O. FRICK.

ELECTRIC TRANSFORMER FURNACE.

APPLICATION FILED MAR. 2, 1904.

917,040. Patented Apr. 6, 1909.

Fig: 1.

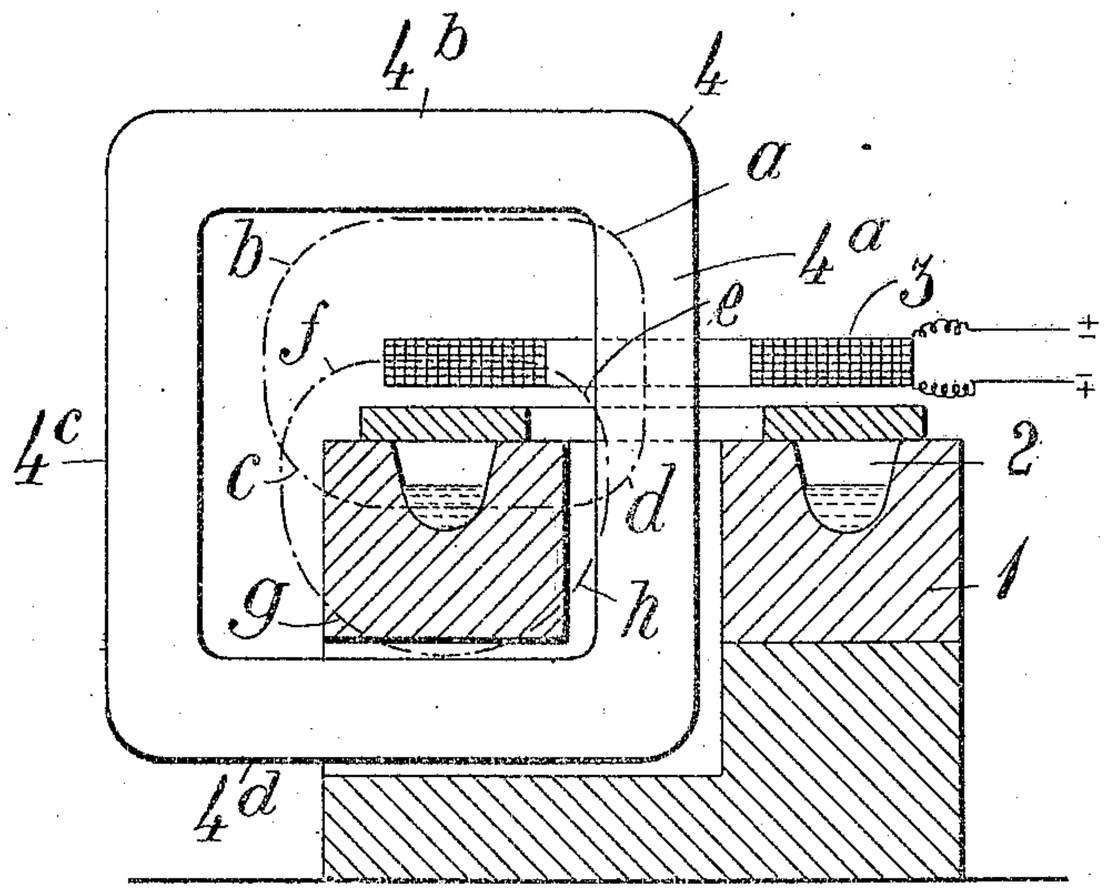
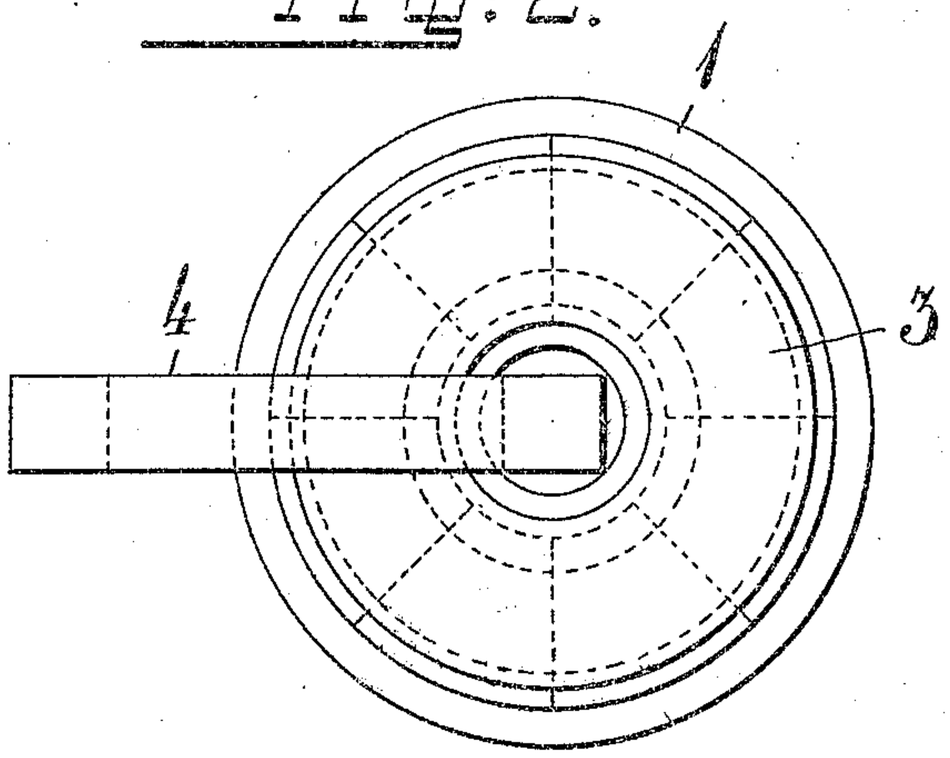


Fig: 2.



Witnesses.

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OTTO FRICK, OF SALTSJÖBADEN, SWEDEN.

ELECTRIC TRANSFORMER-FURNACE.

No. 917,040. Specification of Letters Patent. Patented April 6, 1909.

Application filed March 2, 1904. Serial No. 196,184.

To all whom it may concern:

Be it known that I, OTTO FRICK, a subject of the King of Sweden, and resident of Saltsjöbaden, Sweden, have invented an Electric Transformer-Furnace, of which the following is a specification, reference being had to the accompanying drawing, forming a part hereof.

The invention relates to an improved electric transformer furnace in which the mass to be heated is contained in an annular hearth and is induced by means of a primary coil, the said coil and hearth being arranged on a closed iron core.

The object of the invention is to provide a transformer furnace having a low self-induction and accordingly a high power factor so that the size of the generator plant connected to the furnace may be reduced to a minimum.

The invention consists chiefly in the combination of a masonry base with an annular hearth for the material to be treated forming the secondary circuit, a primary winding facing a horizontal side of the hearth and a closed magnetic core, one limb of which is surrounded by the hearth and by the said primary winding and the other limbs of which do not closely surround the primary winding, but are at such a distance from the said winding that a free space is left between the iron and the primary winding.

In the accompanying drawing I have shown diagrammatically one embodiment of my invention, Figure 1 being a transverse section through the furnace and Fig. 2 a plan view thereof.

Referring to the drawing, 1 designates the masonry of the furnace provided on its upper surface with a circular hearth 2, in which the material to be treated is placed.

The furnace works, as a rule, with molten material, for instance, steel, which is filled in from a suitable melting furnace, though the furnace may also be charged with unfused material. In every case the material to be treated forms a closed electric circuit in the hearth, as is well known from other transformer furnaces.

3 designates a primary coil which is to be connected in well known manner to an electric alternating current generator, which supplies the furnace with the necessary electric energy. The coil 3 faces a horizontal side of the hearth and is suitably placed above the latter, as shown in the drawing.

4 designates a rectangular iron core, one limb 4^a of which is surrounded by the hearth 2 and the primary coil, 3. The other limbs 4^b, 4^c and 4^d of the core do not closely include the primary and secondary circuits of the transformer furnace, as is usual in ordinary transformers, but are at such a distance from them that the leakage fields when the furnace is working do not in an essential degree pass through the iron. As is shown in the drawing the limbs 4^b and 4^c are not in contact with the primary winding, but have a free space between them and the said winding, and also between the limbs 4^c and 4^d, and the secondary circuit is a space that is greater than the space between the primary and secondary circuits.

In Fig. 1 I have shown by dotted lines the limits of the main parts of the leakage fields when the furnace is working. The said main part of the leakage field of the primary winding may be supposed to occupy the space around the primary coil to a distance equal to the shortest distance between the coil and the center of the cross section of the secondary circuit. By the dotted lines *a*, *b*, *c*, *d*, I have indicated the cross section of said primary leakage field. In the same manner the main part of the leakage field of the secondary circuit may be supposed to occupy the space around the secondary circuit to a distance equal to the shortest distance from the said circuit to the center of the cross-section of the primary winding. By the dotted line *e*, *f*, *g*, *h*, I have indicated the cross section of the said secondary leakage field. As will be seen from the drawing, the limbs 4^b, 4^c and 4^d of the iron core are at such a distance from the primary and secondary circuits that the leakage fields limited by the lines *a*, *b*, *c*, *d*, and *e*, *f*, *g*, *h*, respectively do not in an essential degree pass through the said limbs.

An essential feature of my invention above described lies in the possibility of designing the cross-sectional form of the primary winding without interfering with the diameter of the secondary member, while at the same time iron is avoided in the leakage fields. By the combination of a primary winding facing a horizontal side of the hearth and a magnetic core of the form above described I am able to use a primary coil of a flat disk

form, such a coil having a high magnetic resistance in the leakage field around it, whereby the self-induction of the furnace is reduced.

I am aware that transformer furnaces have been proposed in which the primary and secondary circuits lie one above the other, and also that furnaces are known in which are used iron cores, which are at a comparatively great distance from the primary and secondary circuits, and I do not regard such arrangements as novel *per se*, but

What I claim is—

1. An electric induction furnace comprising a masonry base with an annular hearth for the material to be treated forming the secondary circuit of the furnace, a primary winding facing a horizontal side of the hearth, and a closed magnetic core, one limb of which is surrounded by the hearth and by the said primary winding and the other limbs of which are at such distance from the said winding that a free space is left between the iron and said winding.

2. An electric induction furnace comprising a masonry base having an annular hearth for the material to be treated, a primary winding above the hearth and facing the same, and a closed magnetic core in inductive relation to the hearth and primary winding, one limb of which core is surrounded by the hearth and primary winding and the other limbs thereof are beyond the essential parts of the leakage fields of the primary windings and secondary circuit formed by the hearth.

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

OTTO FRICK.

Witnesses:

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