J. E. WEBSTER.

COMMUTATOR FOR DYNAMO ELECTRIC MACHINES.

APPLICATION FILED SEPT. 8, 1908.

931,105.

Patented Aug. 17, 1909.

3 SHEETS—SHEET 1.

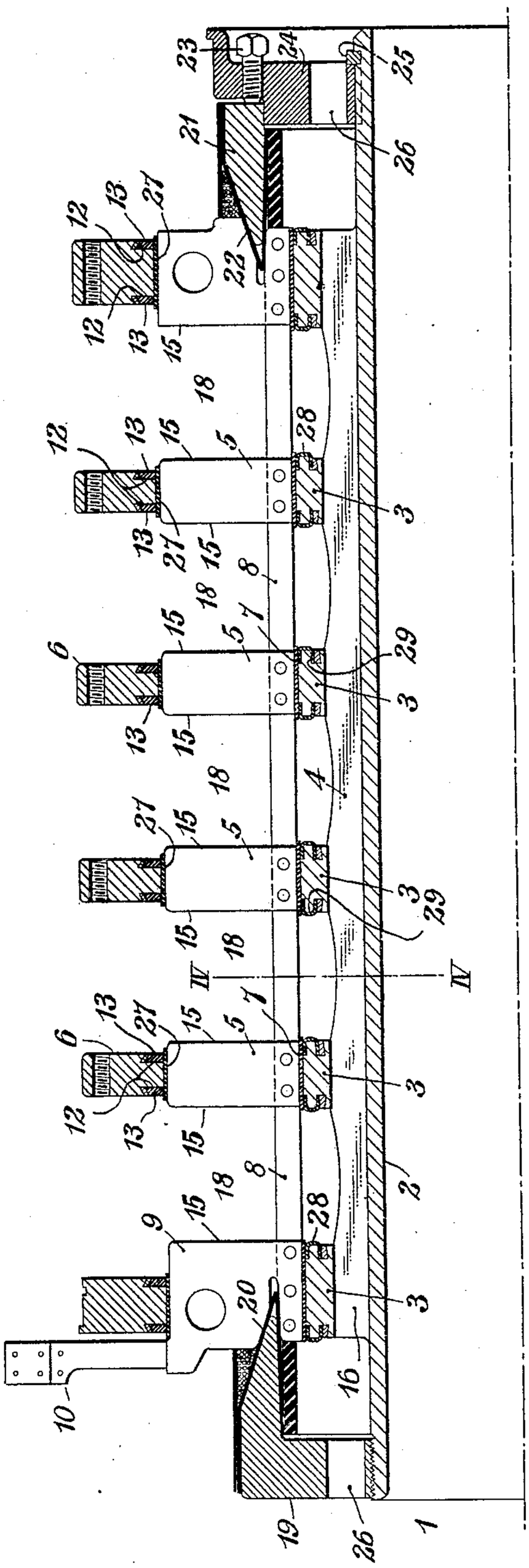

Fig. 1.

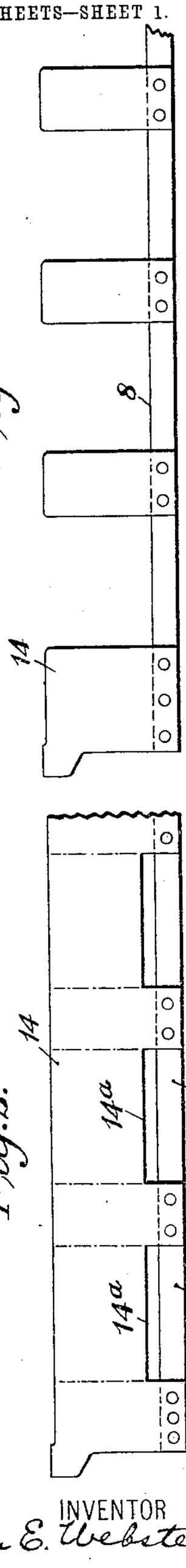

Fig. 2.

Fig. 3.

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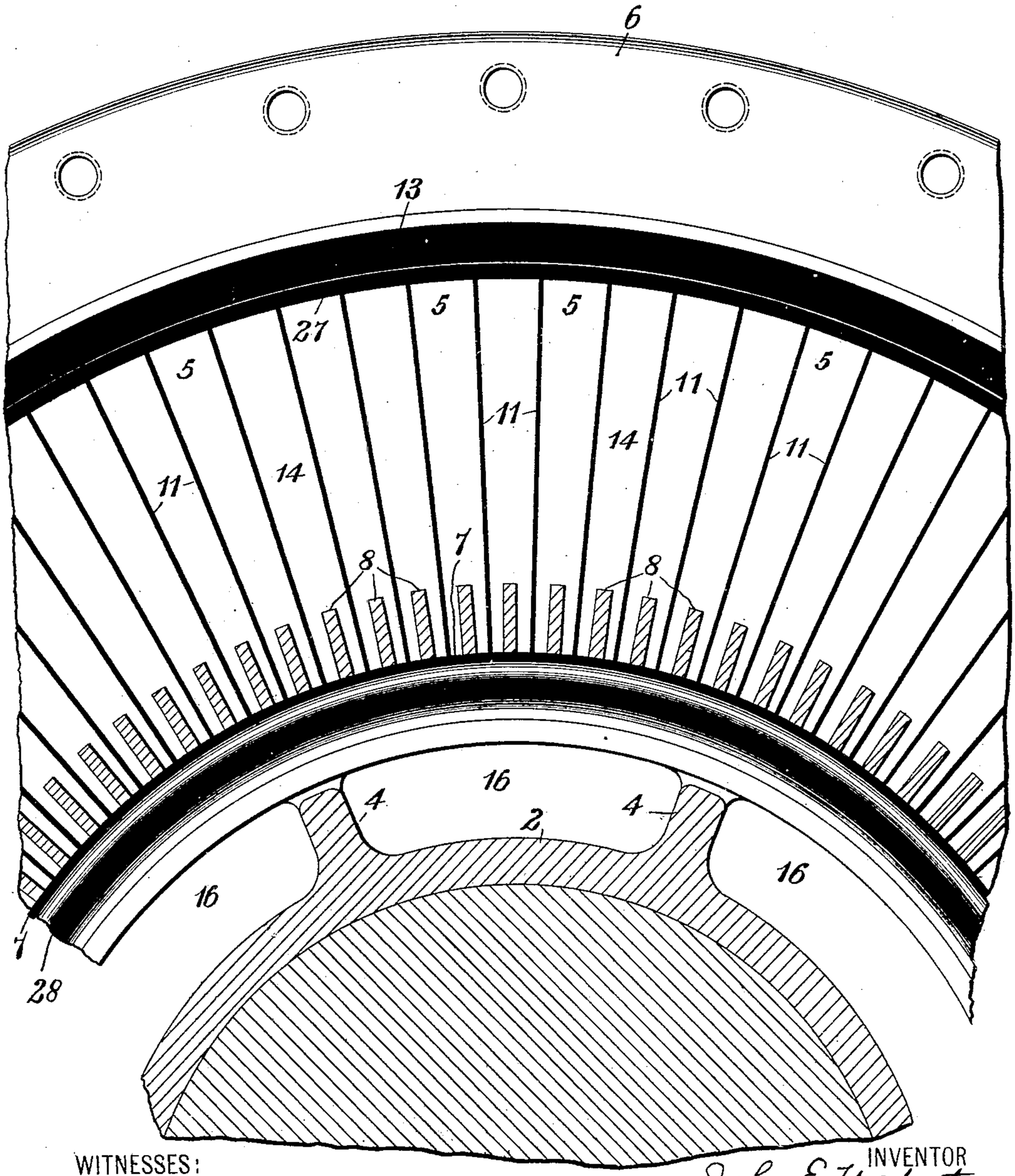
3 SHEETS—SHEET 2.

Fig. 4.



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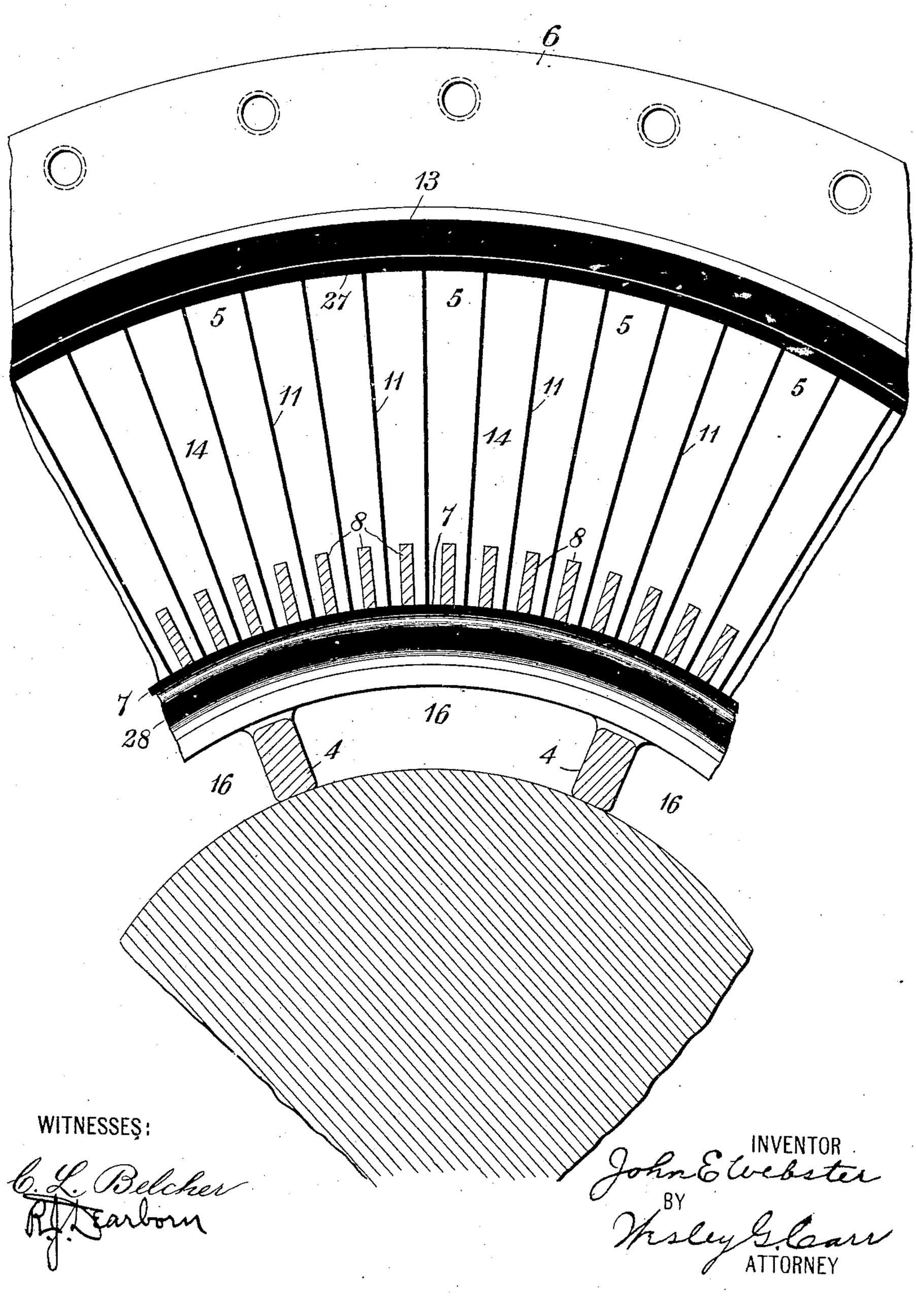
3 SHEETS—SHEET 3.

Fig. 5.



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UNITED STATES PATENT OFFICE.

JOHN E. WEBSTER, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, OF EAST PITTSBURG, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

COMMUTATOR FOR DYNAMO-ELECTRIC MACHINES.

No. 931,105. Specification of Letters Patent. Patented Aug. 17, 1909.

Application filed September 8, 1908. Serial No. 452,089.

To all whom it may concern:

Be it known that I, JOHN E. WEBSTER, a citizen of the United States, and a resident of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Commutators for Dynamo-Electric Machines, of which the following is a specification.

My invention relates to dynamo-electric machines of the commutator type, and it has for its object to provide a simple device of this character that shall be specially adapted for use with high speed machines of large capacity, such as direct current turbine-driven generators.

In order to obtain a relatively large working surface without abnormally increasing the total length of the commutator, it has heretofore been proposed to so construct the commutator as to provide annular projections having a plurality of exposed plane contact surfaces perpendicular to the axis. Commutators constructed in this manner are very hard to ventilate, and, consequently, tend to become overheated in operation. To my knowledge, commutator cylinders of the usual type have been cooled by forcing air across their working surfaces parallel to the axis of the machine, but this method is found to be ineffective under high speed operation because the cool air is thrown from the surfaces centrifugally. My improved commutator is so constructed as to overcome the difficulties just referred to without evolving an expensive or complicated arrangement.

Figure 1 of the accompanying drawings is a longitudinal section of a portion of a commutator constructed and ventilated in accordance with my invention. Fig. 2 is a detail view showing the form in which several of the commutator bars or segments are assembled, and Fig. 3 is a similar view showing the form of all of the bars when the commutator is complete. Fig. 4 is a sectional view taken on line IV—IV of Fig. 1. Fig. 5 is a view corresponding to that of Fig. 4 of a slightly modified structure.

Referring to Figs. 1, 2, 3 and 4 of the drawings, the structure here shown comprises a sleeve or bushing 1 having an inner cylindrical portion 2, longitudinal ribs 4 and a series of similar ring members 3 which are preferably integral with the ribs and are concentric with the bushing; a plurality of wedge shaped blocks 5 of copper or other suitable conducting material which constitute commutator segments and are mounted on the rings to form a series of commutator disks. The segments of each disk are similar to each other and are mounted directly on an insulating sleeve 7 by which they are separated from their supporting ring 3. The commutator disks are so arranged relative to each other that the corresponding segments of each lie in the same radial plane and they are connected together in longitudinal rows by a plurality of conducting strips 8 which are relatively thin in order to interfere to a minimum degree with the ventilation of the commutator structure. Each of the segments of the commutator disks which is disposed at the inner end of the series is provided with a radial neck 10 of conducting material by which it may be readily connected to the coils of a dynamo-electric machine.

The segments of the commutator disks are held in position against centrifugal forces tending to displace them in operation by means of shrink rings 6 which are separated from the segments by insulating sleeves 27, the segments being separated from each other by plates or strips 11 of insulating material in the usual manner. To further prevent arcing between the segments and the shrink rings, annular grooves 12 are provided in the sides of the rings, adjacent to their edges, and insulating rings 13 are disposed therein.

In order that the corresponding segments of the several commutator disks may be maintained in longitudinal alinement in the same radial plane, it is desirable in assembling the commutator structure to insert at intervals a bar 14, of the form shown in Fig. 2, which may afterward be notched, as shown in Fig. 3, in order that the plane disk surfaces 15 may be used as working surfaces and may be engaged by any suitable contact brushes (not shown).

The segments of the finished commutator structure are all similar to each other, since the bars 14 (as shown in Fig. 2) are provided with shallow notches 14ª, and the projections thus formed are connected by one of the strips 8 of conducting material.

The assembling of the structure is rela-

tively simple, since the corresponding segments of the several commutator disks are connected by the conducting strips 8 before they are mounted in position on the rings 3.

The ribs 4 are so arranged that longitudinal passages are provided between them which communicate, as above indicated, with the spaces 18 adjacent to the working surfaces of the commutator structure. By this means, the warm air adjacent to the disk surfaces is forced out by the centrifugal force which accompanies the high speed operation of the commutator and cool air rushes in through the passages 16 to replace that which was forced away. The thin strips 8 of conducting material assist the ventilation of the commutator, since they act as vanes or fan blades when the commutator is in operation.

The inner end of the bushing 1 is provided with a clamping V-ring 19 which is screw-threaded on to the bushing and engages suitable recesses 20 in the ends of the segments. A second V-ring 21 is provided at the opposite end of the commutator structure and engages recesses 22 in the commutator segments, the rings being forced toward each other by set-screws 23 which are screw-threaded through a collar or wiper-ring 24 that is held in position by a key 25. The V-rings and the wiper-ring are all provided with annular segmental openings 26 which are in alinement with the longitudinal passages 16.

The insulation between the commutator segments and the rings 3 may be materially improved by means of insulating rings 28 of U-shaped section which are fitted over the side surfaces of the rings 3, suitable recesses 29 being provided to receive them.

The V-rings are made relatively light and may be omitted entirely, since the shrink-rings are adapted to oppose the centrifugal forces tending to displace the segments when the commutator is in operation.

As shown in Fig. 5 of the drawings, the inner sleeve or bushing 2 may be omitted, the longitudinal ribs being adapted to fit on to the shaft of the dynamo-electric machine, and the diameter of the commutator structure for a given depth of ventilating passage being somewhat reduced.

It will be understood that other structural modifications may be effected within the spirit and scope of my invention, if desired.

I claim as my invention:

1. A commutator structure comprising a bushing or cylinder having a plurality of ring members, commutator segments mounted on the ring members to constitute a series of spaced commutator disks, and means for electrically connecting segments of the commutator disk in longitudinal rows.

2. A commutator structure comprising a bushing or cylinder having a plurality of ring members connected to the outer surface of the cylinder by integral ribs, a plurality of commutator segments mounted on the rings in radial planes and insulated therefrom and from each other to constitute a series of spaced commutator disks, strap conductors for connecting the segments in longitudinal rows, and means for holding the segments of each commutator disk in position.

3. A commutator structure comprising a bushing or cylinder having a plurality of rings connected to its outer surface by integral ribs to provide longitudinal passages for ventilation, a plurality of commutator segments mounted on the outer cylindrical surfaces of the rings in radial planes and insulated therefrom to constitute a series of spaced commutator disks, relatively thin electric conductors for connecting the segments in longitudinal rows and shrink-rings, insulated from the segments, for holding them in position on the rings.

4. A commutator structure for dynamo-electric machines comprising a bushing having a plurality of annular projections supported by longitudinal ribs to form ventilating passages, commutator segments mounted on the annular projections and insulated therefrom and from each other to constitute spaced commutator disks, and narrow strips of conducting ribbon for connecting the corresponding segments of the several disks in longitudinal planes.

5. A commutator structure for dynamo-electric machines comprising a series of commutator disks having a plurality of wedge-shaped blocks or segments, and means for electrically connecting the corresponding segments of the several commutator disks together.

6. A commutator structure for dynamo-electric machines comprising a series of commutator disks spaced apart and arranged side by side, means for electrically connecting the corresponding segments of the disks together, and longitudinal ventilating passages connecting the annular spaces formed between the commutator disks together.

In testimony whereof, I have hereunto subscribed my name this 31st day of August, 1908.

JOHN E. WEBSTER.

Witnesses:

Jos. L. C. Davis,

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