(No Model.)

3 Sheets—Sheet 1.

S. Z. DE FERRANTI.

ELECTRICAL CONVERTER.

No. 427,751. Patented May 13, 1890.

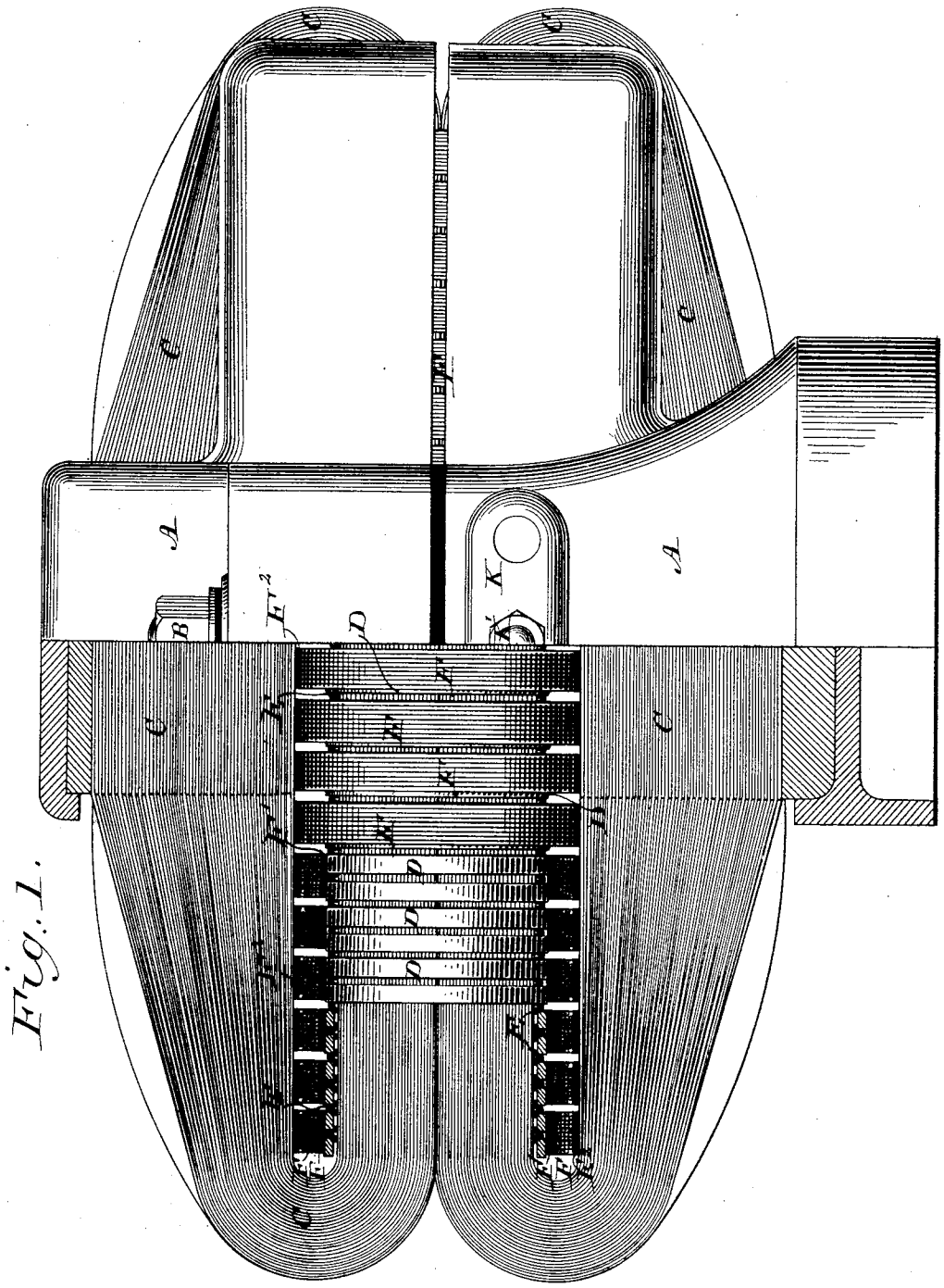

Fig. 1.

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(No Model.) 3 Sheets—Sheet 2.

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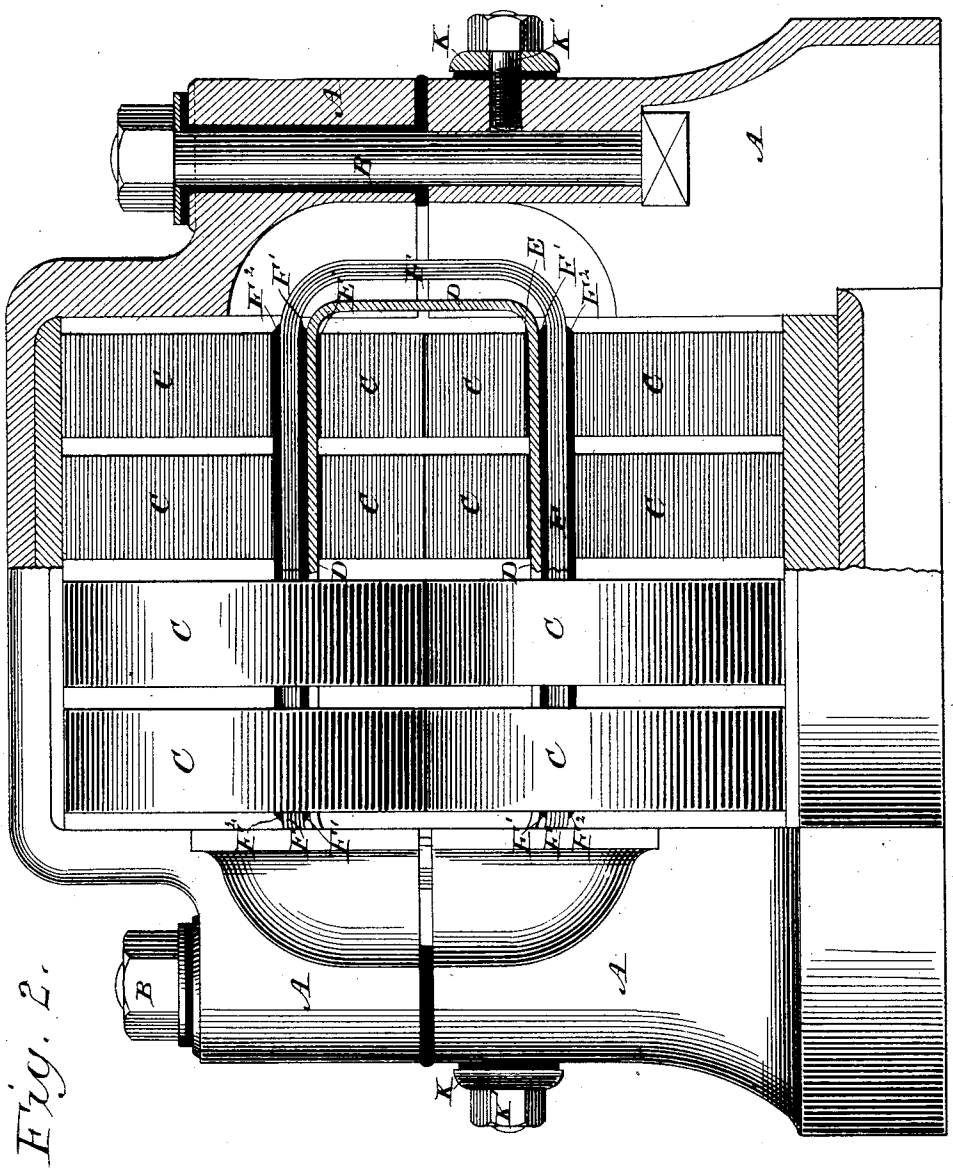

Fig. 2.

WITNESSES

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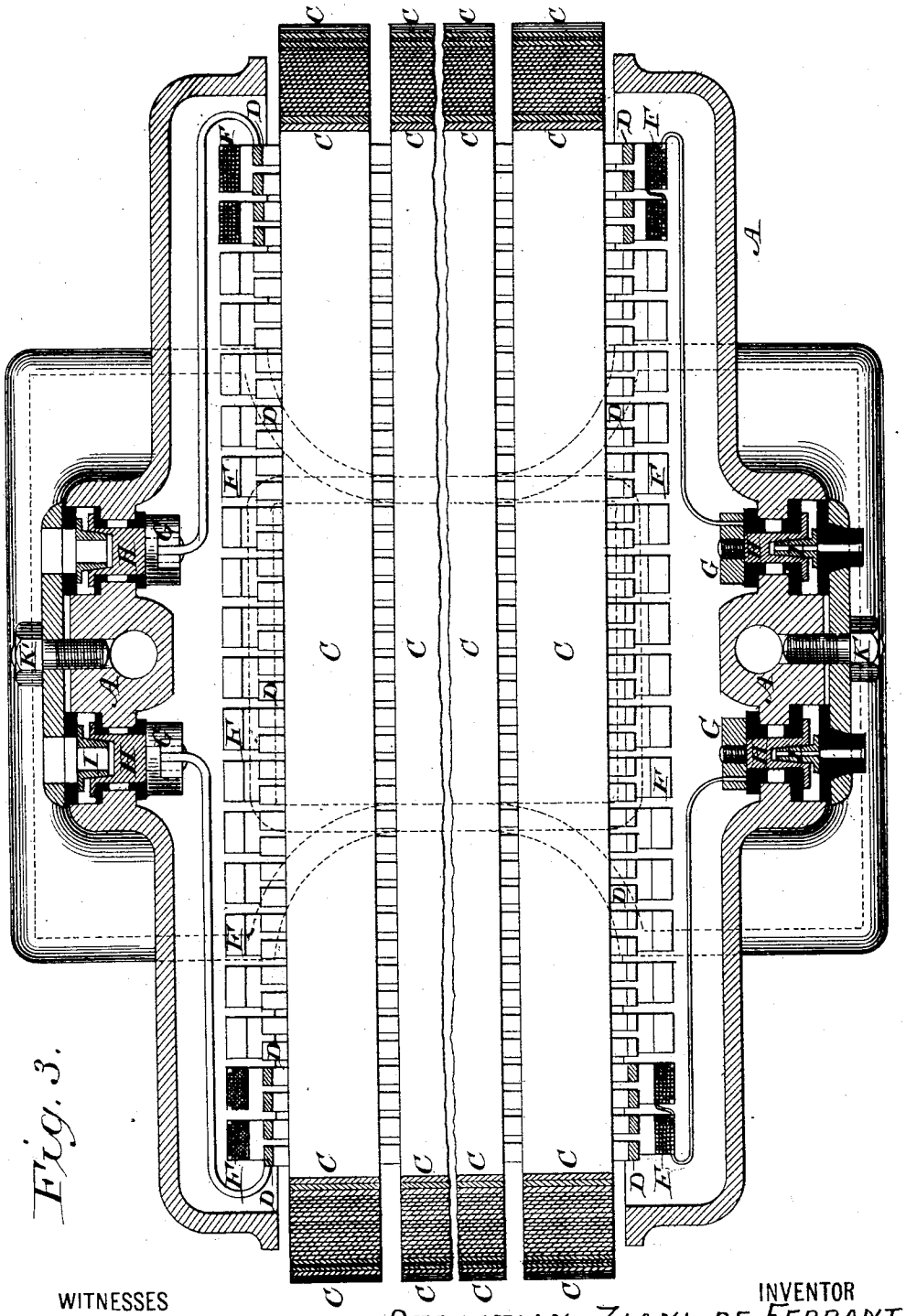

Fig. 3.

WITNESSES

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UNITED STATES PATENT OFFICE.

SEBASTIAN ZIANI DE FERRANTI, OF HAMPSTEAD, COUNTY OF MIDDLESEX, ENGLAND.

ELECTRICAL CONVERTER.

SPECIFICATION forming part of Letters Patent No. 427,751, dated May 13, 1890.

Application filed October 10, 1888. Serial No. 287,734. (No model.) Patented in England December 9, 1885, No. 15,141; in France December 9, 1886, No. 180,176; in Belgium January 8, 1887, No. 75,875, and in Italy March 31, 1887, No. 21,119.

To all whom it may concern:

Be it known that I, SEBASTIAN ZIANI DE FERRANTI, electrician, a subject of the Queen of Great Britain, residing at 120 Fellowes Road, Hampstead, in the county of Middlesex, England, have invented certain new and useful Improvements in Electrical Converters, (for which I have received Letters Patent in Great Britain, No. 15,141, dated December 9, 1885; in France, No. 180,176, dated December 9, 1886; in Belgium, No. 75,875, dated January 8, 1887, and in Italy, No. 21,119, dated March 31, 1887,) of which the following is a specification.

This invention relates to electric converters in which primary and secondary coils of insulated conductors surround a core of soft iron, which core also extends outside and around the coils and forms metallically-closed magnetic circuits. The core is composed of laminæ of soft iron arranged in groups, and these groups are separated by open spaces, so that the heat which results from the rapid alternate magnetization and demagnetization of the core may be freely dissipated. The primary conductor is wound in coils of the proper dimensions and covered with insulating material, and these coils surround the core. The secondary coil (the convolutions of which are comparatively few) is separated from the core by chairs or blocks of insulating material. For the better protection of such converters I inclose them in cases, each in two parts, which are clamped fast onto the soft-iron core and extend over and inclose the coils, but with a clear space between, in order that the insulation may not be endangered. One of the halves or parts of the case is provided with compartments for forming the connections. There are two such compartments—one for the connections of the primary circuit and the other for the connections of the secondary circuit. Each of the compartments is provided with a cover. The circuit-wires are attached to the cover, and in putting on the cover, and thereby closing the compartment, the circuit-connections are made.

In order that my said invention may be fully understood and readily carried into effect, I will proceed to describe the drawings hereunto annexed.

In the drawings, Figure 1 shows a side elevation, one half in section, of a converter constructed in accordance with my invention. Fig. 2 is an end elevation, one half in section. Fig. 3 is a horizontal section of the same. A portion is broken out or omitted from the center of the apparatus to reduce the dimensions of the figure.

The converter represented by the drawings is the subject of my pending application, Serial No. 235,192, filed April 18, 1887, and has also in part been patented to me by United States Letters Patent No. 389,838, dated September 18, 1888.

A A is a cast-iron frame or casing made in two main parts, which are held together by bolts B B. By way of precaution the parts of the frame are more or less insulated from each other.

C C C represent ribbons of soft Swedish iron, about one thirty-second of an inch in thickness, formed into bundles. The different ribbons in each bundle are not in metallic contact, being separated by paper. The paper is cemented to the ribbons. Each ribbon is thus covered on one side for one half of the length and for the other half it is covered upon the other side. The ribbons, after receiving the windings upon them, are bent round and made to overlap at their ends, and where they so overlap the two ends of each ribbon are in metallic contact; but every ribbon is separated by the paper from the other adjacent ribbons. Thus each ribbon forms a ring in which there is a complete magnetic circuit. In the converter shown by the drawings four such bundles of ribbons C C are indicated; but the number and dimensions will vary according to the size and capacity of the converter.

Around the central part of each bundle a taping is applied to keep it together, and then, before the ends of the ribbons are brought together, the coil or spiral of copper rod D is passed around the bundle, so that the coil D surrounds the central parts of the four bundles. To separate the coil D from the bun-

dles, short insulators or chairs E E, of vulcanized fiber or vulcanite, are inserted. Over the coils D, I apply rings F F, previously prepared and wound upon a former. Each ring consists of an inner layer F′, of insulated material, (paper saturated with shellac varnish is that which I employ.) Over this is a winding of copper wire, insulated in the usual way with cotton, and over this again is another layer F^2 of the same insulated material. The insulating material F′ F^2 is applied only at the upper and under surfaces of the ring. At the ends of the rings where the wire is at a distance from other metal it has no other covering but the cotton wound around it. The wire which I employ in the converter shown by the drawings has a sectional area but one twenty-fourth that of the rod D, and the number of convolutions is twenty-four for each turn which the spiral D makes around the core of iron ribbons C. As shown in the drawings, each ring is made to overlap two convolutions of the coil D, and it contains forty-eight turns of wire. The rings F F should be applied around the bundle C, while the shellac insulation is still in a more or less plastic condition. The wires of the rings F F are then connected electrically from ring to ring, so as to form a continuous circuit through all the rings from end to end of the apparatus. The terminal wires of the series of rings are then brought out and are electrically connected with the metal blocks G G, which are secured in their places by the screw-pieces H H. These pieces have flanges upon them, and insulated washers are embraced between the flanges and the blocks G. These insulating-washers are inserted into apertures provided in the frame A to receive them. In each piece H there is a conical recess adapted to receive a ferrule I. To these ferrules the electric leads from the dynamo are attached in such manner as to insure a good connection. K is a cover-plate with apertures init, through which these leads pass. The holes in the cover-plate are bushed with insulating-washers to insure due isolation of the leads. The coupling of the leads with the rings F F is thus effected simply by screwing up the bolt K′, which secures the cover, and thereby forcibly thrusting the ferrules I into the conical recesses in the screw-pieces H H. The copper coil or spiral D, intended to form part of the lamp-circuit, is similarly brought to terminals on the other side of the machine. The connections are made in the manner already described, except that the dimensions of the leads are different, and that, this being the low-tension circuit, the thickness of the insulating material is diminished. A lesser separation of the metallic parts will here suffice.

It will be observed that in this machine free spaces for ventilation are left between the several bundles C, and between these and the coil D, and again between the coils and the rings of coiled wire F. This is an important feature in converters of which the dimensions are at all considerable, as it allows currents of air to pass freely through and to carry off the heat which is generated in working.

I claim—

1. The combination, with a separately-formed secondary coil and its insulation and a separately-wound primary coil covered with insulation, of a core composed of magnetically-insulated laminæ of soft iron, which, after the coils are placed in position, are joined to form independent closed magnetic circuits extending around the exteriors of the coils.

2. In an electrical converter, the combination of the core, the low-resistance secondary coil, and a primary coil consisting of a number of separately-wound and independently-insulated coils connected together, substantially as set forth.

3. The combination, with a converter having primary and secondary coils and a soft-iron core within the coils, and also extending around them, of a metal case in two parts clamped together and fast onto the soft-iron core, and extending over and inclosing the coils, but without contact therewith, leaving a clear space, in order that the insulation may not be endangered.

4. The combination, with a converter having primary and secondary coils and a soft-iron core within the coils, and also extending around them, of a metal case in two parts clamped together, and on one of the parts two separate compartments containing the connections of the primary and secondary circuits, respectively.

5. The combination, with a converter having primary and secondary coils and a soft-iron core within the coils, and also extending around them, of a metal case in two parts clamped together and on one of the parts two separate compartments containing the connections of the primary and secondary circuits, respectively, and with covers to the said compartments carrying circuit-wires, and which, when clamped on, close the compartments and complete the connections.

6. The combination, with a converter having primary and secondary coils and a soft-iron core within the coils, and also extending around them, of a metal case with separate compartments provided upon it containing the connections of the primary and secondary circuits, respectively.

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