No. 619,761. Patented Feb. 21, 1899.

T. B. KINRAIDE.

DYNAMO ELECTRIC MACHINE.

(Application filed Sept. 29, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig: 1.

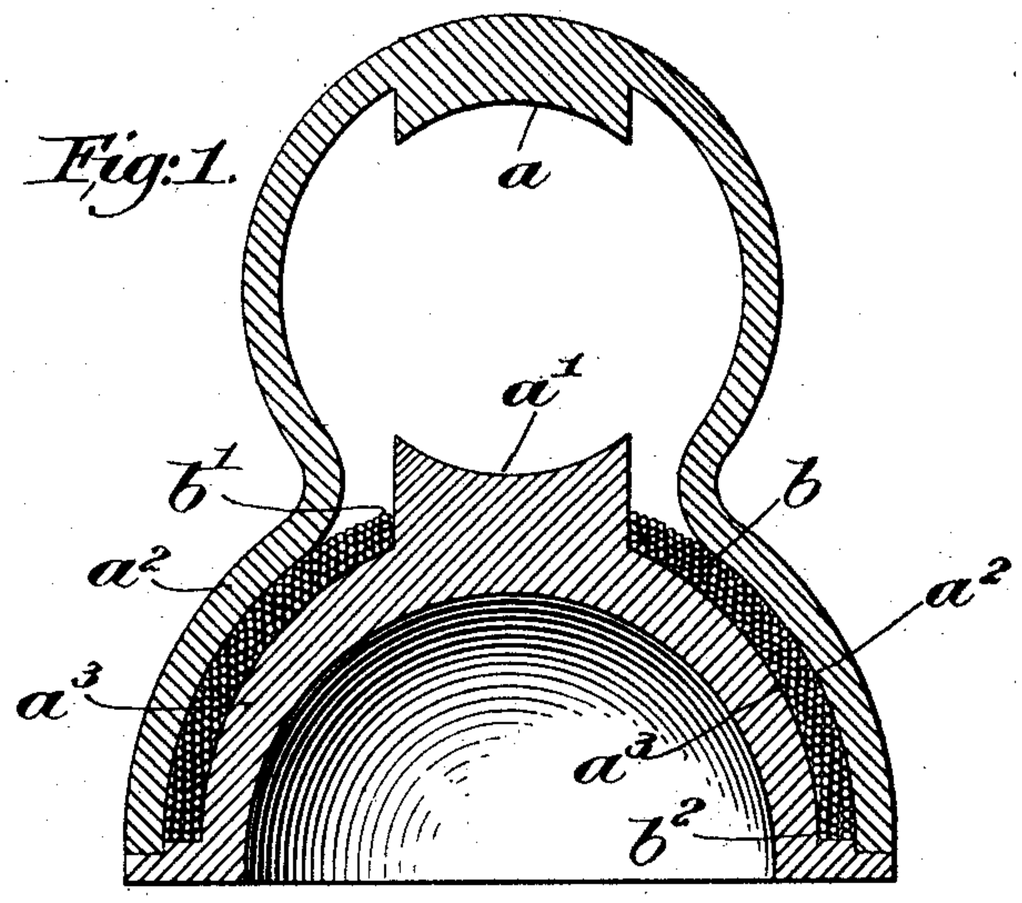
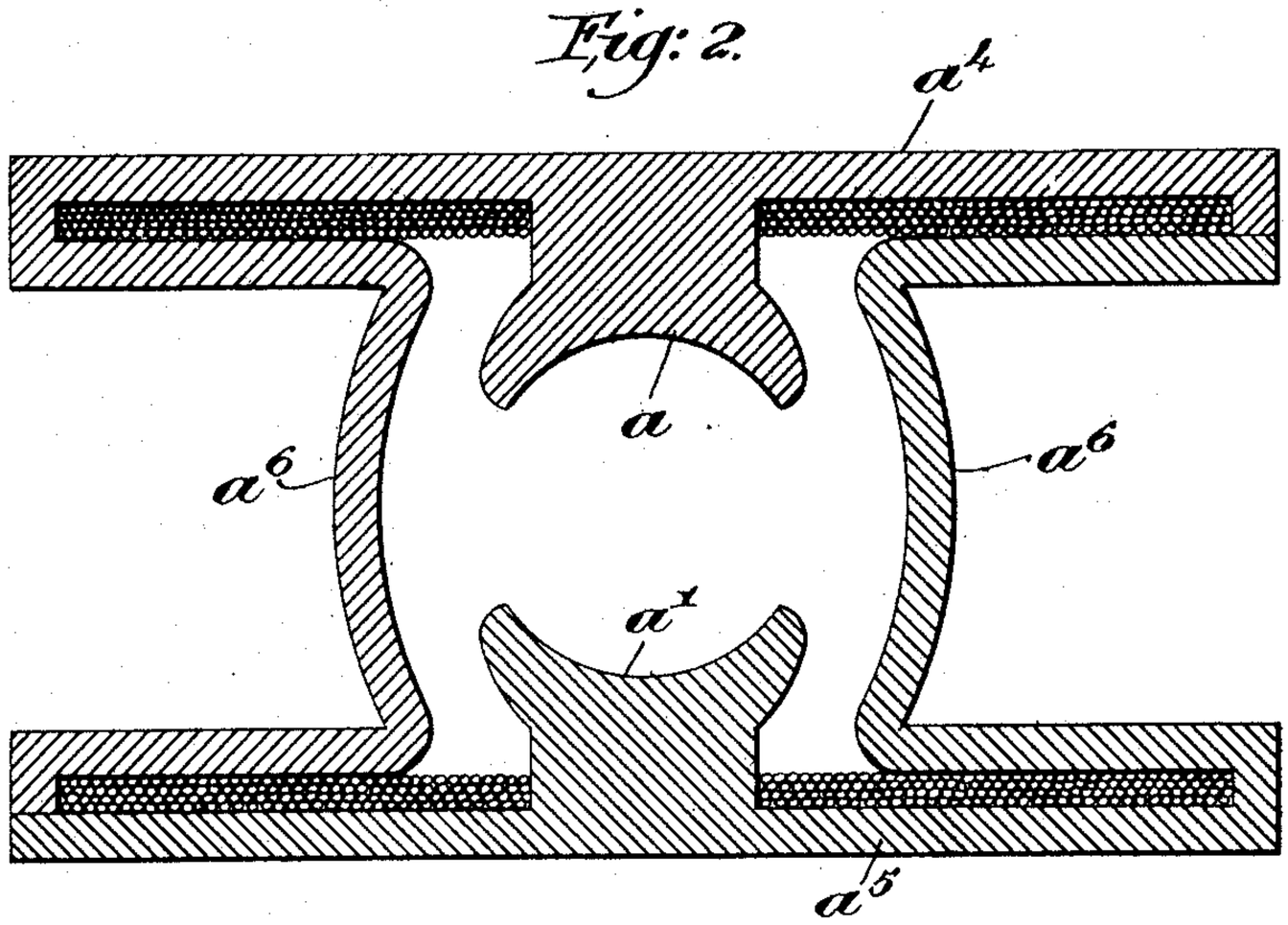


Fig: 2.



Witnesses,
Edward F. Allen.
James M. Urquhart.

Inventor,
Thomas B. Kinraide,
by Crosby Gregory.
atty's.

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(No Model.) 2 Sheets—Sheet 2.

Fig: 3.

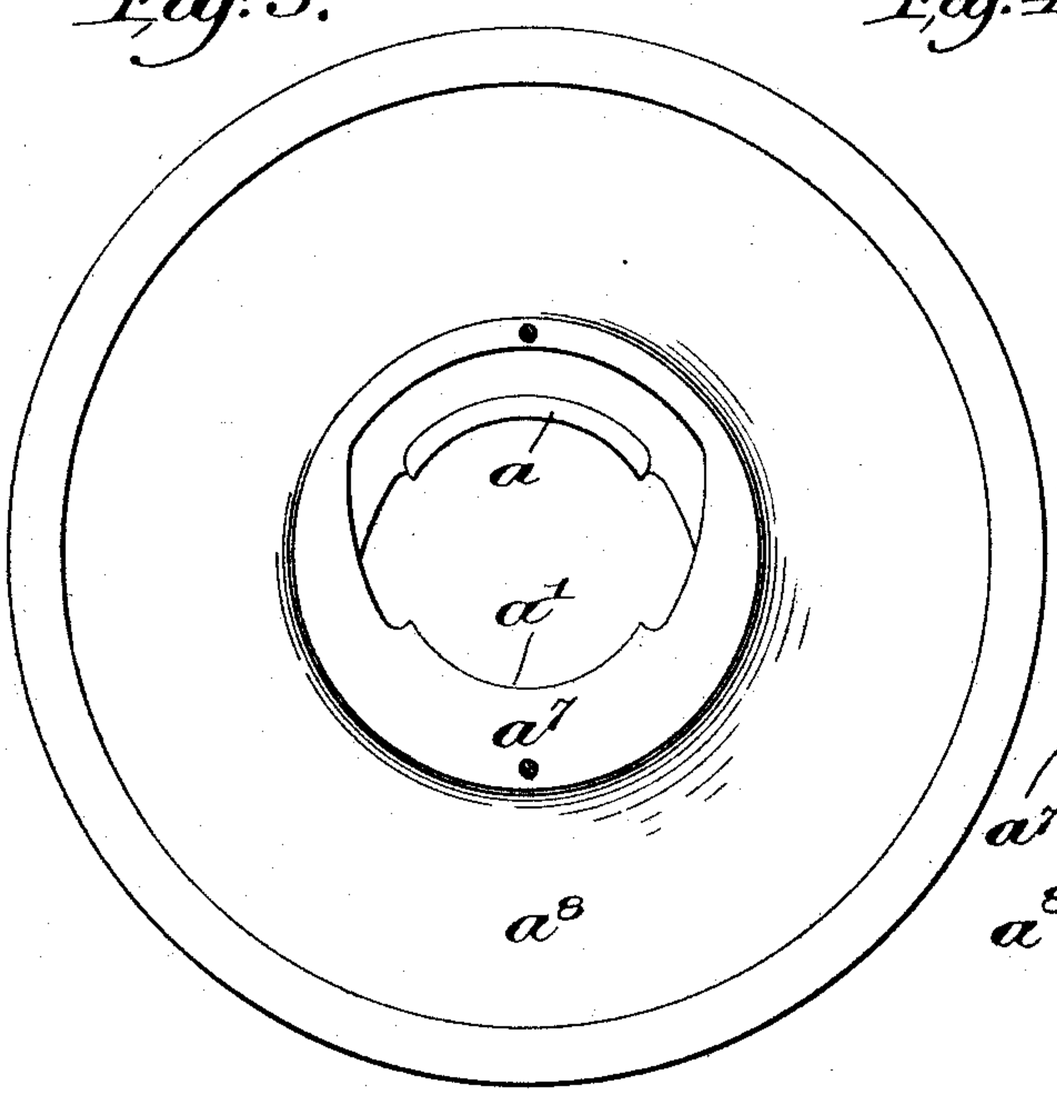


Fig: 4.

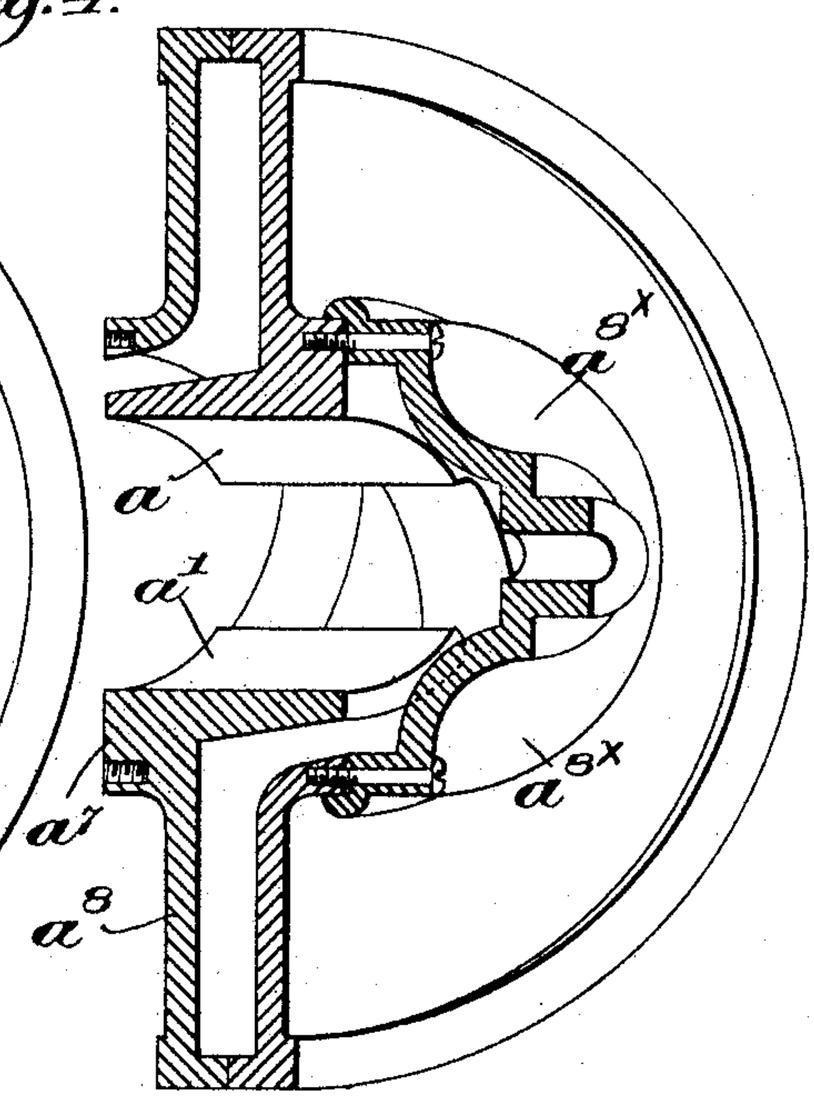


Fig: 5.

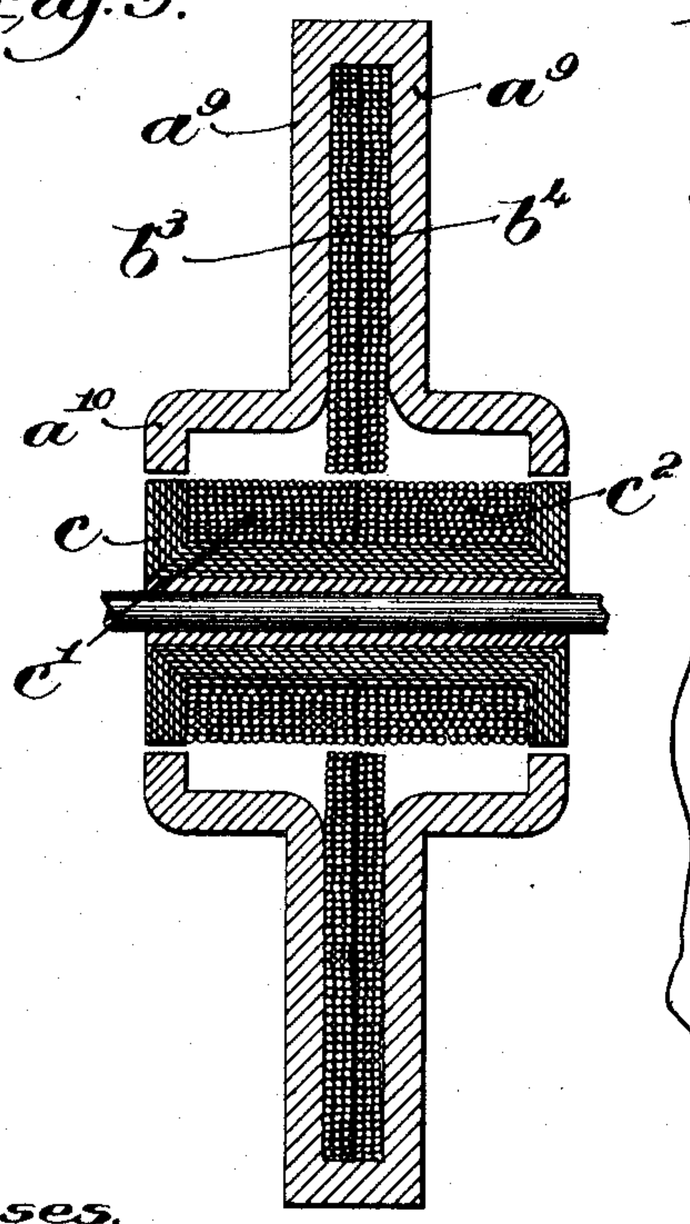
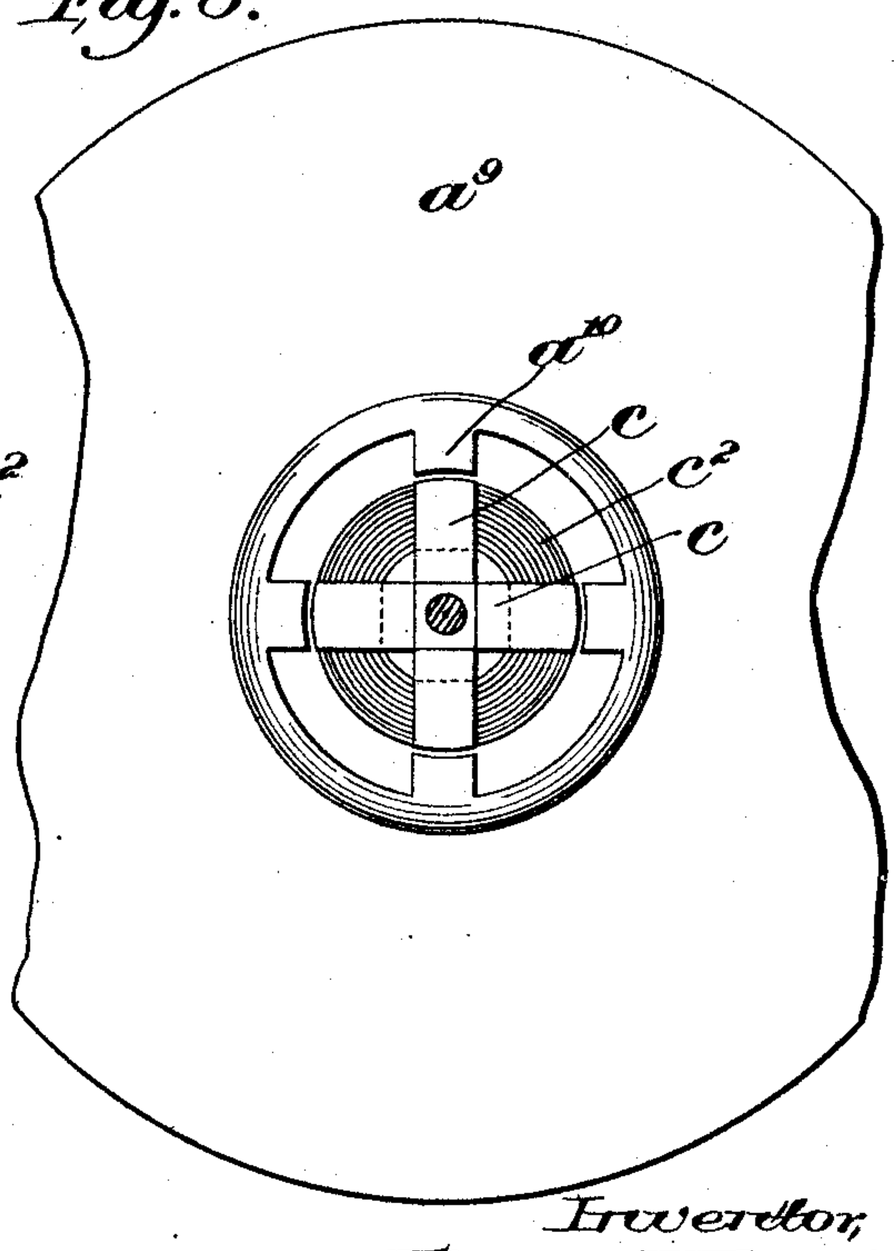


Fig: 6.



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Inventor,
Thomas B. Kinraide,
By Busby Gregory.
Atty's.

UNITED STATES PATENT OFFICE.

THOMAS B. KINRAIDE, OF BOSTON, MASSACHUSETTS.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 619,761, dated February 21, 1899.

Application filed September 29, 1898. Serial No. 692,159. (No model.)

To all whom it may concern:

Be it known that I, THOMAS B. KINRAIDE, of Boston, county of Suffolk, State of Massachusetts, have invented an Improvement in Electrical Apparatus, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention is herein shown as applied to dynamos or motors, and it resides in the discovery or application of a new principle of winding, by which the lines of magnetic force are conveyed from a larger area to a smaller area for use, thereby producing polarization without any large extent of interior repulsion, such as is manifested in bar or cylindrical magnets or pole-pieces.

My invention might be termed a "focalizer" or "magnetic transformer" for the reason that it focalizes at the center all the lines of force from the successively longer turns toward the periphery. This gives quantitative effect and transforms the magnetic effect due to the lines of force from the longer turns at the periphery into magnetic potential at the center.

My invention will be more fully apprehended from the following description, taken in connection with the accompanying drawings, which are illustrative of different embodiments of my invention.

In the drawings, Figures 1 and 2 are central vertical sections of field-magnets constructed and wound to embody my invention. Fig. 3 is a view in side elevation, and Fig. 4 is a sectional perspective, of another form of field-magnet for a dynamo or motor embodying the same principles. Fig. 5 is a central vertical section, and Fig. 6 a side elevation, (partly broken,) of still another construction embodying the same invention, these figures showing the focalizer-field with extension-poles.

In Fig. 1 I have shown a field-magnet having two opposite pole-pieces $a\,a'$, which, it will be understood, coöperate with an armature, which, however, is not shown, inasmuch as it does not constitute part of my present invention, my invention relating to the form and arrangement of the field-winding. The field-winding is indicated at b, where it will be seen that instead of being wound around the pole-piece in the form of a cylinder, which would be the usual winding, it is wound with progressively longer coils or turns, the shortest turns being at b' and increasing in length from that point to the outer or peripheral turns at b^2. Preferably the winding is very thin, in order that it may have direct action upon an extended area of the magnetic-field material, and I have herein shown the respective poles as energized from the opposite parallel surfaces $a^2\,a^3$, thereby producing a motor or generator of the iron-clad type.

In Fig. 2 the pole-pieces $a\,a'$ are at the center of disks $a^4\,a^5$, connected at a^6 to constitute virtually one magnet.

Figs. 3 and 4 also show disk-shaped fields in which the pole-pieces $a\,a'$ project in opposite directions from the hubs a^7 of similar castings a^8, the latter preferably having extensions $a^{8\times}$ thereof to constitute journal-bearings for the armature-shaft. (Not shown.)

Figs. 5 and 6 show a four-pole alternator having a split winding made up of the two parts $b^3\,b^4$, which act on the disk-shaped field-magnets a^9 the same as in the other figures, the difference being, however, that the pole-pieces a^{10} are spread apart or extended, an armature being shown in position having stampings in the form of flat oblong strips of sheet metal c, bent at right angles opposite the pole-pieces and containing armature-windings $c'\,c^2$, which may or may not rotate with the armature, as may be preferred. This form of winding focalizes the magnetic lines to the best advantage and produces a quantitative effect at the pole-piece at the center.

One advantage of my new system or manner of winding is that much less winding is necessary for giving a practically-saturated pole-piece, and, moreover, the polarization of the lines of magnetic force takes place in the most natural manner without interior repulsion or pressure except at the place of use where required, and the lines of force are not wasted and dissipated. Their natural and normal outlet or direction of movement in or on the iron is toward the pole-piece at the center, where the polarization is desired. Also by having the winding spread out in thin layers, as shown especially in Figs. 1 and 2, there is a minimum conflict of lines of force in the windings themselves, there being merely enough thickness of winding over the surface

of the iron to generate just the number of lines of force which can be accommodated by the iron.

By this system of winding the field offers less resistance to the flow of the energizing-current, the strength of the field at the periphery being almost *nil*, while at the center the concentration gives great strength, and on account of this low resistance I am enabled to obtain a much higher degree of saturation in the coil of the armature, and in consequence much greater efficiency from the machine.

By spreading the pole-pieces, as in Fig. 5, I am enabled to employ an armature or secondary winding of very many turns and small diameter, which produces high voltage.

I have chosen for illustration in explaining my invention castings adapted to dynamos or motors; but it will be understood that my invention is not restricted in this respect, but may be used for transformers of various descriptions and, indeed, for a wide range of electrical work, and I intend herein to claim the same broadly.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an electrical apparatus, an electromagnet for producing a magnetic field, and means for polarizing or converging the lines of magnetic force of said magnet from a large area thereof to a smaller area or pole, said means including a winding spread out coextensively with said large area and immediately adjacent to the surface of said magnet, substantially as and for the purpose set forth.

2. In an electrical apparatus, an electromagnet having its center of polarization substantially coincident with the mechanical center of the magnet, said magnet extending therefrom in a relatively thin body of constantly-increasing circumferential area from said center, and a relatively thin winding for said magnet, said winding having its turns constantly longer as they recede from said center of polarization, substantially as described.

3. In an electrical apparatus, coöperating magnets having central pole-pieces or places of polarization, said magnets each extending laterally in divergent directions from their respective regions of polarization, and windings for said magnets, said windings proceeding from said central pole-pieces outwardly along the surfaces of said radiating parts of the magnets in turns longer as they recede from the said pole-pieces, and said magnets inclosing their said windings between them, substantially as described.

4. In an electrical apparatus, coöperating magnets having central pole-pieces or places of polarization, said magnets each extending laterally in divergent directions from their respective regions of polarization, and windings for said magnets, said windings proceeding from said central pole-pieces outwardly along the surfaces of said radiating parts of the magnets in turns longer as they recede from the said pole-pieces, and said magnets inclosing their said windings between them, the said pole-pieces being spread apart, and an armature to coöperate with said pole-pieces, substantially as described.

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

THOMAS B. KINRAIDE.

Witnesses:
GEO. H. MAXWELL,
ALEXANDER C. PROUDFIT.