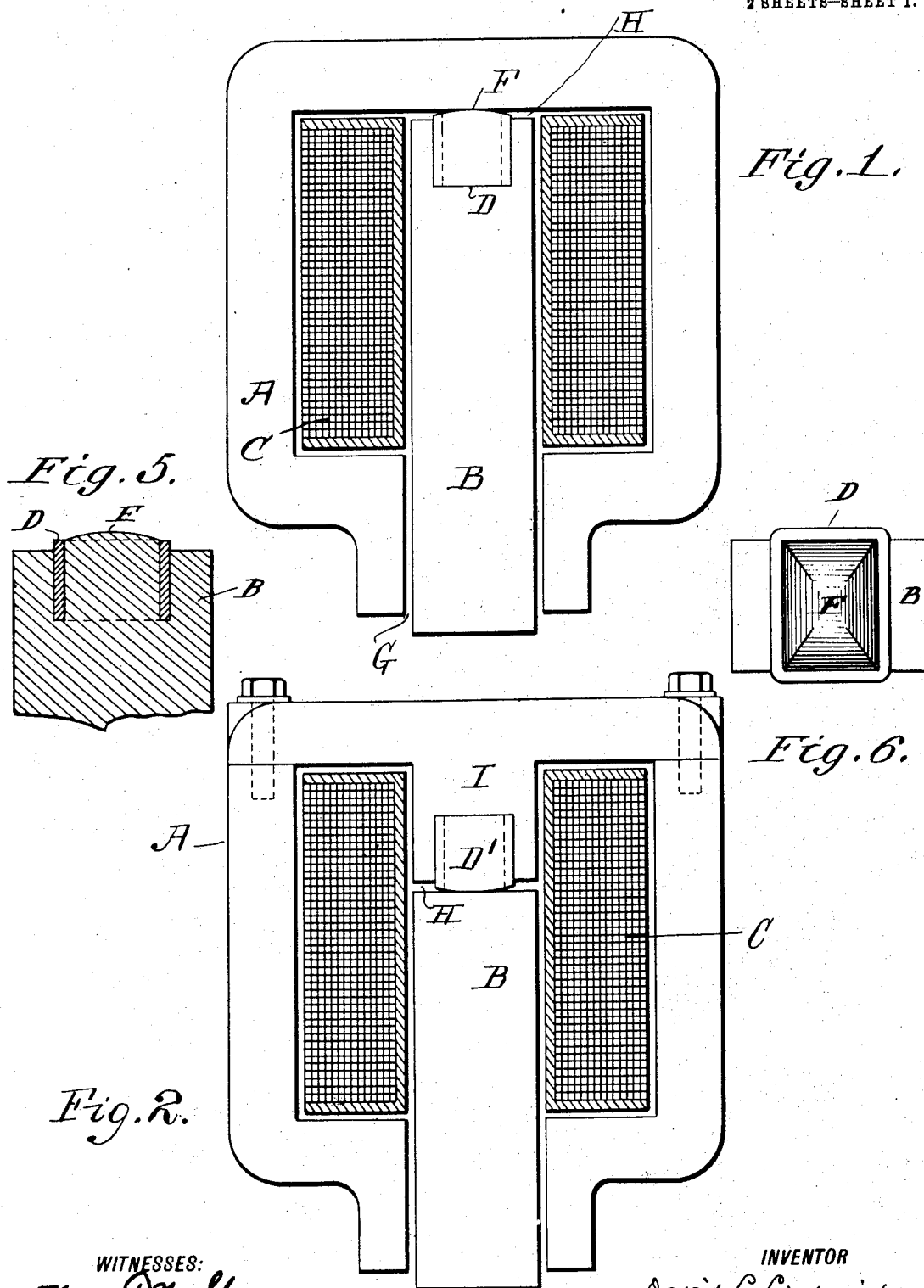


D. L. LINDQUIST.
 ALTERNATING CURRENT ELECTROMAGNET.
 APPLICATION FILED FEB. 9, 1910.

1,005,857.

Patented Oct. 17, 1911.

2 SHEETS—SHEET 1.



WITNESSES:
May J. Mc Harry
Gertrude T. Porter.

INVENTOR
David L. Lindquist
 BY *Samuel Benjamin*
 ATTORNEY

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Fig. 3.

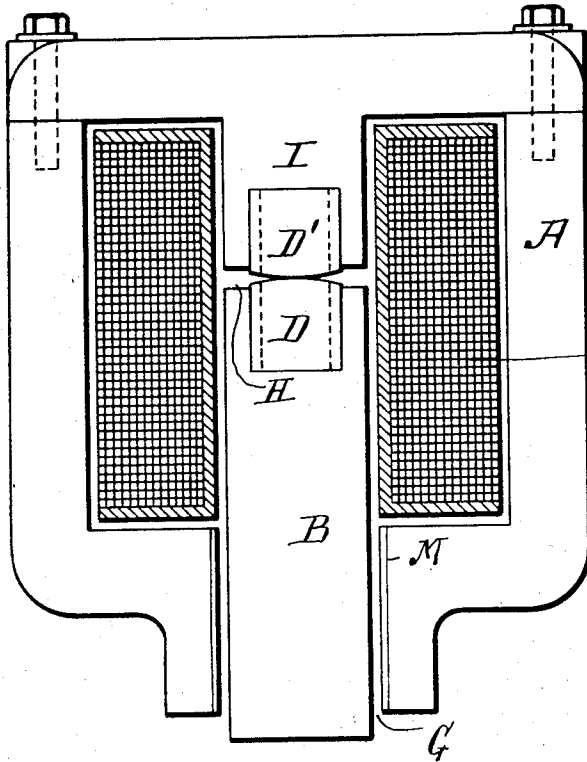


Fig. 9.

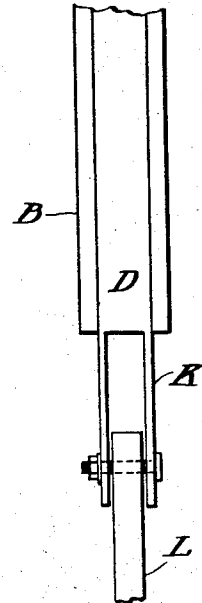


Fig. 7.

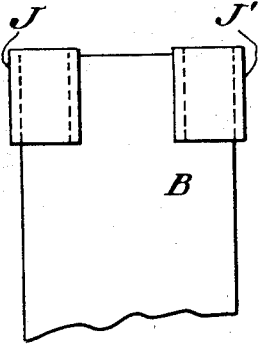


Fig. 8.

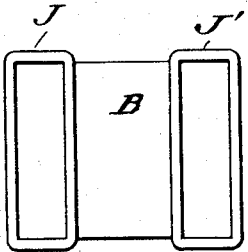
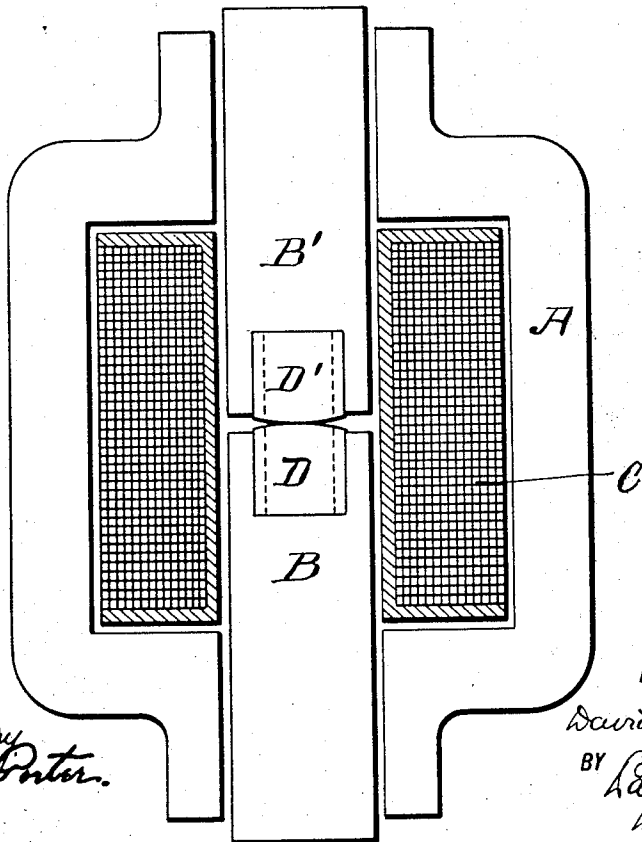


Fig. 4.



WITNESSES:

May T. McHenry
 Etta T. Porter.

INVENTOR

David L. Lindquist

BY *Paul Benjamin*
 his ATTORNEY

UNITED STATES PATENT OFFICE.

DAVID L. LINDQUIST, OF YONKERS, NEW YORK, ASSIGNOR TO OTIS ELEVATOR COMPANY, A CORPORATION OF NEW JERSEY.

ALTERNATING-CURRENT ELECTROMAGNET.

1,005,857.

Specification of Letters Patent.

Patented Oct. 17, 1911.

Application filed February 9, 1910. Serial No. 542,818.

To all whom it may concern:

Be it known that I, DAVID L. LINDQUIST, a subject of the King of Sweden, residing at Yonkers, in the county of Westchester and State of New York, have invented a certain new and useful Improvement in Alternating-Current Electromagnets, of which the following is a specification.

The invention is an alternating current electromagnet comprising a core and primary and secondary conductors constructed and arranged so that magnetic fluxes different in phase are produced therein, whereby the tractive effect on the armature never falls to zero, and hence a constant pull is exerted which prevents chattering of said armature against the core.

The invention consists in the proportioning of the secondary conductor, and in the construction of core and conductor, as more particularly pointed out in the claims.

In the accompanying drawings—Figure 1 is a side elevation of my alternating current magnet, showing the coil in section. Fig. 2 is a similar view of a modified form in which the secondary conductor is placed on the stationary instead of on the movable member of the core. Fig. 3 is a similar view of another modified form in which secondary conductors are placed on both the secondary and movable members of the core. Fig. 4 is a similar view of still another modified form in which both members of the core are movable, with a secondary conductor on each. Fig. 5 is an enlarged section of the polar end of the movable core, showing the convex extremity. Fig. 6 is a top view of said extremity. Fig. 7 is an enlarged section of the polar end of the movable core, showing two secondary circuit conductors therein. Fig. 8 is a top view of said extremity. Fig. 9 shows a portion of the movable core inclosing the secondary conductor, the said secondary conductor having arms protruding from the core and connected to a member actuated by said core.

Similar letters of reference indicate like parts.

A is the stationary core, B the movable core or armature, and C the primary coil which is to be connected with any suitable source of alternating current.

In the form of my device shown in Fig. 1, the secondary circuit is a sleeve D of

metal, which is seated in two recesses milled in the end of the movable core C. The portion of the core surrounded by sleeve D has its end face F convex, as best shown in Figs. 5 and 6, and this convex extremity, when the core is in attracted position, meets the abutment formed by the stationary core, so that the movable core B is free to rock on said extremity and thus to adjust itself symmetrically in the magnetic field. In order to permit this, a slight clearance is left at G between the core B and the ends of the arms of the field core A. On each side of the secondary conductor D, the face of core B is cut away, so that air gaps H are formed in the magnetic circuit which constitute a permanent reluctance therein.

In the form shown in Fig. 2, the stationary core A has a leg I which enters the primary coil. The secondary conductor D' is applied to said leg, and the air gaps H are made by cutting away the extremity of said leg in the manner already described.

In the form shown in Fig. 3, two secondary conductors D and D' are employed, one on the leg I, and the other on the armature B.

In the form shown in Fig. 4, two movable cores or armatures B, B' are present, each carrying a secondary conductor D and D'.

Instead of using one secondary conductor, as D, upon either stationary or movable core, I may use two such conductors J, J', Figs. 7, 8, a part of each conductor being seated in a milled recess in the end of the core, so that each conductor surrounds a part of the core.

Instead of making the secondary conductor in the form of a sleeve extending for a short distance into the movable core, I may elongate said sleeve to extend as far into said core as may be desired. And I may form arms K on it projecting beyond the end of the core and beyond the primary coil, as shown in Fig. 9, to which arms may be connected any member L, designed to be actuated by the movement of said core.

The secondary circuit conductor is to be given an ohmic resistance proportioned to the frequency of the current alternations; the greater the frequency, the greater being the resistance. This may be accomplished by selecting a suitable metal for the said conductor. I have found brass, or even copper, suitable for low frequencies, and

German silver for high ones. It may also be accomplished by suitably proportioning the dimensions of the sleeves. It is important to observe also, that the sleeve should also be proportioned in mass and radiating surface, so as to effect proper absorption and distribution of the heat generated therein, and that such proportioning is to be considered in adapting the secondary conductor to the frequencies employed. Extending the sleeve into the core increases both mass and radiating surface, and where more rapid cooling is desired, making the secondary conductor with projections extending outside the core, as shown in Fig. 9, facilitates that object.

It is preferable to provide the ends of the arms of the core A with a facing M, Fig. 3, of non-magnetic metal, such as brass or copper, so as to provide for a certain permanent reluctance in the magnetic circuit in case of the core B coming in contact with core A, and to prevent contact of iron to iron.

The following are the actual dimensions of an alternating current magnet, which has been manufactured under my direction for actual commercial use, the specific form of core being substantially that shown in Figs. 7 and 8. Length of conductors J, J'—4 inches. Material—German silver, 18% nickel, for 60 cycles; soft brass for 25 cycles. External dimensions of cross sectional parallelogram; length $1\frac{1}{2}$ inches—width $\frac{7}{16}$ inch. Thickness of conductors $\frac{1}{16}$ inch. Laminations—sheet steel, No. 28 gage, in each conductor about 20, between conductors about 40. For 220 volts, 60 cycles, the magnet coil was wound with 500 turns of No. 14 B. & S. D. C. C. wire with taps at 450, 400 and 350 turns. For exactly the above voltage the 450 turn tap was used. With 192 volts, 60 cycles, the total pull of the magnet was 82 pounds.

I claim:

1. An alternating current electro-magnet comprising a stationary core, a movable core in plunger form, and an abutment for said movable core within the magnet coil: one

of the meeting faces of said movable core and said abutment being convex.

2. An alternating current electro-magnet comprising a stationary core, a movable core in plunger form, and an abutment for said movable core within the magnet coil: the end face of said movable core meeting said abutment being convex.

3. An alternating current electro-magnet comprising a primary coil, a stationary core, a movable core, and a secondary conductor inclosing a part of said movable core.

4. An alternating current electro-magnet comprising a primary coil, a stationary core, a movable core, and a secondary conductor on each of said cores.

5. An alternating current electro-magnet comprising a primary conductor, a core having two recesses in its polar face, and a secondary conductor seated in said recesses and inclosing the intervening portion of said core.

6. An alternating current electro-magnet comprising a core, and primary and secondary circuit conductors, to cause the magnetic fluxes due to the currents in said conductors to differ in phase: the said secondary conductor having an extension protruding beyond its supporting core, and the said conductor and extension being proportioned to absorb and distribute the heat developed in said secondary conductor.

7. In combination with an alternating current electro-magnet comprising a core, and primary and secondary circuit conductors, to cause the magnetic fluxes due to the currents in said conductors to differ in phase, an extension on said secondary conductor protruding beyond its supporting core, and a movable member actuated by said electro-magnet and connected to said extension.

In testimony whereof I have affixed my signature in presence of two witnesses.

DAVID L. LINDQUIST.

Witnesses:

GERTRUDE T. PORTER,
MAY T. MCGARRY.