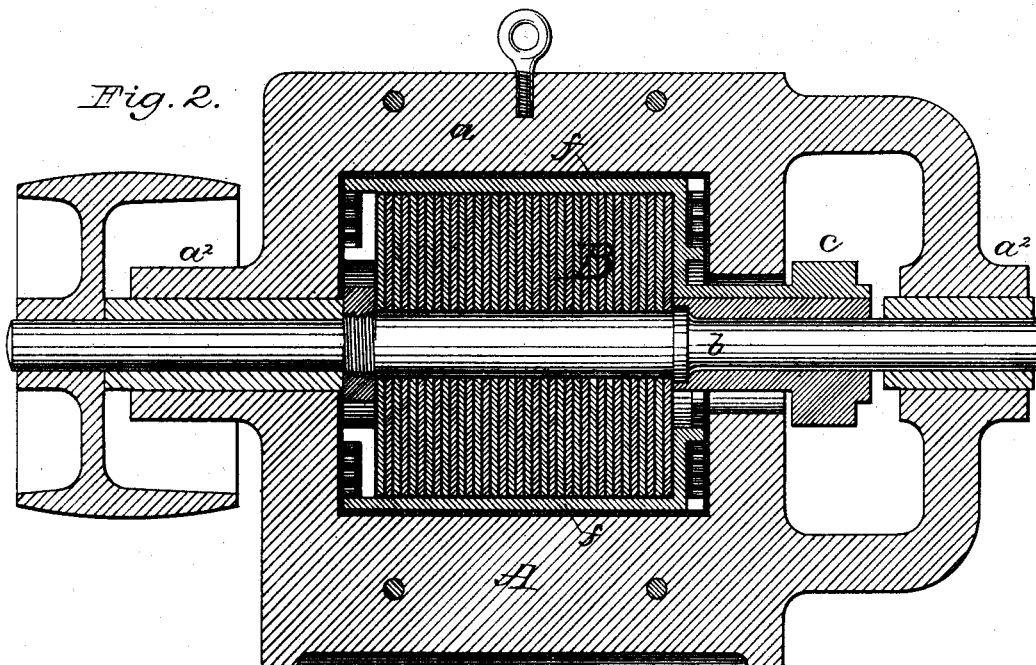
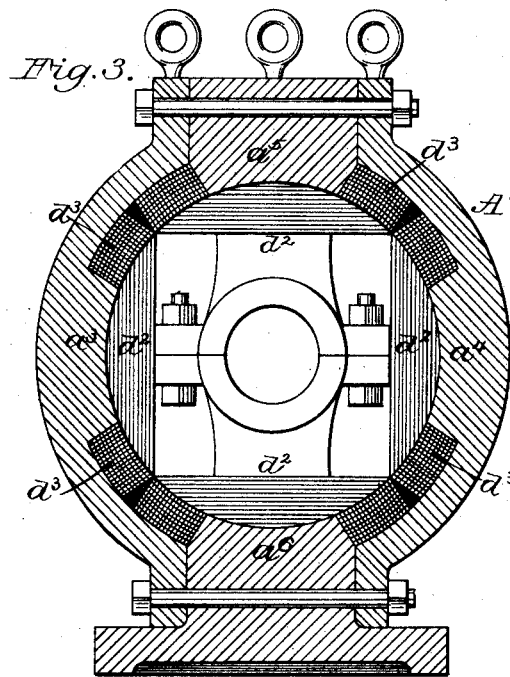
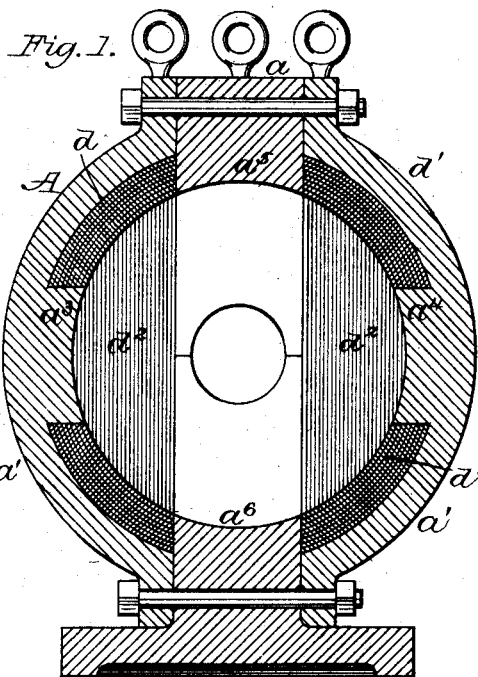


R. EICKEMEYER.
DYNAMO ELECTRIC MACHINE.

No. 422,511.

Patented Mar. 4, 1890.



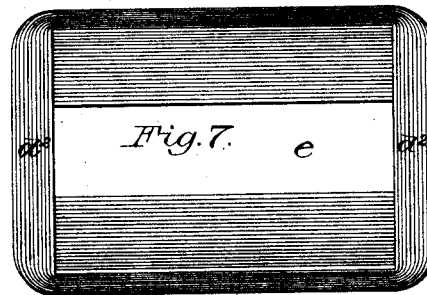
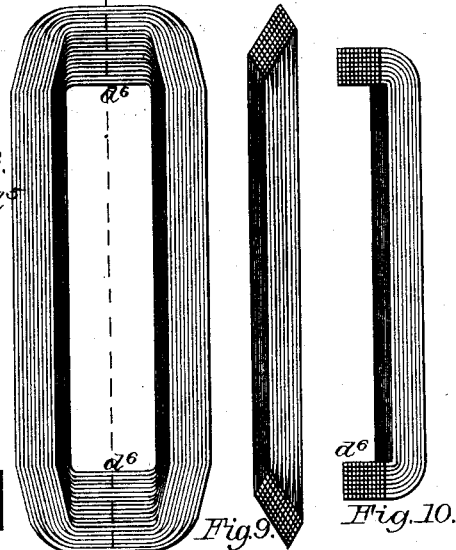
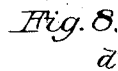
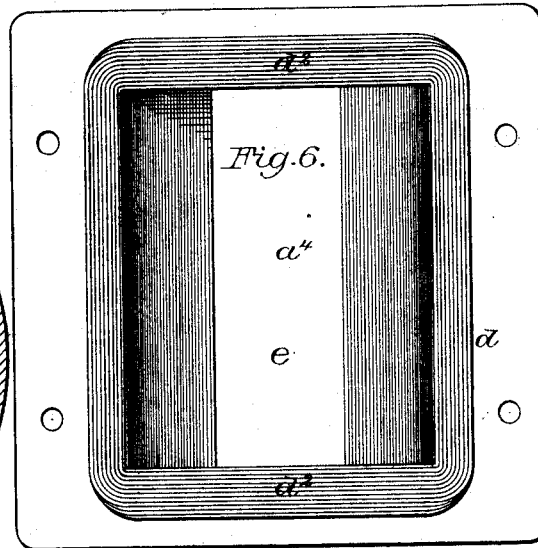
Attest:
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2 Sheets—Sheet 2.

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UNITED STATES PATENT OFFICE.

RUDOLF EICKEMEYER, OF YONKERS, NEW YORK.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 422,511, dated March 4, 1890.

Application filed August 4, 1887. Serial No. 246,126. (No model.)

To all whom it may concern:

Be it known that I, RUDOLF EICKEMEYER, of Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Dynamo-Electric Machines; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming a part of the same, is a clear, true, and complete description of the several features of my invention.

In my Letters Patent No. 342,504, dated May 25, 1886; No. 351,906, dated November 2, 1886, and No. 358,340, dated February 22, 1887, I disclosed a certain line of improvements applied, respectively, in connection with so-called "unipolar," "multipolar," and "bipolar" machines, and wherein in each instance an exciting-helix was inclosed within a magnetic shell and directly polarized the armature-core, as distinguished from polarizing the armature by induction, as in all prior machines known to me. In each variety of my said patented machines I have employed an exciting coil or helix which peripherally surrounded the armature, and in some of my said bipolar machines the armature has been surrounded longitudinally by the exciting-helix. I have now devised a novel type of multipolar machines in which separate exciting-helices are employed for developing four or more appropriate poles within the iron shell, and each of said helices also directly polarizes appropriate portions of the armature-core.

In my aforesaid prior multipolar machines the armature is surrounded peripherally by the exciting helix or helices; but I have now so organized the shell, the helices, and an armature as to obtain valuable advantages similar to those which accrue from the use of helices which longitudinally surround an armature, as in my aforesaid bipolar machines.

In developing my invention I have for the first time provided within the shell suitable helix-receiving recesses, chambers, or receptacles, and then in a novel manner wound and specially formed the helices, so that they can be readily placed in their proper positions, longitudinal with the axis of the shell, and to embrace certain interior portions of

the shell for developing pole-faces, as well as to directly polarize portions of the armature-core opposite to said faces, and also to appropriately magnetize the armature-core at its ends.

After describing the several features of my invention, as variously illustrated in the drawings, such as are considered to be appropriate subjects for this application will be duly specified in the several clauses of claim hereunto annexed.

Referring to the two sheets of drawings, Figure 1, Sheet 1, illustrates in lateral vertical section the shell or casing of a four-pole machine containing two exciting-helices in one form of arrangement in accordance with my invention. Fig. 2 illustrates a machine having a shell like Fig. 1 and a suitable armature in position, the whole being shown in longitudinal vertical section. Fig. 3 illustrates in lateral vertical section a shell or casing similar to that of Fig. 1, but embodying four exciting-helices and a correspondingly different arrangement thereof. Fig. 4, Sheet 2, in lateral vertical section, illustrates a shell or casing having six pole-faces and containing three exciting-helices in accordance with my invention. Fig. 5 illustrates in similar manner another form of a six-pole casing or shell and containing six exciting-helices in accordance with my invention. Fig. 6 illustrates one of the side sections of the casing detached and an exciting-helix in position therein. Figs. 7 to 10, inclusive, illustrate detached exciting-helices, or parts of helices, of which specific reference will hereinafter be made.

In Fig. 1 the iron shell or casing A, shown in cross-section, is composed of a central longitudinal section *a* (in two parts, the lower one having a suitable base) and two counterpart side sections *a' a'*, the four parts being bolted together and constituting the frame of the machine. As better illustrated in Fig. 2, the central section *a* affords the bearings *a²* for the shaft *b* of the armature B, and between one of said bearings and the adjacent end of said section an open space is afforded for accommodating the commutator *c*. Each of said side sections has ends, as shown in Fig. 6, and on its inner side it is longitudinally recessed above and below a pole-face,

there being one of these at each inner side of the shell at a^3 and a^4 . At the top and bottom of the interior of the shell similar pole-faces a^5 and a^6 are afforded by portions of the central section a . Each pole-face a^3 and a^4 is embraced longitudinally between the straight parallel sides of an exciting coil or helix d d' , said sides occupying the recesses intervening between the pole-faces. These helices at their ends d^2 protrude beyond the ends of said pole-faces, but are inclosed by the ends of the side sections a' , and the several convolutions at the ends of the helices lie parallel with each other and with the inner surface of the ends of the shell, and they are closely adjacent to the coincident surfaces of the central section a and extend across portions of the ends of the armature. These helices are so wound as to develop similar poles at the faces a^3 and a^4 , and at faces a^5 a^6 opposite polarity, so that said poles alternate N S N S. Said helices also develop at longitudinal portions of the periphery of the armature-core polarities opposite to those at each pole-face, and the ends d^2 of the helices appropriately magnetize the ends of said core. As in my prior machines, the several magnetic circuits are wholly within the casing or shell, and each includes portions of the armature-core, and each affords an effective magnetic field.

In Fig. 3 the shell or casing A' differs slightly from the casing A , but like that is adapted for use in a four-pole machine. Instead of two exciting-helices I herein employ four, each designated d^3 , and each longitudinal recess between the pole-faces a^3 , a^4 , a^5 , and a^6 contains the longitudinal and parallel portions of two helices, and the ends of the helices are inclosed by the ends of the shell. With this arrangement the ends of an armature-core are magnetically exposed to the ends d^2 of all of the helices at points adjacent to each pole-face.

In Fig. 4 the shell or casing A^2 differs from the others in the form of the sections and in having six pole-faces a^3 , a^4 , a^5 , a^6 , a^7 , and a^8 symmetrically located. The longitudinal recesses between the pole-faces are occupied by the longitudinal and parallel portions of the three helices d^4 , which at their ends d^2 are coincident with appropriate portions of the armature-core when the latter is mounted. These helices thus arranged develop the six poles in the shell and opposite poles on the armature-core, said poles alternating and affording a highly-efficient magnetic field.

In Fig. 5 the shell or casing A^3 differs from those previously described in that it is composed of a central section in two parts and four side sections, each section affording a pole-face, of which there are six— a^3 a^4 a^5 a^6 a^7 a^8 . The helices d^5 are counterparts, one for each pole-face, and the longitudinal recesses between the pole-faces are each occupied by the longitudinal and parallel portions of the two helices, as in Fig. 3; but these helices

have ends d^6 , unlike the ends d^2 , before described, in that no portion of said ends lie against the ends of the pole-faces, but are curved inward therefrom toward the center or axis of the shell, as clearly indicated, and are inclosed by the ends of the shell, as before described.

For a better comprehension of the character of these novel exciting-helices I will now refer to Figs. 6 to 10, inclusive.

In Fig. 6 one of the helices d d' of Fig. 1 is shown in plan view within a side section of the shell. Its terminals are, as usual, at the inner and outer convolutions. The insulated wire for this helix is wound upon a "former," by which the space e is determined, so as to properly embrace a pole-face, and the bulk of wire is adapted to properly occupy the recesses between the pole-faces as well as the recesses adjacent to the ends of the shell. The helix thus formed can be well charged with shellac or other suitable insulating matter, which, when hardened, will result in a perfect structure, which can be handled without liability of injury and readily inserted in proper place upon a section of a shell or removed therefrom.

In Fig. 7 one of the helices d^4 of Fig. 4 is shown in plan view, having the proper space e for receiving a pole-face. This helix is wound and shaped into a predetermined form, as before described.

In Fig. 8 I show a detached helix d^5 of Fig. 5 in plan view after it has been wound upon a former and before its ends d^6 have been bent, as shown in Fig. 5. In Fig. 9 a longitudinal section thereof is shown, and in Fig. 10 a similar section after the ends d^6 have been bent into form, as in Fig. 5, by means of pressure and a mold adapted to impart to the helix the precise form required.

It will be observed that each helix is wholly at one side of the axis of the shell, and that when an armature is in place a portion of it must be directly polarized by each of the helices, and that the latter occupy positions with relation to the armature-core which enable them to operate partially like such of my prior helices as were peripheral to the armature and partially like those which surrounded the armature longitudinally, and it may be well here to state that in my prior bipolar machines, as disclosed in my Letters Patent No. 358,340, I have embodied co-operating peripheral and longitudinal helices and also a diagonally-arranged helix, which necessarily approximates to a helix which is both longitudinal and peripheral in its arrangement with relation to the armature. The shells or casings herein described, provided with four or more interior pole-faces, interior recesses at the ends of said faces, and intermediate longitudinal recesses for the reception and complete inclosure of exciting-helices, I believe to be broadly new. I believe it to be also broadly new to combine with a shell or casing having four or more interior pole-faces two or more wholly-inclosed

independent but co-operating exciting-helices, which polarize the armature-core and pole-faces whether each pole-face has its own helix, or each helix polarizes a particular pole-face, or two of said helices co-operate in polarizing one or more of said pole-faces and the armature-core.

The armature B and commutator C need no special description, it being understood that they are adapted for use in multipolar machines.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a multipolar dynamo-electric machine, a shell or casing containing four or more interior longitudinal recesses and having pole-faces between said recesses, in combination with exciting coils or helices located within said recesses, extending from end to end of said pole-faces, wholly inclosed within the shell, and each of them being wholly at the one side of the axis of the shell, and having its end portions extended toward said axis beyond the interior circular line of said shell, substantially as described.

2. In a multipolar dynamo-electric machine, a shell or casing containing four or more interior longitudinal recesses and having pole-faces between said recesses, in combination with exciting coils or helices, each of which is wholly inclosed within said shell and is specially formed or shaped at its sides and ends to properly enable it to occupy its

appropriate recesses, and while embracing a pole-face between its sides to have its ends projected toward the axis of said shell, substantially as described.

3. In a multipolar dynamo-electric machine, the combination, substantially as hereinbefore described, of a shell or casing having four or more interior pole-faces, interior longitudinal recesses alternating with said faces, an armature within said shell, and exciting coils or helices wholly inclosed within and directly polarizing said shell and developing alternate poles at said faces, and also directly polarizing said armature, and developing opposite each pole-face an opposite polarity in a coincident portion of the armature-core.

4. In a multipolar dynamo-electric machine, the combination, substantially as hereinbefore described, of a shell or casing having four or more interior pole-faces and longitudinal recesses alternating with said faces, an armature within said shell, and exciting coils or helices occupying said recesses, developing alternate polarity at said faces, directly polarizing the armature, and developing opposite each of said pole-faces an opposite polarity in the armature, and having ends which overlie and magnetize segmental portions of the ends of said armature.

RUDOLF EICKEMEYER.

Witnesses:

EDWARD P. MOFFAT,
HENRY OSTERHELD.