Oct. 25, 1927. 1,646,862

W. HOSKINS

INDUCTION FURNACE

Filed June 3, 1927 2 Sheets-Sheet 1

Fig. 1.

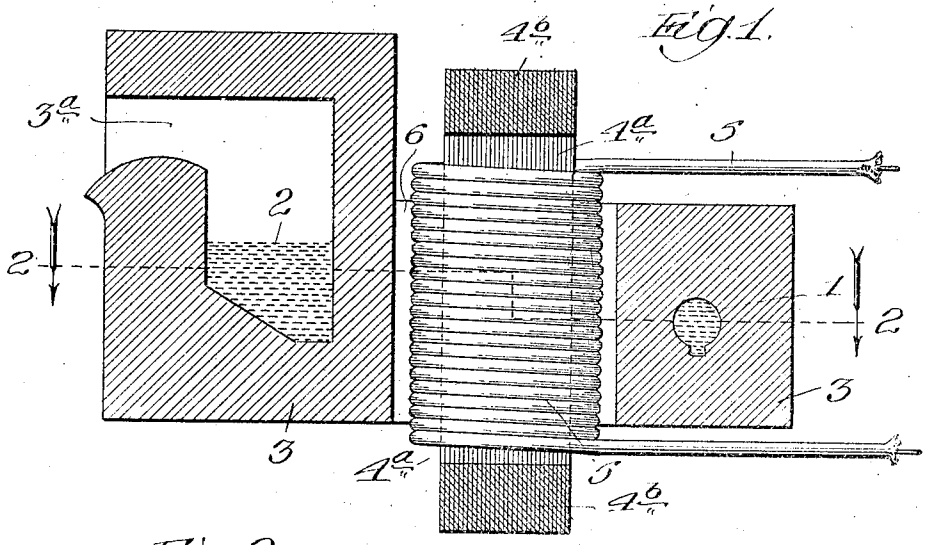
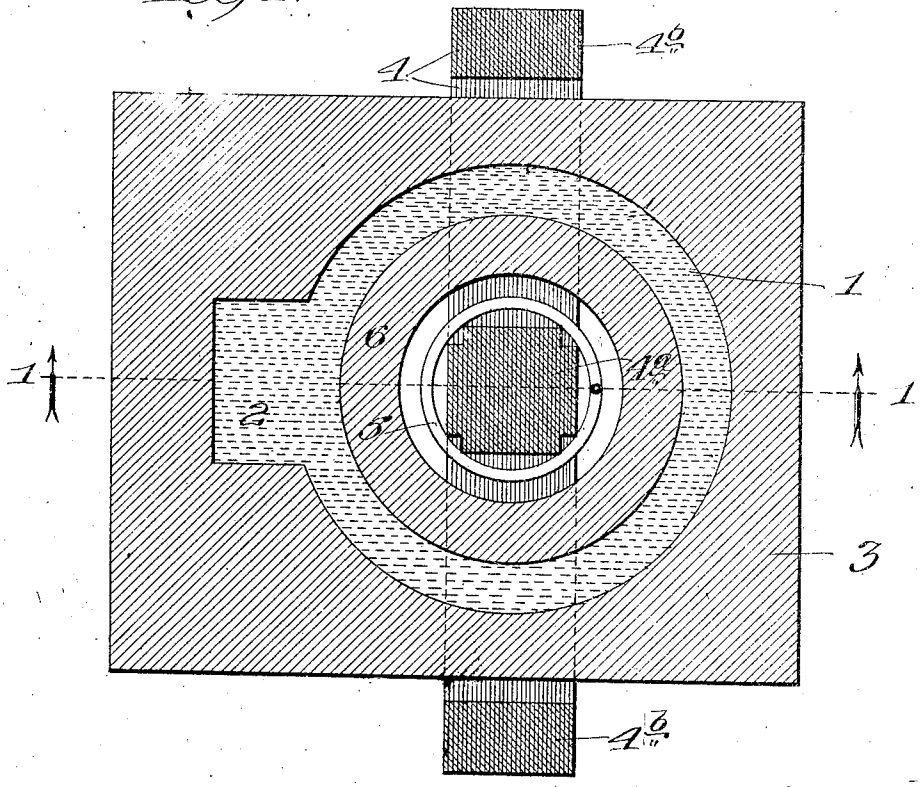


Fig. 2.



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Filed June 3. 1927 2 Sheets-Sheet 2

Fig. 3.

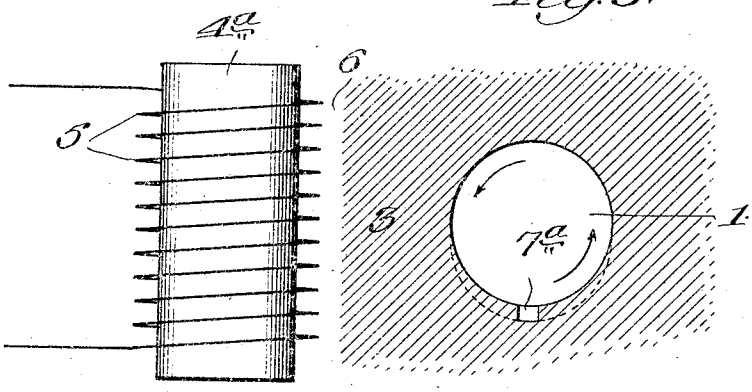


Fig. 5.

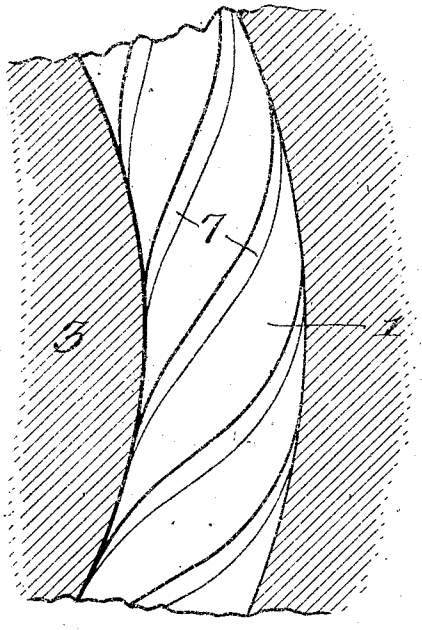
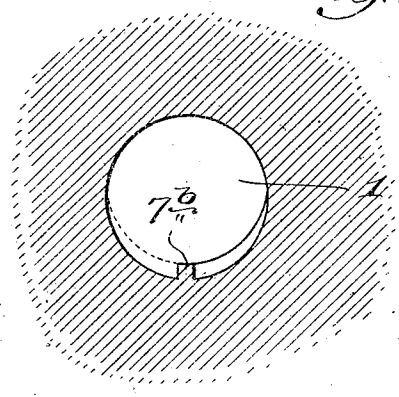


Fig. 4.



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UNITED STATES PATENT OFFICE.

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INDUCTION FURNACE.

Application filed June 3, 1927. Serial No. 196,232.

The present invention relates to improvements in electric induction furnaces and particularly to means effecting, among other results, a stirring action and movement of the material along the heating receptacle. It will be fully understood from the following description, illustrated by the accompanying drawings, in which:—

Figure 1 is a diagrammatic vertical sectional view of an improved furnace showing one embodiment of my invention, the section being taken as indicated at line 1—1 of Fig. 2; Fig. 2 is a plan sectional view taken as indicated at line 2—2 on Fig. 1; Fig. 3 is a vertical sectional view, similar to Fig. 1, showing, however, only the right half of the furnace and indicating by arrows the direction of rotation of the molten metal in the heating receptacle and also showing a spiral channel in the bottom of the heating receptacle; Fig. 4 is a vertical sectional view of the heating receptacle showing a spiral projection or fin in the bottom thereof; and Fig. 5 is an enlarged plan sectional view of the bottom of the heating receptacle showing the spiral projections or channels therein.

Referring more particularly to Figs. 1 and 2, the numeral 1 represents a ring-like trough communicating on one side of the furnace with an enlarged chamber 2. The trough 1 and chamber 2 are supported in a furnace setting 3 which may be constructed of magnesite or any suitable refractory and non-conducting material. Numeral 4 represents a transformer core of the figure 8 type, the central leg 4^a of which passes through the ring-like trough 1 and the side legs 4^b of which are just outside the furnace walls or setting 3. Numeral 5 represents a suitably insulated primary coil wound around the central leg 4^a of the transformer core 4. A cooling space 6 is provided to protect the primary coil 5 from the heat generated within the trough 1. If desired, however, water-cooled pipes or other cooling means may be employed around the coils. I have shown the chamber 2 provided with an opening 3^a in the walls of the furnace setting 3 through which material may be supplied to and withdrawn from the chamber 2. However, for the purposes of my invention, the chamber 2 and trough 1 may be either closed or opened.

While I prefer to use a transformer core of the figure 8 type, an ordinary rectangular transformer core or any other suitable kind of core may, if desired, be employed. Also, while I have shown a trough circular in cross section and ring-like in horizontal section, it is clearly within the spirit of my invention to use troughs of other shapes in which a rotation of the liquid metal in a vertical plane, as hereinafter described, will take place.

In the operation of certain electric furnaces, it is desirable to stir a bath of fluid metal while it is maintained at a very high degree of temperature. Also it is desirable to heat the metal primarily in a restricted chamber or trough of small cross section and to supply the metal, when sufficiently heated, to a reservoir or chamber of larger cross section. These and other advantages I secure as follows.

It is known that in an induction furnace, in which the metal bath chamber is not straight but shaped to form a closed circuit, that a rotation or circulation of the metal takes place in a vertical plane. This is illustrated in Fig. 3 in which arrows indicate the direction in which the liquid metal rotates with relation to the primary coil 5. I propose to convert the vertical movement of the molten material into a forward or substantially horizontal movement by placing fixed inclined obstructions in the trough or chamber or in both trough and chamber. Preferably these obstructions are spiral in shape and may be in the form of grooves or chanels 7^a, as shown in Fig. 3, or projections 7^b, as shown in Fig. 4. While I have illustrated in Figs. 3, 4 and 5 a preferred type of trough in which the bottom alone is rifled or provided with grooves 7^a or projections 7^b, it will be understood that the entire trough may, if desired, be rifled or provided with inclined obstructions.

In the operation of the apparatus, I prefer to employ a single-phase alternating current. As the fluid metal is set in rotation or circulation in a vertical plane, the inclined obstructions pitch the liquid forward in a substantially horizontal plane along the walls of the trough. In this manner the metal, which is heated to a high temperature in a channel of narrow cross section, is passed into the reservoir or chamber of large cross section 2. Also, the whirling movement given the liquid by the inclined obstructions very effectively stirs the metal.

It is not intended that the details of ap-

paratus illustrated shall be regarded as limitations upon the scope of the invention, except in so far as included in the accompanying claims.

I claim:

1. An induction furnace comprising a curved rifled trough supported within a furnace setting, conducting material in said trough, means for inducing an electric current in said material whereby a rotation of said material is produced, and means for supplying material to and withdrawing material from said trough.

2. An electric induction furnace comprising a circular trough, a chamber of greater cross-section communicating with said trough, material in said trough and chamber to be heated, means for inducing an electric current in said material whereby a rotation of the material is secured, and inclined obstructions in said trough positioned obliquely to the line directed toward the center of the trough and serving to advance the material along the trough.

3. In a device of the character set forth, a refractory container in the form of a ring, means for inducing electric currents in material within said container, said means comprising inducing a variable magnetic field in a plane substantially at right angles to the plane of the container, and causing a rotation of said material, and means within the container positioned obliquely with respect to the line directed toward the center of the container for advancing the material around the container.

4. In a device of the character set forth, a trough supported within a furnace setting and forming a complete circuit, means for inducing an electric current in material within said trough, whereby a rotary movement of the material is produced, and inclined obstructions in said trough for producing substantially horizontal movement of the material.

5. An electric induction furnace comprising a chamber and a trough communicating at its two ends with the chamber and forming therewith a complete circuit, means for inducing an electric current in the material within the trough and chamber, whereby a substantially rotary movement of the material is effected, and inclined obstructions in the trough serving to advance material to and from the chamber.

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