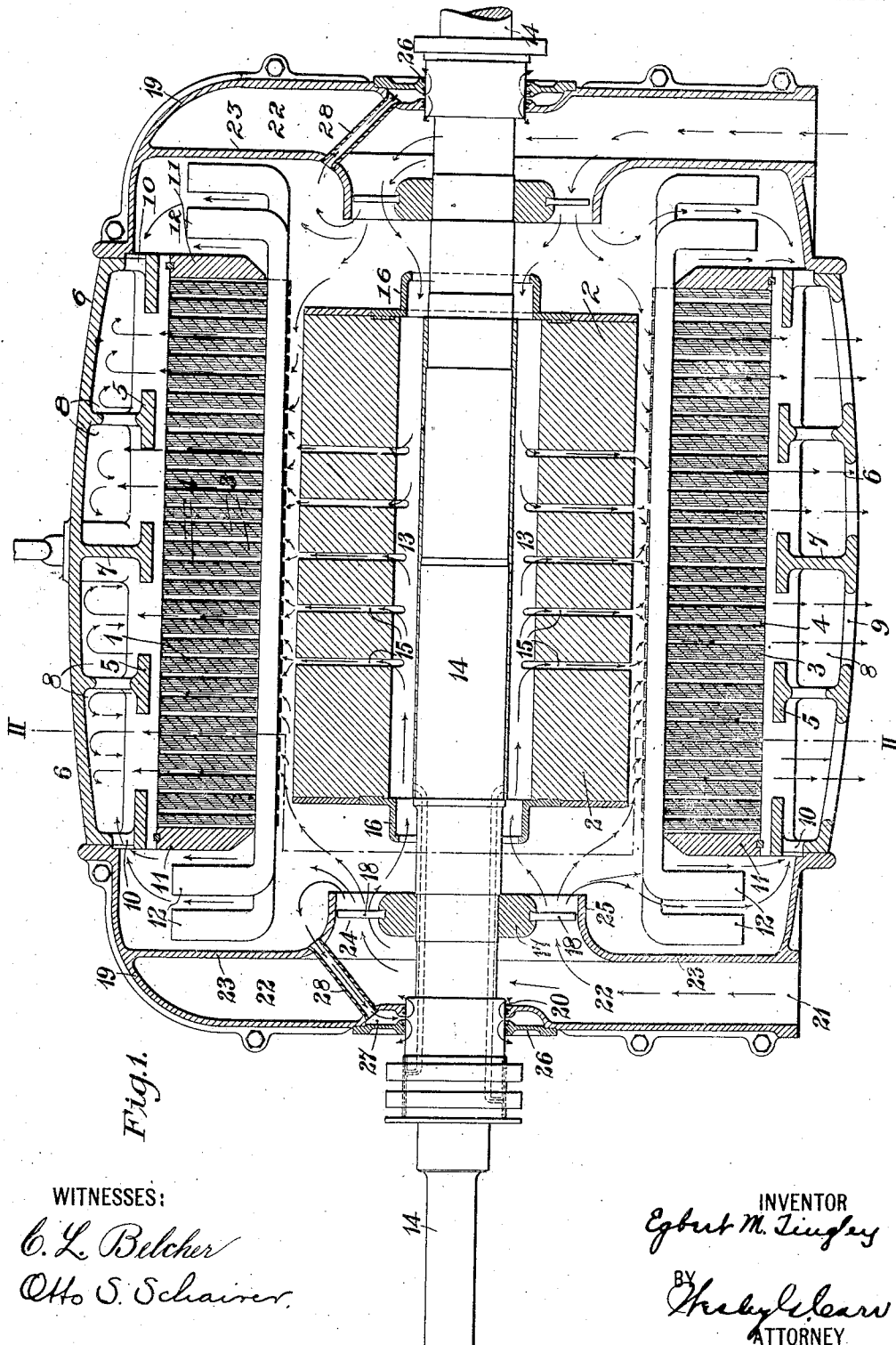


E. M. TINGLEY.
DYNAMO ELECTRIC MACHINE.
APPLICATION FILED MAR. 17, 1905.

1,057,386.

Patented Mar. 25, 1913.

2 SHEETS—SHEET 1.



WITNESSES:

C. L. Belcher
Otto S. Schairer

INVENTOR

Egbert M. Tingley

BY

Thos. L. L. L.
ATTORNEY

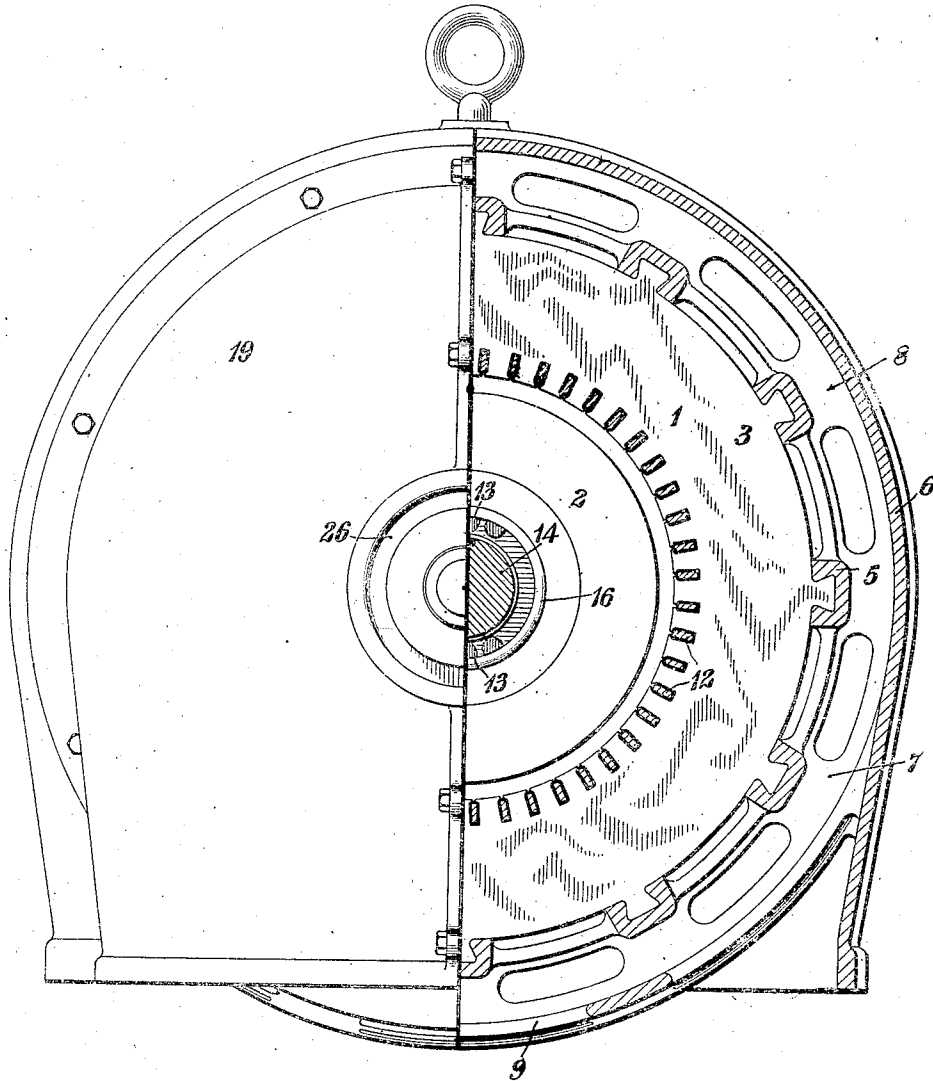
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2 SHEETS-SHEET 2.

Fig. 2.



WITNESSES:

C. L. Belcher
Otto S. Schauer

INVENTOR

Egbert M. Tingley

BY

Wm. L. Carr
ATTORNEY

UNITED STATES PATENT OFFICE.

EGBERT M. TINGLEY, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE
ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

DYNAMO-ELECTRIC MACHINE.

1,057,386.

Specification of Letters Patent.

Patented Mar. 25, 1913.

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To all whom it may concern:

Be it known that I, EGBERT M. TINGLEY, a citizen of the United States, and a resident of Pittsburgh, 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 particularly to those which are operated at high speeds, such, for example, as turbine-driven generators.

The object of my invention is to provide a structure for dynamo-electric machines by means of which ventilation may be greatly facilitated and the noise concomitant with operation at high speed may be rendered unobjectionable.

A further object is to provide improved means for establishing and maintaining a circulation of air through the structure.

The horse-power capacity of dynamo-electric machines is limited and determined largely by their ability to dissipate the heat that results from losses of energy in their electrical and magnetic circuits. In the construction and operation of the more usual types of machines, in which one member rotates at only moderate speeds and both members are of such dimensions as to afford large superficial areas, the ready dissipation of heat does not present a problem which is serious and important as compared with that which is presented in machines which are adapted to be operated at very high speeds. On account of the high speeds of operation, the structures of turbine-driven generators may be, and it is desirable that they should be, more compact than those of generators of the corresponding capacity that are driven by reciprocating engines. However, approximately the same amounts of heat must be dissipated from the smaller superficial areas, and it is therefore quite desirable that the structure of turbo-generators shall be well adapted to facilitate ventilation and that suitable means shall be employed for effecting forced ventilation of the structure, thereby increasing the number of watts that may be dissipated per unit of area.

It is the specific object of my invention to provide such a structure and such means.

My invention is illustrated in the accompanying drawings, Figure 1 of which is a

view, partially in side elevation and partially in section, of a dynamo-electric machine constructed in accordance therewith, and Fig. 2 is a view, partially in end elevation and partially in section, on line II—II of Fig. 1.

The dynamo-electric machine here shown as embodying my invention comprises a stationary armature 1 and a rotatable field magnet 2. The armature comprises slotted disks or laminae 3 arranged in groups with ventilating passages 4 between the groups, the laminae being mounted in a cylindrical frame 5 that is connected with an inclosing casing 6 by means of supporting webs 7 in such manner that an annular chamber 8 is provided between the frame 5 and the casing 6. Exhaust ports or apertures 9 are provided in the bottom portion only of the inclosing casing 6, and an annular set of apertures 10 is provided between the framework 5 and the inclosing casing 6 at each end of the structure. The groups of laminae are clamped between end plates 11 that are keyed or otherwise secured to the framework 5, and the coils 12 of the armature winding are placed in the longitudinal grooves or slots in the laminae.

The rotatable member 2, which, in this case, carries the field magnet winding (not shown), is provided with longitudinal passages 13 adjacent to the shaft 14 and with communicating, transverse apertures 15, end-bells 16 being provided at the ends of the member for the purpose of partially covering the ends of the passages 13 and thereby directing currents of air into the passages. Mounted upon the shaft 14, in proximity to the end-bells 16, are collars 17 in the peripheries of which propeller blades 18 are secured at such angles as to produce drafts of air toward the dynamo-electric machine and into the ventilating apertures.

The ends of the machine are provided with inclosing end-bells 19 having centrally located apertures 20 through which the ends of the shaft 14 project. The end-bells 19 are also provided with inlet ports 21, at the bottom of the machine, that are adapted to be placed over apertures in the floor upon which the machine is placed, though, of course, the inlet ports may open at any other desired points with reference to the remainder of the machine. The inlet ports 21 communicate with chambers 22 that are

formed by the end-bells 19 and partitions 23 that have centrally located apertures 24, the portions of the partitions surrounding the apertures being extended inwardly to form short cylindrical shells 25, within which are located the propeller blades 18.

The portions of the walls of the inlet chambers that surround the apertures 20 are depressed and annular cover plates 26 are provided for the depressions so as to form annular chambers 27. Communication between the chambers 27 and the machine chamber is provided by means of tubes 28, the ends of which perforate the walls of the partitions 23 and of the chamber 27. When the machine is in operation, the air in the chamber containing the rotating member is placed under compression by means of the propellers and, consequently, currents of air traverse the tubular passages 28 into the chambers 27 to provide a compressed air seal between the shaft and the casing. Leakage through the clearance spaces from the exterior into the inlet chamber is in this manner prevented and air from the engine room, which is usually hot and saturated and frequently laden with particles of oil, is not permitted to enter the machine. As before stated, it is intended that the machine shall be placed over apertures in a floor, and it is further intended that the inlet ports shall communicate with the open air or with some source of purified or dry air, and also that the exhaust ports shall communicate with the exterior, or at least that they shall not discharge into the room in which the machine is located.

The operation of my invention may be best understood from a consideration of the directions of the currents of air through the machine during rotation, the directions of the currents being indicated in a general way by means of arrows. The air is drawn through the inlet ports 21, the chambers 22 and the apertures 24 by means of the propeller blades and is forced into the chamber containing the armature and field magnets, whence it is conducted through the longitudinal apertures 13 to the transverse apertures 15 in the rotating member, through the ventilating spaces 4 in the stationary member into the annular chamber 8 and out through the exhaust ports 9. Another current is established between the stationary and rotatable members, through the ventilating spaces 4 in the stationary member, into the annular chamber 8 and out through the exhaust ports 9, and still another current is established through the ends of the coils 12, the annular sets of apertures 10, into the annular chamber 8 and out through the exhaust ports 9.

From the description and drawings, it will be understood that all currents of air are confined within chambers which have no

communication with the room in which the machine is located, the noise due to operation being thereby rendered practically unobjectionable, and that the structure of a machine embodying my invention is such that large amounts of heat may be effectually dissipated from very small superficial areas.

I claim as my invention:

1. In a dynamo-electric machine, the combination with a middle chamber having exhaust ports at one side and containing armature and field magnet cores and coils, end chambers having inlet ports at one side, and constricted passages between the end chambers and the middle chamber, of means for establishing a circulation from the inlet ports, through the end chambers, and constricted passages and the middle chamber to the exhaust ports.

2. In a dynamo-electric machine, the combination with a main chamber having bottom exhaust ports and containing armature and field magnet cores and coils, end chambers having bottom inlet ports, and constricted passages between the end chambers and the main chamber, of means for establishing a circulation in opposite directions from the inlet ports, through the end chambers and through the main chamber to the exhaust ports.

3. In a dynamo-electric machine, the combination with a main chamber having exhaust ports at one side and containing armature and field magnet cores and coils, end chambers having inlet ports at one side, and constricted communicating passages between the end chambers and the main chamber, of means located in the constricted passages for establishing a circulation of air from the outer chambers to and through the main chamber to the exhaust ports.

4. In a dynamo-electric machine, the combination with a stationary member having an outer circumferential chamber provided with exhaust ports at one side, annularly located and transverse ventilating passages that communicate with said chamber, and a rotatable member provided with communicating, longitudinal and transverse ventilating passages, of end chambers having inlet ports at one side, and fans located in openings with which the inner walls of the end chambers are provided.

5. In a dynamo-electric machine, the combination with a stationary member having an outer circumferential chamber, annularly located and transverse ventilating passages and one or more exhaust ports that communicate with said chamber, and a rotatable member that is provided with communicating, longitudinal and transverse ventilating passages, of end chambers having inlet ports, and means located and operating in openings with which the inner walls of the end chambers are provided for es-

tablishing a circulation through all of said passages and chambers simultaneously.

6. In a dynamo-electric machine, the combination with a stationary member having an outer circumferential chamber, annularly located and transverse ventilating passages and exhaust ports that communicate with said chamber, and a rotatable member that is provided with communicating, longitudinal and transverse ventilating passages, of chambers having inlet ports, and means for establishing a circulation simultaneously through the longitudinal passages in the rotatable member, the transverse passages in both members, into the circumferential chamber, between the outer and inner circumferences of the members, through the transverse passages in the stationary member, into the circumferential chamber, and through the annularly located passages in the stationary member, into the circumferential chamber.

7. In a dynamo-electric machine, the combination with a stationary member having an outer circumferential chamber, annularly located and transverse ventilating passages and an exhaust port that communicate with

said chamber, and a rotatable member that is provided with communicating, longitudinal and transverse ventilating passages, of chambers having inlet ports and discharge apertures, and means located in said discharge apertures for establishing a circulation through all of said chambers and passages.

8. In a dynamo-electric machine, the combination with a stationary member having an outer circumferential chamber, annularly located and transverse ventilating passages and an exhaust port that communicate with said chamber, and a rotatable member that is provided with communicating, longitudinal and transverse ventilating passages, of end brackets having inlet ports and chambers and discharge apertures, and means for establishing a circulation through all of said chambers and passages.

In testimony whereof, I have hereunto subscribed my name this 11th day of March, 1905.

EGBERT M. TINGLEY.

Witnesses:

WESLEY G. CARR,

BIRNEY HINES.