No. 780,085. PATENTED JAN. 17, 1905.

B. A. BEHREND & W. D. POMEROY.

DYNAMO ELECTRIC MACHINE.

APPLICATION FILED MAY 14, 1904.

2 SHEETS—SHEET 1.

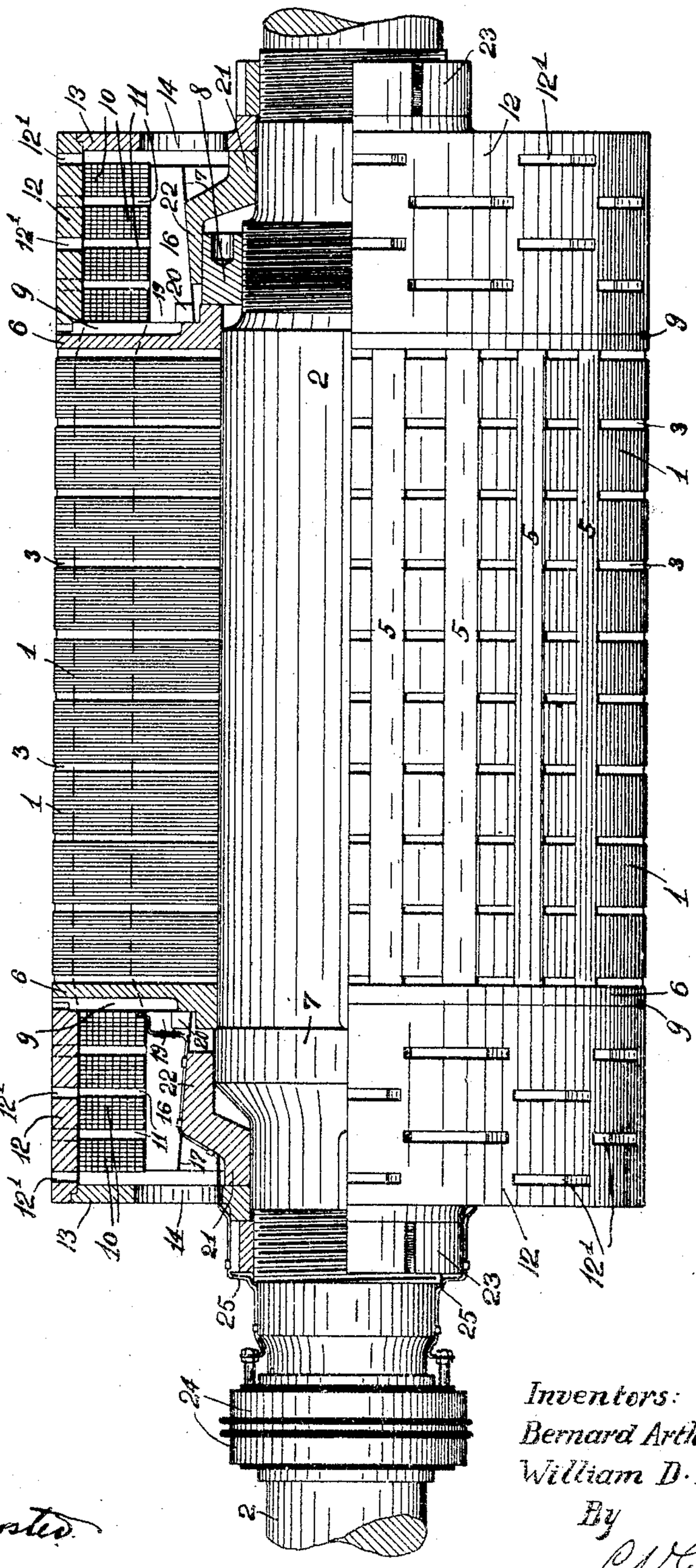

Fig. 1.

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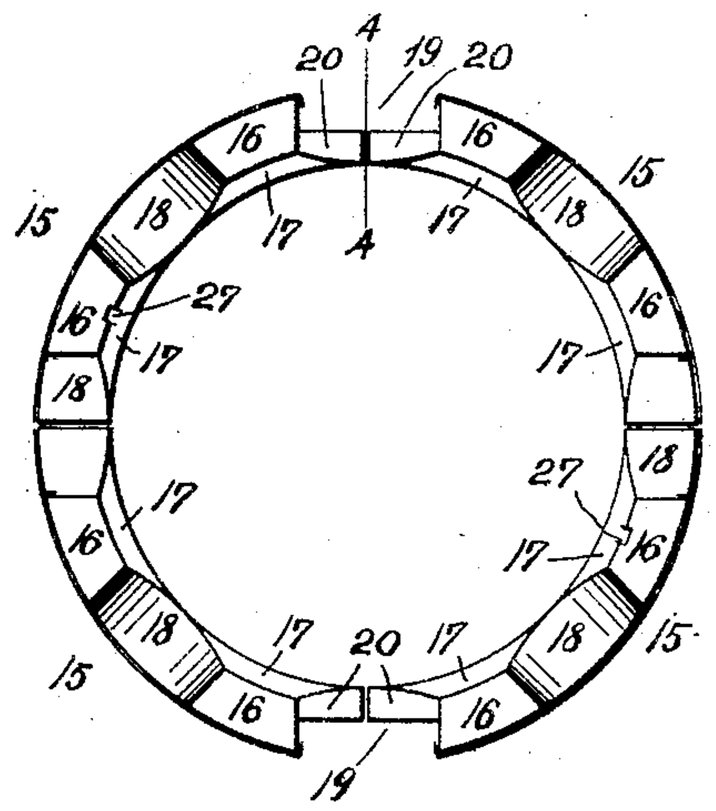

Fig. 2.

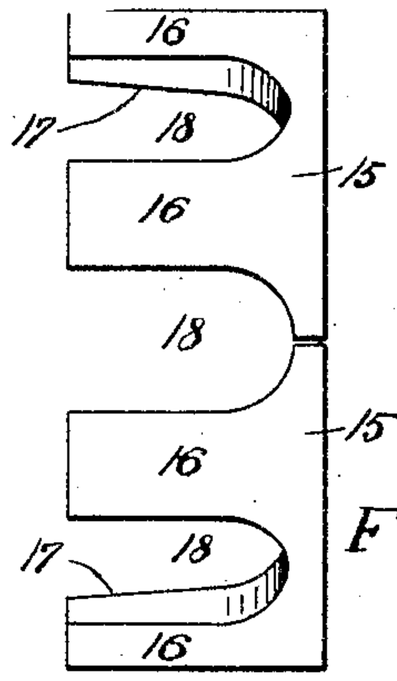

Fig. 3.

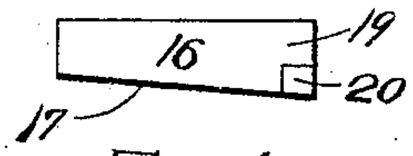

Fig. 4.

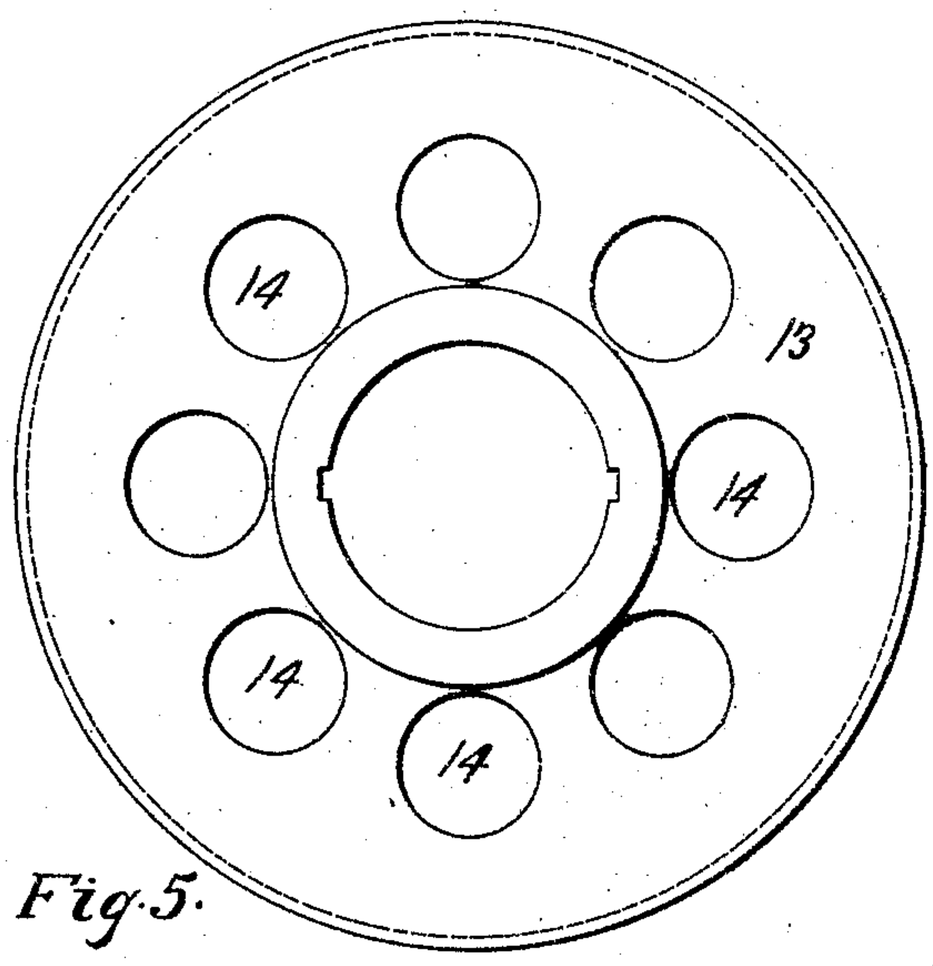

Fig. 5.

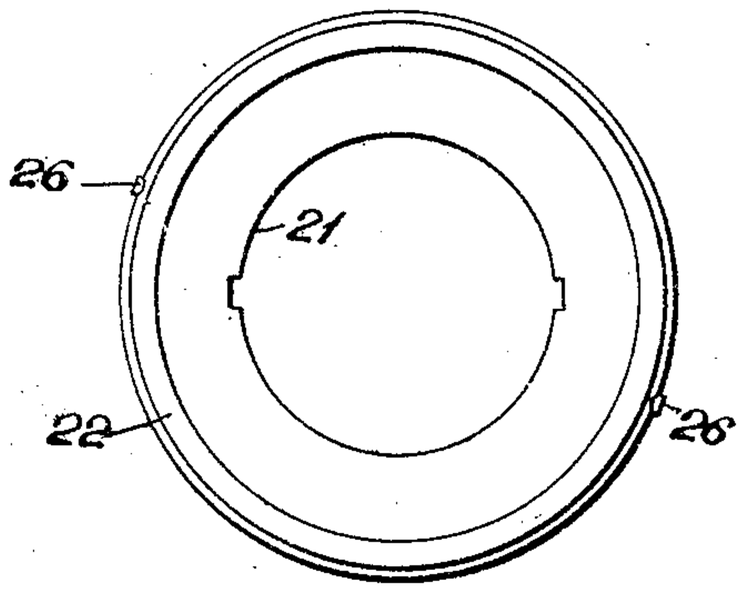

Fig. 7.

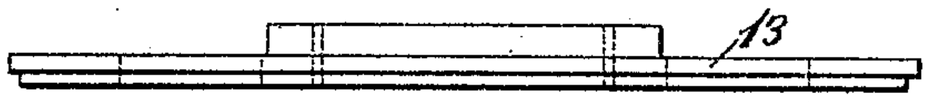

Fig. 6.

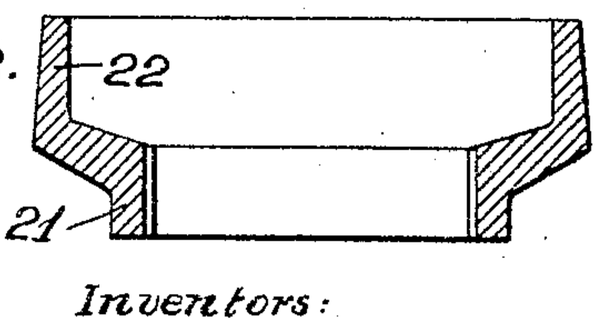

Fig. 8.

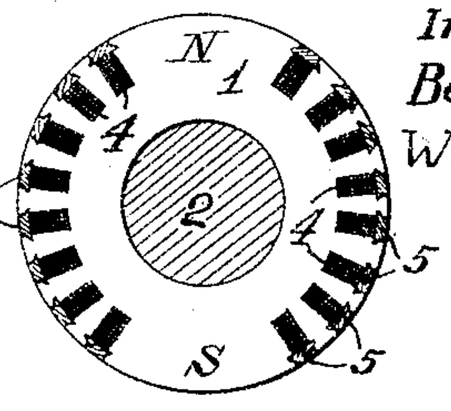

Fig. 9

Witnesses:

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No. 780,085. Patented January 17, 1905.

UNITED STATES PATENT OFFICE.

BERNARD ARTHUR BEHREND AND WILLIAM D. POMEROY, OF NORWOOD, OHIO, ASSIGNORS TO THE BULLOCK ELECTRIC MANUFACTURING CO., A CORPORATION OF OHIO.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 780,085, dated January 17, 1905.

Application filed May 14, 1904. Serial No. 207,922.

To all whom it may concern:

Be it known that we, BERNARD ARTHUR BEHREND and WILLIAM D. POMEROY, citizens of the United States, residing at Norwood, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Dynamo-Electric Machines, of which the following is a full, clear, and exact specification.

Our invention relates to dynamo-electric machines, and particularly to the construction of the revolving element.

The object of our invention is to provide a construction of the rotating part particularly adapted for very high speed machines, such as generators, when directly connected to steam-turbines, and to secure a compact and rigid well-balanced construction with all parts well protected and firmly held in place.

A further object is to obtain good ventilation and at the same time reduce the noise due to air-resistance, which becomes excessive at high speeds with the more usual constructions.

Our invention will be understood by reference to the following description and accompanying drawings, and the novelty thereof will be more definitely set forth in the claims.

Figure 1 is a part sectional and part side view of a revolving field-magnet embodying our invention. Fig. 2 is an end view of the rotor wedge-pieces. Fig. 3 is a side view of the same. Fig. 4 is a detail view of the wedge-piece on the line 4 4 of Fig. 2. Figs. 5 and 6 are face and edge views of the end cover. Figs. 7 and 8 are end and sectional views, respectively, of the clamping-ring; and Fig. 9 is a cross-section, very much reduced, of the rotor-core.

The core is built up of laminæ 1, assembled on the supporting-shaft 2, and are grouped in sections spaced from each other by the separators 3 of any approved design. The outline of the laminæ is indicated in Fig. 9, the core being of the slotted type. In the present instance the rotor represents a revolving field-magnet, the windings 4 being connected in series, so as to produce when excited by direct current a north pole N and a south pole S, diametrically opposite each other, giving a bipolar field. The windings are retained in the slots by the wedges 5, of phosphor-bronze or some other non-magnetic metal, and the external surfaces are finished so as to give a perfectly-smooth exterior.

The laminæ are clamped between the end plates 6, one of which abuts against the shoulder 7 on the shaft and the other is retained in place by the nut 8, screwed onto the shaft 2. The said end plates are of the same general outline as the laminæ shown in Fig. 9. At diametrically opposite points corresponding to the portions not slotted, which are indicated by N S in Fig. 9, the faces of the end plates are partially cut away, as shown at 9, Fig. 1, to provide openings for ventilation.

The end connections of the windings are shown at 10, Fig. 1, and the coils are separated from each other by spaces 11 to provide for ventilation. The end connections are covered by the cylindrical pieces 12 of nickel-steel or some other metal having great mechanical strength. These cores not only serve to protect the coils, but also withstand the great centrifugal force exerted upon them. The cylindrical covers 12 are notched into the end plates 6 at one end and into cover-plates 13 at the other, as shown in Fig. 1. The cover-plate 13 (shown in detail in Figs. 5 and 6) is mounted and keyed upon the shaft 2. It is provided with a number of openings 14 for ventilation, and the cylindrical covers 12 are also provided with openings 12′ for the same purpose, the said openings coinciding with the spaces 11 between the coils and the openings 9 in the end plates 6.

At the interior surface of the end connections are located the wedge-pieces 15. (Shown in detail in Figs. 2, 3, and 4.) Four of these wedge-pieces comprise an expansible ring, one of which rings is used at each end of the rotor. The wedge-pieces are of some suitable cast metal, such as aluminium composition, and are provided with projections 16, having inclined inner surfaces 17, the said projec-

tions being separated from each other by openings 18. In the composite ring there are openings 19 provided at diametrically opposite points, these being created by cutting away the corners of the wedge-pieces, as shown in Figs. 2 and 4, leaving only the projecting ends 20.

Within the wedge-pieces 15 is placed a clamping-ring. (Shown in detail in Figs. 7 and 8.) This clamping-ring has a portion 21, which is fitted to the shaft and keyed thereon, and a portion 22 of larger diameter, which in the ring at the left-hand end of the rotor engages an enlarged portion of the shaft and in that at the right-hand end engages the nut 8. The outer surface of the part 22 of the ring is inclined to correspond with the inclined surface 17 of the projections 16. When the clamping-rings are forced into position, the wedge-pieces 15, which seat against the end plates, are pressed outwardly against the end connections and securely hold the latter in a fixed position between the said wedge-pieces and the cylindrical covers 12. Projections 26 on the clamping-ring engage slots 27 in the wedge-pieces and prevent the latter from turning. The clamping-rings are retained in position by the end covers 13. The end covers are held in place by the nuts 23, screwed onto the shaft. Current may be conducted to the rotor-winding through the collector-rings 24 and the leads 25, one lead being placed diametrically opposite the other, so as to be balanced.

In the operation of the rotor there is a free circulation of air through the openings 14 in the end covers and between the projections 16 of the wedge-pieces and out through the spaces 11 between the coils and through the openings 12 in the cylindrical covers. The air may also pass through the openings 19 and 9 between the inner end turns and the end plates. Ventilation is further secured by air passing into and out of the spaces between the sections of laminæ.

Although we have shown and described our invention as embodied in a bipolar-field-magnet construction, it is obvious that any number of poles desired may be used or the rotor may be wound as an armature, and other changes may be made in construction without departing from the spirit of the invention or the scope of the claims.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In the revolving element of a dynamo-electric machine, the combination of a core, windings thereon, and means for supporting the end turns or connections comprising an outside cover and clamping means within the end turns for holding the same in fixed position against the outside cover, substantially as described.

2. In the revolving element of a dynamo-electric machine, the combination of a core, windings thereon, and means for supporting the end turns or connections comprising an outside cylindrical cover and internal clamping members, substantially as described.

3. In the revolving element of a dynamo-electric machine, the combination of a core, windings thereon, and means for supporting the end turns or connections comprising an outside cylindrical cover, an internal expansible ring and means for expanding said ring, substantially as described.

4. In the revolving element of a dynamo-electric machine, the combination of a core, windings thereon, and means for supporting the end turns or connections, comprising an outside cylindrical cover, internal wedges and a wedge-ring for forcing the said wedges outwardly, substantially as described.

5. In the revolving element of a dynamo-electric machine, the combination of a core, windings thereon, and means for supporting the end turns or connections, comprising an outside cylindrical cover, an internal composite ring having an inclined inner surface, and a second ring having an inclined outer surface, substantially as described.

6. In the revolving element of a dynamo-electric machine, the combination of a core, windings thereon, and means for supporting the end turns or connections, comprising an outside cylindrical cover, an internal composite ring having projections with inclined inner surfaces, and a second ring having an inclined outer surface, there being ventilating-spaces through the windings and outside cover, substantially as described.

7. In the revolving element of a dynamo-electric machine, the combination of a core, windings thereon, and means for supporting the end turns or connections, comprising an outside cylindrical cover, an end cover, internal wedge-pieces, and a wedge-ring, openings for ventilation being provided through the said end cover, wedge-pieces, end turns or connections and outside cylindrical cover, substantially as described.

8. In the revolving element of a dynamo-electric machine, the combination of a slotted core, windings thereon, the end connections being spaced from each other for ventilation, an outside cover for said end turns having openings communicating with said spaces between the end turns or connections, and means for clamping said end turns in fixed position, substantially as described.

9. In the revolving element of a dynamo-electric machine, the combination of a slotted core, windings thereon, the end connections being spaced from each other for ventilation, an outside cover for said end connections having openings communicating with said spaces between the end connections, and clamping

means having openings communicating with the openings between the end connections, substantially as described.

10. In the revolving element of a dynamo-electric machine, the combination of a slotted core, windings thereon, the end connections being spaced from each other for ventilation, an outside cover for said end connections having openings communicating with said spaces between the end connections, clamping means having openings communicating with the openings between the end connections, and a perforated end cover, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

BERNARD ARTHUR BEHREND.
WILLIAM D. POMEROY.

Witnesses:
CHARLES E. LORD,
L. C. MARBURY.