No. 740,147. PATENTED SEPT. 29, 1903.

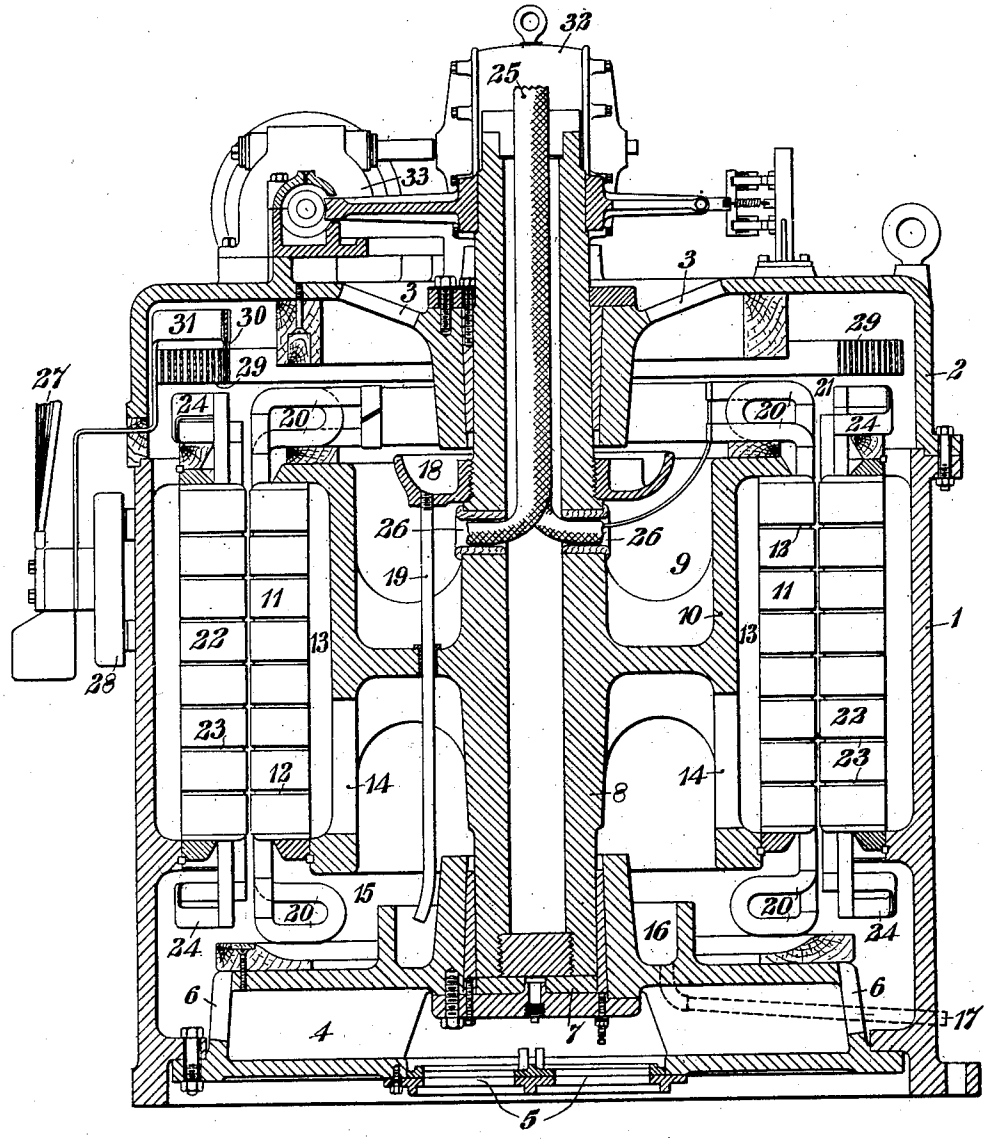
B. G. LAMME.

ELECTROMOTIVE FORCE REGULATOR.

APPLICATION FILED OCT. 2, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

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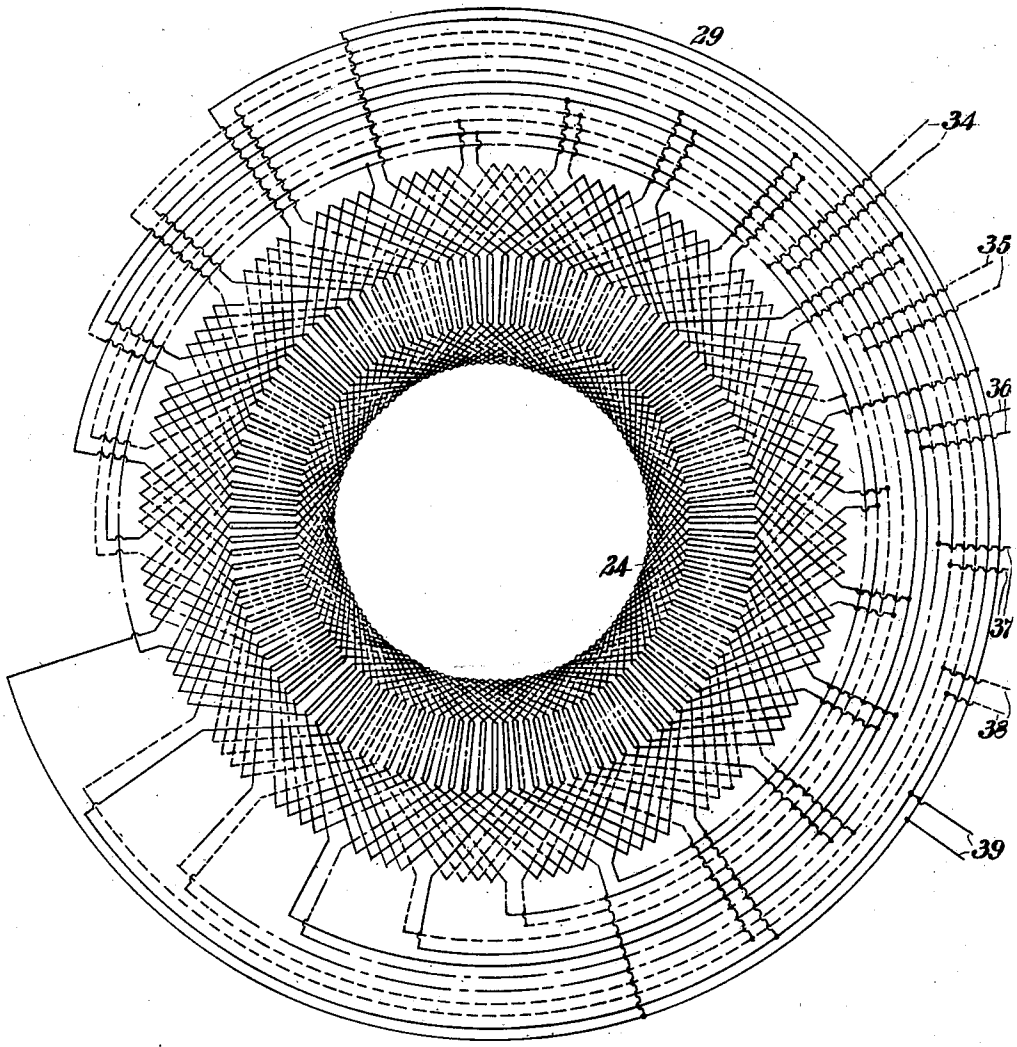
B. G. LAMME.

ELECTROMOTIVE FORCE REGULATOR.

APPLICATION FILED OCT. 2, 1902.

NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2.



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No. 740,147. Patented September 29, 1903.

UNITED STATES PATENT OFFICE.

BENJAMIN G. LAMME, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

ELECTROMOTIVE-FORCE REGULATOR.

SPECIFICATION forming part of Letters Patent No. 740,147, dated September 29, 1903.

Application filed October 2, 1902. Serial No. 125,716. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN G. LAMME, 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 Electromotive-Force Regulators, of which the following is a specification.

My invention relates to apparatus for raising and lowering the electromotive force of alternating-current circuits, and particularly to such apparatus as varies the electromotive force by inductive action between a primary and a secondary member, which are relatively movable so as to change the polar relations.

The object of my invention is to provide an induction voltage-regulator of compact and durable construction which shall be thoroughly ventilated so as to keep the temperature within satisfactory limits and in which the noise due to the current alternations shall be reduced to a minimum.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a central longitudinal section of the regulator, and Fig. 2 is a diagram of the windings of the primary member.

The operating parts of the regulator are inclosed within a casing 1, which, as shown, is cylindrical in form and has a removable cap or top portion 2, provided with comparatively large ports or openings 3, and a hollow base 4, provided with openings or ports 5 in its bottom and with a series of ports 6 in its periphery. The base 4 is also provided with a step-bearing 7 for a hollow shaft 8 of the rotating member 9 of the regulator, which member comprises a hollow drum 10, (here shown as constituting an integral part of the shaft,) and with a laminated core 11, provided with horizontal ventilating-ducts 12, which communicate with an annular chamber or passage 13, located between said core and the periphery of the drum 10. The shell of the drum at or near its lower end is provided with ports or openings 14, through which air is admitted to the chamber 13 and to which the air is supplied through the ports 5, the chamber formed by the hollow base 4, ports 6, and a chamber 15, into which the ports 6 open and which is also in open communication with the ports 14 through the lower port of the drum 10. The base 4 is also provided with an annular cup 16, from the bottom of which a pipe 17 leads to the exterior of the casing. At the upper end of the drum 10 the shaft 8 is provided with a cup 18, from the bottom of which a pipe 19 leads to the cup 16, these parts being provided in order to collect and remove from the apparatus any liquid which may be formed by condensation or otherwise collected in either of the cups 16 and 18. The movable member of the regulator is provided with coils 20, which are located in slots in the core 11 and project, respectively, therefrom considerable distances into the chamber 15 at the bottom of the regulator and into a corresponding chamber 21 at or near the upper end of the casing, the ports 3 being the outlet-ports from the chamber 21. The stationary core 22 surrounds the movable core 11 and is in such close proximity to the latter as to leave a very small air-gap. This core is also provided with ventilating-ducts 23, which correspond to the ducts 12 in the core 11. The coils 24, constituting the winding of the stationary member, are also located in slots in the core and project, respectively, into the chambers 15 and 21. The conducting-leads between the winding of the movable member and the external circuits are in the form of cables 25 and extend inward through the hollow shaft 8 and therefrom through lateral openings 26. The connections of the stationary winding with the external conductors 27 are made by means of a terminal board 28 on the outside of the casing and a set of annular strap-conductors 29 in the upper part of the casing, between which and the terminal board extend suitable couplings 30 and strap-leads 31. The movable member is given its motion of partial rotation necessary for raising and lowering the electromotive force of the circuit in which it is used by means of an electric motor 32, preferably of the polyphase induction type, the shaft of which operates the shaft 8 through the medium of suitable worm-gearing 33.

The construction and arrangement of the

casing and cores as above described are such as to provide admirable ventilation, and thus keep the temperature sufficiently low for satisfactory operation, and the relative location of the cores of the primary and secondary members is such that a minimum air-gap is provided between them which tends to eliminate the noise ordinarily produced by alternating currents when acting upon laminated structures. This tendency to noisy operation is also further obviated by the arrangement of the windings of one or both of the members, that shown in Fig. 2 being the winding of the primary or stationary member of the device or apparatus and being, as shown, arranged and connected for an eight-pole winding supplied with six-phase currents, the external leads for the several phases being represented at 34, 35, 36, 37, 38, and 39 and each phase being supplied to the winding 24 by conductors 29 and suitable branch conductors leading therefrom. The arrangement and connections are clearly indicated as such that the winding for each phase produces eight magnetic poles and the phases so overlap each other as to make a uniformly-distributed field, and therefore provide magnetic circuits that are so equalized as to substantially eliminate or very materially reduce the humming which results from unbalanced magnetic circuits in apparatus of this character. My invention is of course not limited to the number of phases of current supplied to the apparatus or to the number of poles produced therein; neither is it limited to the mechanical details as regards either form, dimensions, or relative location of parts except in so far as limitations may be imposed by the prior art.

I claim as my invention—

1. An induction-regulator comprising a casing having ventilating-passages, a stationary core supported by said casing and having ventilating-ducts, a rotatable member having a core provided with ventilating-ducts and located in close proximity to said stationary core, windings located in slots in the respective cores and projecting into the ventilating-passages in the casing and means for actuating the rotatable member.

2. An induction-regulator supplied with polyphase currents and at least one of its members having a plurality of parallel circuits for each phase and for each pole whereby the magnetic circuits are equalized.

3. An induction-regulator supplied with polyphase currents and one of the members of which has its windings distributed and connected so that each phase of current traverses a plurality of conductors corresponding to each pole, in parallel.

4. An induction-regulator having cores provided with longitudinal slots and transverse ventilating-ducts and with coils located in the core-slots and projecting beyond their ends, in combination with a casing having ventilating-passages into which the coil ends project at both ends of the cores.

5. An induction-regulator having relatively movable, concentric cylindrical cores in close proximity to each other and provided with ventilating-ducts, coils located in slots in said cores and projecting beyond the ends thereof and a casing having air-conducting passages into which said coils project.

In testimony whereof I have hereunto subscribed my name this 25th day of September, 1902.

BENJ. G. LAMME.

Witnesses:

JAMES B. YOUNG,

BIRNEY HINES.