(No Model.)

A. POLESCHKO.

ELECTRICAL TRANSFORMER.

No. 464,677. Patented Dec. 8, 1891.

Fig. 1.

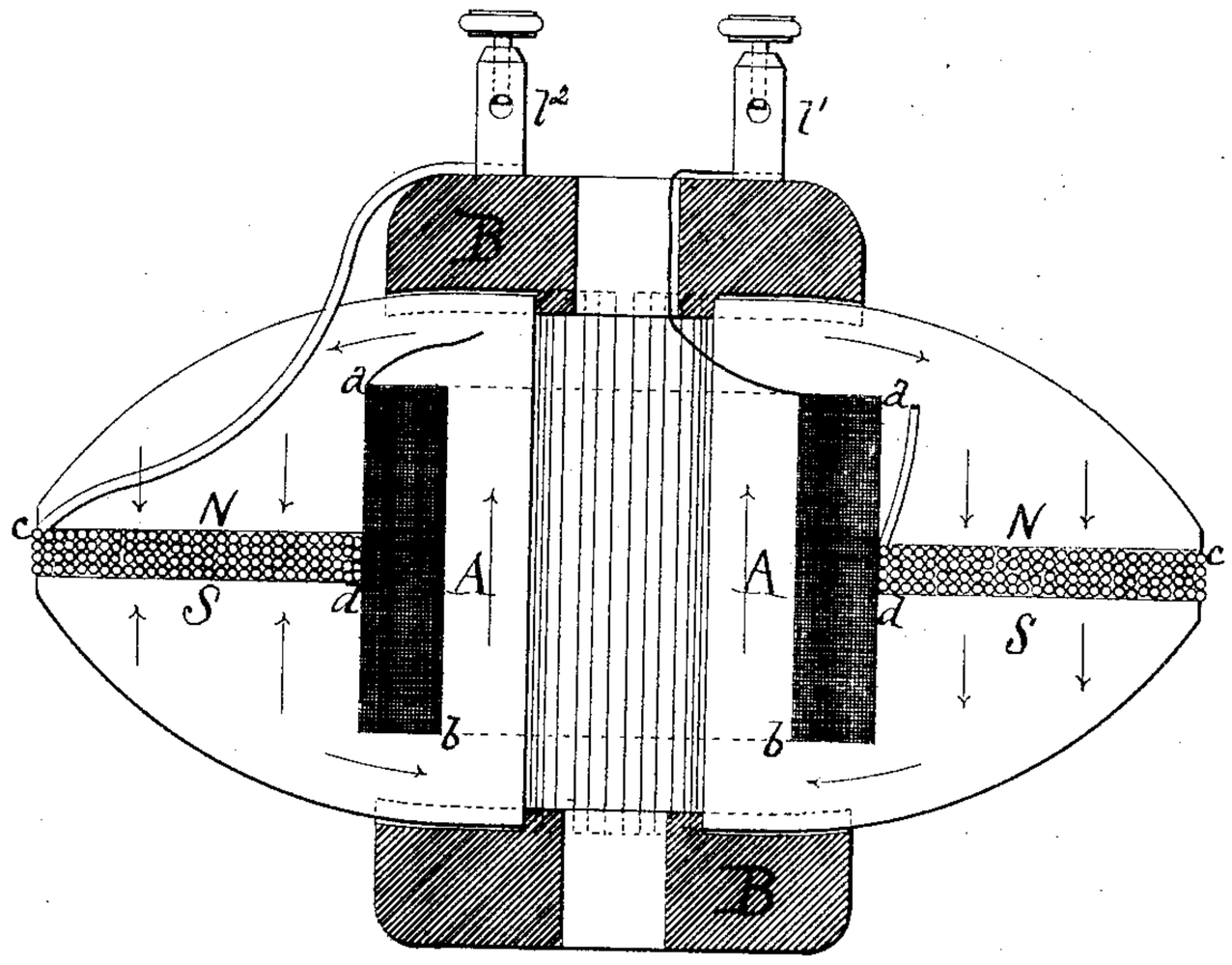
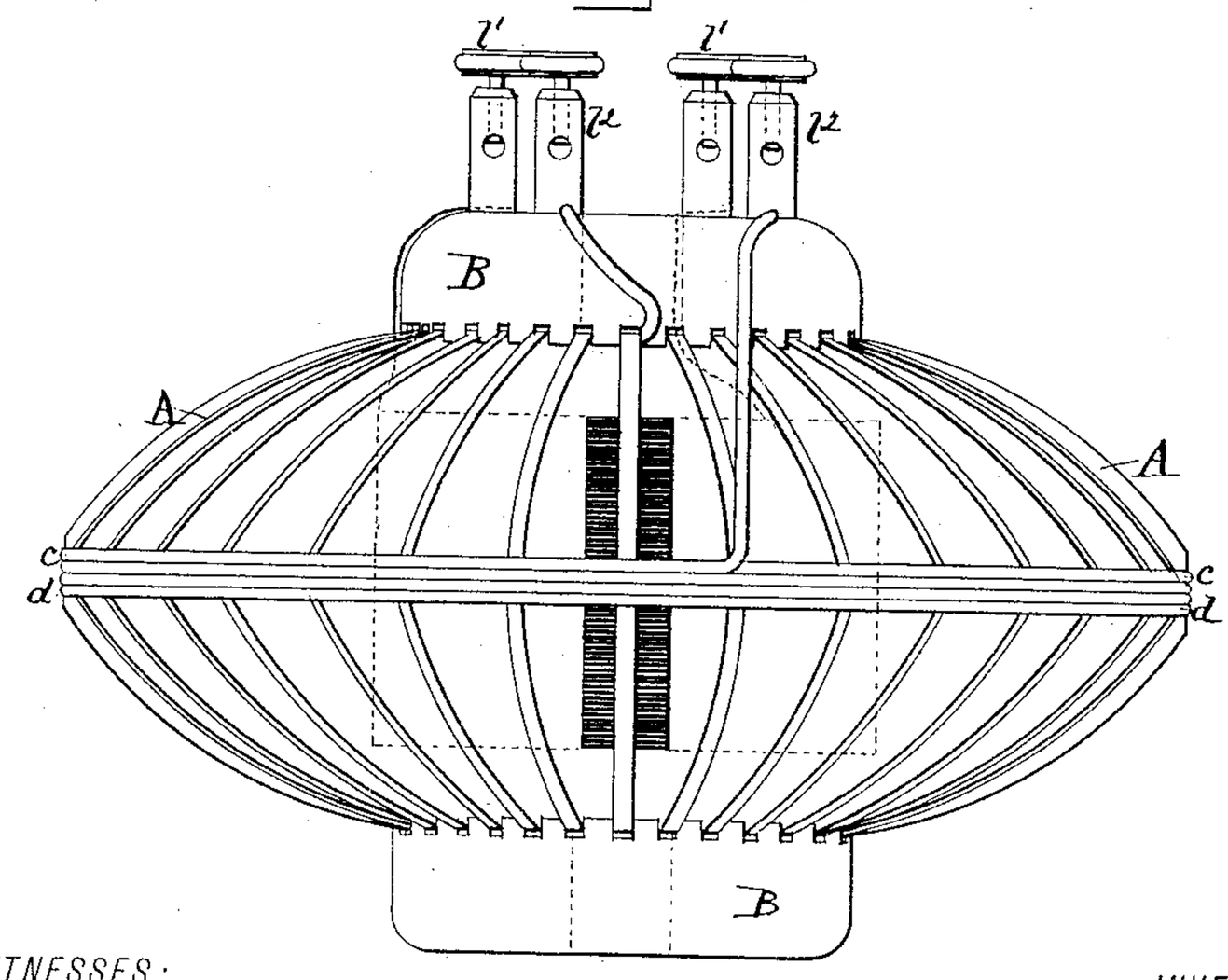


Fig. 2.



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ARCADIUS POLESCHKO, OF ST. PETERSBURG, RUSSIA.

ELECTRICAL TRANSFORMER.

SPECIFICATION forming part of Letters Patent No. 464,677, dated December 8, 1891.

Application filed April 17, 1891. Serial No. 389,385. (No model.)

To all whom it may concern:

Be it known that I, ARCADIUS POLESCHKO, a subject of the Emperor of Russia, and a resident of St. Petersburg, Russia, have invented certain new and useful Improvements in Electrical Transformers, of which the following is a specification.

All existing transformers may be classed in two groups. In the one (the Ruhmkorff coil and the Gaulard & Gibbs transformer) the iron core is in the form of a cylinder. In the other the iron core is in the form of a closed geometrical figure, annular (in the Zipernowski, Deri, and Blaty) or otherwise, (in the Westinghouse, Ferranti, &c.) In transformers of the first group the lines of force generated in the iron core by the action of the primary helix are given off as a bundle from the north pole and proceed to the south pole across the outer space, where they form closed curves of all possible radii. The secondary coil in this case is in the intermediate space between the iron core and the exterior system of line of force. In transformers of the second group all the lines of force generated in the iron core by the action of the primary coil remain entirely in the core itself without appearing at the exterior. These lines of force remaining in the iron core can only pass in the interior of the spirals of the secondary coil (in the case of an interior core) or they will encircle the outer secondary coil, (the outer core.) In both cases the lines of force never touch the secondary helix itself.

In transformers of the first group, as well as the other, the secondary coil is not traversed by all the lines of force which circulate in the iron. It is only a small portion of the lines of force which detach themselves, so to speak, from the general magnetic flow which reaches the secondary coil in closing along short elementary curves. In other words, in both cases the secondary coil is influenced not by the magnetic flow in the iron core, but directly by the current in the primary coil. In arrangements of this kind the iron core, although it augments the inductive capability of the primary coil, absorbs quite unproductively too great a number of lines of force in itself. Such is the condition of things when the primary circuit is closed and the magnetic flux is produced. The nature of the lines of magnetic force and their mode of formation is not at present well determined. According to Poyting and other physicists the energy of magnetic force flows from the exterior, and when the current is on it distributes itself in the iron core by the lateral surface of the cylinder or ring; but the mode of grouping of these lines at the moment of their entrance into the iron core and their distribution on the surface of the core is unknown. From this point of view and admitting that the most favorable moment of induction will be precisely that at which the force of the magnetic energy flows from the exterior into the iron core by its lateral surface it remains, nevertheless, improbable that in transformers of the two groups mentioned the lines of force can at the moment of their introduction into the iron traverse in its totality the secondary coil. The greater quantity will certainly pass outside the secondary coil. Still the amount of induction depends upon the intersection of the coil to be influenced (the secondary coil in the transformers) by the lines of magnetic force, and the effect of induction becomes greater as the number of lines of force which intersect with the coil increases. It follows that a real advantage would be obtained by an arrangement of the apparatus such that the magnetic flux which circulates in an iron core shall pass in its totality across the secondary coil. My arrangement of transformers, Figures 1 and 2, fulfills this condition. In this apparatus the secondary helix $\pm l_2 \mp l_2$ is influenced in the first place by the current in the primary helix $\pm l_1 \mp l_1$, and in addition by the whole of the magnetic flux which is developed in the iron core A A by the action of the primary coil upon this core. In transformers on my system, as in dynamo-electric machines, the loss of magnetism in the air is only very small, and almost the whole of the lines of force which flow in the iron core encounter the secondary coil in their course and traverse it at right angles.

Arrangement of the transformer.—The core consists of blades or thin plates cut (by means of a stamp) from sheet-iron or soft cast-iron. The plates A A, the shape of which is shown in Fig. 1, are arranged in the form of a ring and inserted at top and bottom into two insulating-hubs B B. The primary coil $\pm l_1 \mp l_1$

is arranged in the vertical cavity *ab* within the interior of the core, Fig. 1, and the secondary coil $\pm l_2 \mp l_2$ is arranged outside the first in form of a flat ring of small height, but of great breadth, in the direction of the diameter of the ring. The secondary coil of this shape is placed in a narrow channel *cd* in the core, extending substantially at right angles to the cavity or slot *ab*. The ends of the two coils are led to corresponding terminals on the insulating-hub. By this arrangement the lines of force meet in their circuit a channel *cd*, and this channel, although containing air, being narrow and long, only slightly increases the resistance of the magnetic circuit. This channel, also, which cuts the mass of the core across the direction of the lines of magnetic force increases very considerably the rapidity of demagnetization and weakens the effect known by the term "hysteresis." In this way it lessens the loss of energy expended in internal work in transformers of other systems. The thin iron plates of the core are insulated one from another by air. This arrangement of core has the double advantage (*a*) of completely avoiding Foucault currents and (*b*) of increasing the cooling-surface. In short, in its outer shape my transformer resembles an air-heating stove or a stove with exterior fins. All the heat developed by the action of the currents in the primary and secondary coils is dissipated in the atmosphere radiating from the enormous lateral surface of the plates of the core and by their fins. The primary and secondary coils are able to carry a current of very considerable volume without producing injurious heating of the transformer.

I claim as my invention—

1. An electrical transformer having a core of spaced iron plates provided with a vertical slot within the core containing the primary coils, and a slot extending substantially at right angles to the first-named slot and containing the secondary coils, substantially as described.

2. An electrical transformer having a core composed of spaced radiating plates made up into a ring provided with a vertical slot within the core containing the primary coils, and a slot extending substantially at right angles to the first-named slot and containing the secondary coils, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ARCADIUS POLESCHKO.

Witnesses:

F. KAUPE,

N. TSCHEXALOFF.