A. KINGSBURY.

DYNAMO ELECTRIC MACHINE.

APPLICATION FILED MAR. 4, 1907.

Patented Jan. 31, 1911.

2 SHEETS—SHEET 1.

982,830.

Fig. 1.

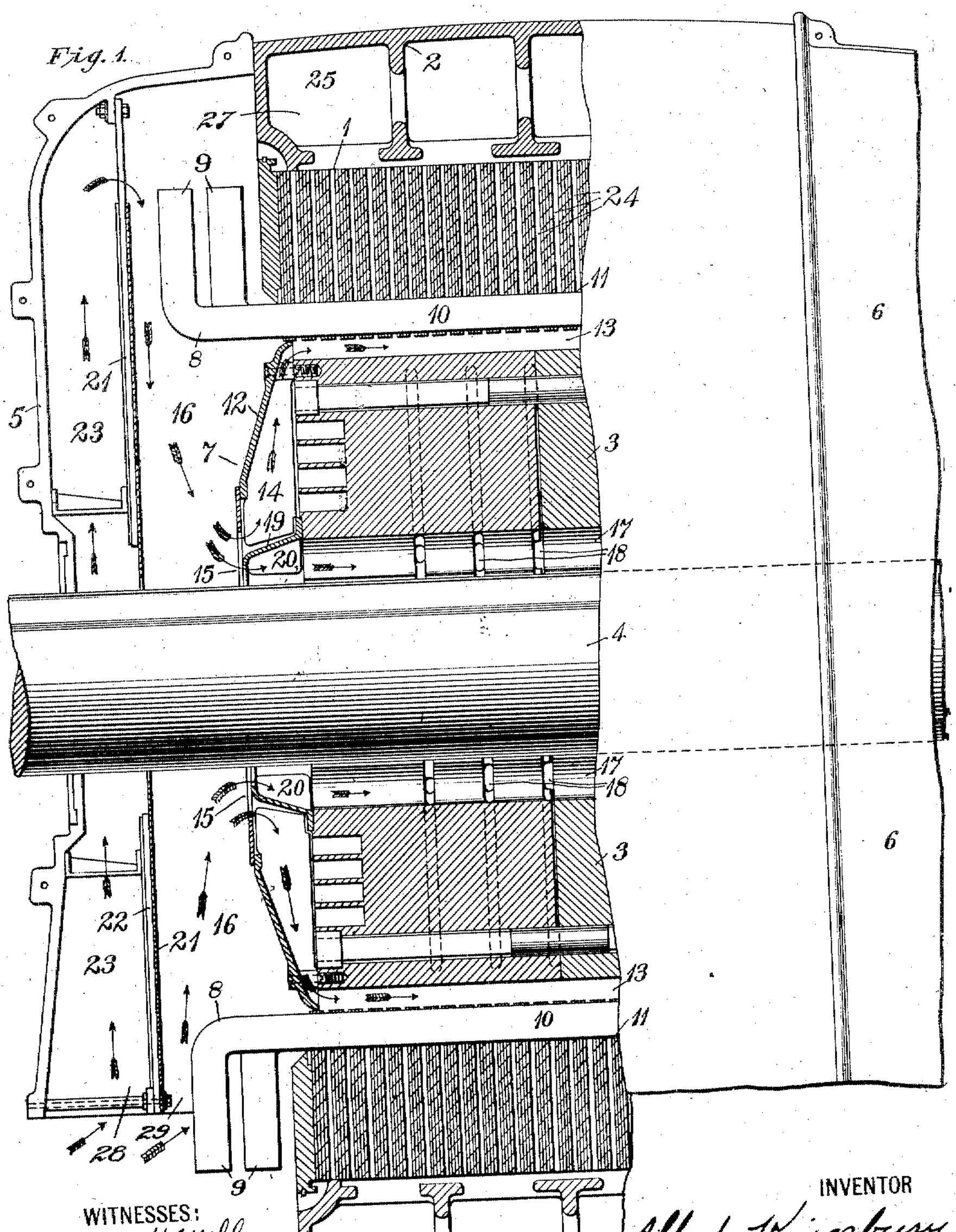

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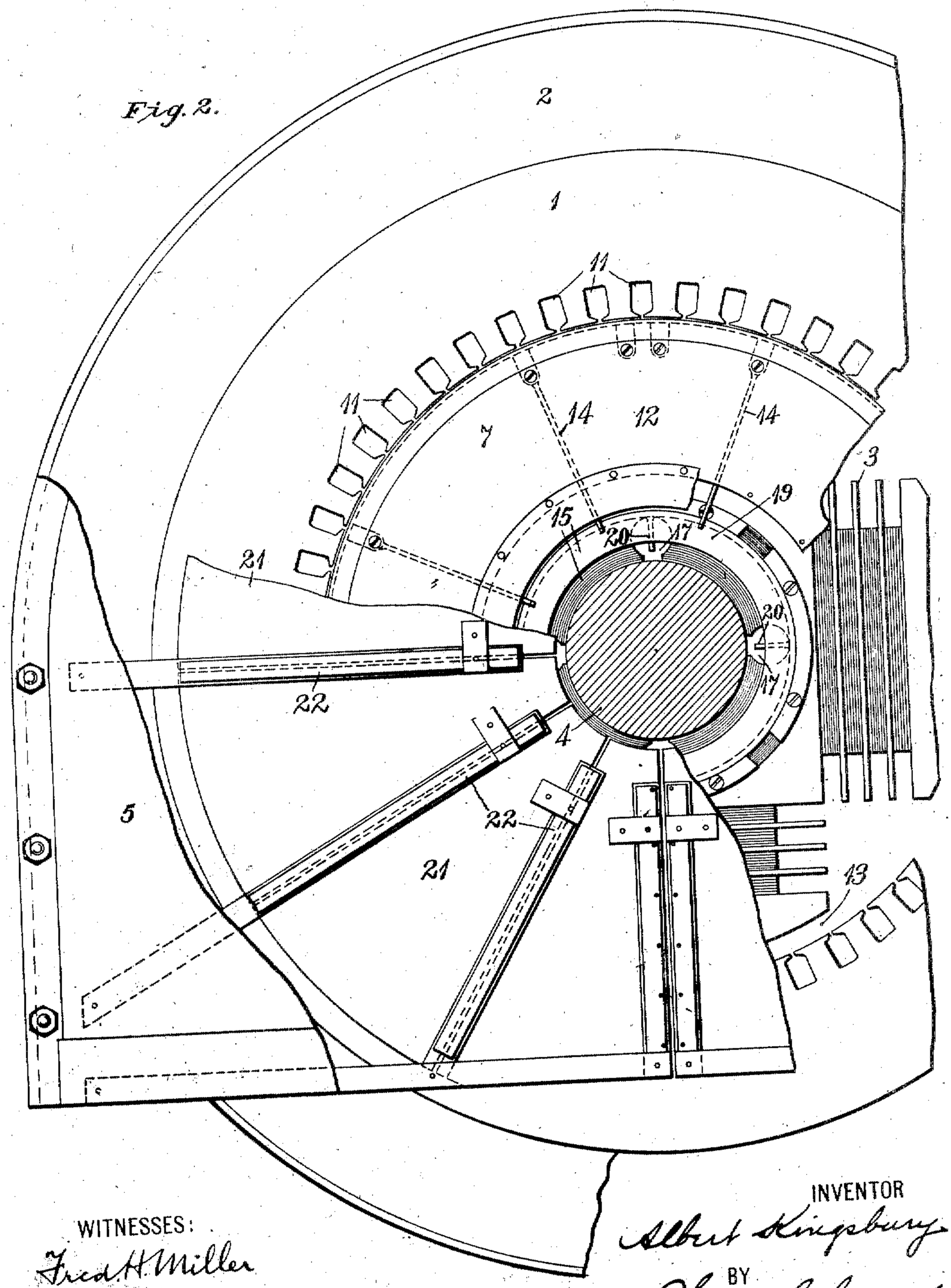
Fig. 2.



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ALBERT KINGSBURY, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

DYNAMO-ELECTRIC MACHINE.

982,830. Specification of Letters Patent. Patented Jan. 31, 1911.

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To all whom it may concern:

Be it known that I, ALBERT KINGSBURY, 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 Dynamo-Electric Machines, of which the following is a specification.

My invention relates to dynamo-electric machines, and has special reference to machines having rotary field magnets that are adapted to operate at relatively high speeds.

The object of my invention is to provide improved means for propelling cool air, or other ventilating fluid, through the magnetizable core members and the windings of dynamo-electric machines in conjunction with means for so directing the fluid thus circulated as to enable the windings of the machine to carry relatively large currents continuously without excessive heating.

Steam turbine-driven generators and other high speed machines are often entirely inclosed by stationary frames to which end bells are attached in order to avoid the noise which would otherwise result from the rushing of the atmosphere through openings in these parts when the machines are in operation. In a structure of this kind, the circulation of air is established from the outside atmosphere into an outer compartment in the end bell (which is usually provided with a partition), from which point it is forced through the air gap, formed between the stationary and rotating members, by means of a propeller attached to the shaft and comprising radial vanes located substantially in the plane of the partition. Consequently, the air passes from the outer to the inner compartment of the end bell near the shaft.

It is a well known fact that, in any machine of the stationary armature type, the so-called end connecting portions of the winding, which are outside the core slots, are raised to higher temperatures by the passage of current through the windings than are other portions of the structure by reason of the fact that a large number of conductors are here grouped together and are surrounded by air, which is a relatively poor heat conductor. The quantity of heat generated at this point is, however, not excessive and, in order that the temperature of these parts may be kept normal, I provide, according to my present invention, means for first directing the cool outside atmosphere through the end connecting portions of the winding and, afterward, this relatively large body of air which is raised in temperature only slightly, is forced through the core structures and windings of the rotating and stationary parts before it is permitted to escape through suitable channels provided for that purpose.

Figure 1 of the accompanying drawing is a partially sectional elevation, in a longitudinal plane, of a dynamo-electric machine constructed in accordance with my invention, the air-propelling device and the compartments of a single end bell being shown as indicative of the arrangement which may be utilized in practice at each end of the machine, and Fig. 2 is an end elevation of a portion of the machine shown in Fig. 1.

Referring to the drawings, the dynamo-electric machine illustrated comprises a stationary core member 1 which is supported by a frame 2, a rotatable core member 3 mounted on a shaft 4, end bells 5 and 6 attached to the stationary frame 2 and air propelling devices 7. The stationary core member 1 is provided with armature coils 8 having end connecting portions 9 and parallel straight portions 10, the latter being located in the core slots 11 in a well known manner.

The stationary frame and the end bells form an inclosing casing for the machine comprising a middle chamber 27 which contains the stationary and movable core members and a pair of end chambers 23 that are separated from the middle chamber by partitions 21 (only one of which is shown), and receive the cool air which is afterward distributed through the active parts of the machine.

Each of the air propellers 7 comprises a cap or bell 12 which is attached to and is of materially greater diameter than the rotating member 3 so that it covers the air-gap 13 which exists between the stationary and rotating members, its outer edge being in close proximity to the inner surface of the armature core. The cap 12 is further provided with radial vanes 14 which may be integral with it, and which force the air into the air-gap 13 when the machine is in operation, an annular opening 15 being provided adjacent to the shaft through which air is received from compartments 16 of the end

bells 5 and 6 that form parts of the main middle chamber 27.

A portion of the air which passes through the opening 15 is forced through longitudinal holes 17 and lateral ducts 18 in the rotating core member by means of an auxiliary propeller 19 that comprises a relatively small bell attached to and located within the bell 12 and provided with propelling vanes 20.

The compartments 16 are located between the ends of the core members and the partitions 21, the latter being supported by radial ribs 22 and being of such shape and size as to provide ample passages between the end chambers 23 and the middle chamber 27 near the top and sides of the end bells 5 and 6.

The operation of the ventilating system is as follows: Fresh, cool air is taken in at the lower edges of the end bells (usually from below the floor of the power house) through ports 28 and 29 into both the end chambers 23 and the compartments 16 of the end bells 5 and 6, and passes directly over the end-connecting portions 9 of the armature coils. The air then enters the caps which form parts of the propelling devices 7, near the shaft 4, and is forced, by means of the vanes 14, into the air-gap 13 so that it circulates through ventilating ducts 24 in the stationary core member. A portion of the air which enters the bell 12 of the propelling device is forced through the longitudinal holes 17 in the rotating core member and passes therefrom through the ventilating ducts 18. The air is finally exhausted through ports 26 in annular compartments 25 which are provided between the stationary core structure and the outermost wall of the supporting frame 2 and form parts of the inner chamber 27. The exhaust ports 26 preferably communicate with the outside air at a point considerably removed from the intake ports, flues or other suitable means (not shown) being connected to either the inlet ports or to the exhaust ports.

It will be understood that various structural modifications may be effected within the scope of my invention, and I, therefore, desire that only such limitations shall be imposed as are indicated in the appended claims.

I claim as my invention:

1. A dynamo-electric machine provided with a middle chamber having one or more side exhaust ports and containing armature and field magnets, an end chamber communicating with said middle chamber, inlet ports at one side of the end chamber and similar inlet ports for the middle chamber adjacent to those of the end chamber.

2. A dynamo-electric machine provided with a middle chamber having one or more exhaust ports and containing armature and field magnets, an end chamber communicating with said middle chamber, inlet ports at one side of the end chamber and similar inlet ports for the middle chamber adjacent to those of the end chamber, means for establishing a circulation of air from the inlet ports of the end chamber through the communicating passage between the end and middle chambers and through said chamber to the exhaust ports.

3. In a dynamo-electric machine, the combination with stationary and rotatable members provided with ventilating passages and separated by a material air-gap, annular compartments surrounding the stationary member and having exhaust ports communicating therewith, of side-by-side end compartments in open communication with each other near their outer peripheral walls and having inlet ports, and means for directing currents of air from said end compartments into said air-gap and into said ventilating passages.

4. In a dynamo-electric machine, the combination with a stationary member having outside circumferential compartments, transverse ventilating passages and one or more exhaust ports that communicate with said compartments, of a rotatable member separated from said stationary member by an air gap and provided with communicating longitudinal and transverse ventilating passages, of side-by-side end compartments in open communication with each other near their outer peripheral walls and having adjacent inlet ports, and means for establishing a circulation of air from said end compartments into and through said air gap and all of said passages.

5. In a dynamo-electric machine, the combination with stationary members provided with transverse ventilating passages and a rotatable member provided with longitudinal and transverse ventilating passages, said members being separated by a material air gap, of a cap or end bell attached to the rotatable member and provided with an annular opening near its center and with radial vanes for forcing air into said air gap, and an auxiliary cap or bell for forcing air into the longitudinal passages in said rotatable member.

6. In a dynamo-electric machine, the combination with stationary and rotatable core members separated by a material air gap, the latter being provided with longitudinal and transverse communicating passages, and a supporting shaft for the rotatable member, of an end bell attached to the end of the rotatable member and provided with inwardly projecting radial vanes for forcing air into said air gap, and an auxiliary means for forcing air into the longitudinal passages in said member.

7. In a dynamo-electric machine, the com-

bination with a stationary core member and a rotatable core member having longitudinal and transverse ventilating passages, of concentric bell-shaped air-propelling devices attached to the end of the rotatable member to create and direct currents of air through the longitudinal and transverse passages of the rotatable member and also through the air gap formed between the rotatable and stationary members.

8. In a dynamo-electric machine, the combination with a rotatable core member having longitudinal and transverse ventilating passages, of a two-part propeller attached to the end of the rotatable member and comprising an inner auxiliary bell having inwardly projecting vanes and an outer, bell-shaped member having inwardly projecting vanes, the outside diameter of the main bell being greater than that of the rotatable member.

In testimony whereof, I have hereunto subscribed my name this 27th day of February, 1907.

ALBERT KINGSBURY.

Witnesses:
JENS BACHE-WÜG,
BIRNEY HINES.