Jan. 1, 1929.

1,697,486

J. C. WOODSON

ELECTRIC FURNACE

Original Filed Feb. 10, 1925

Fig.1.

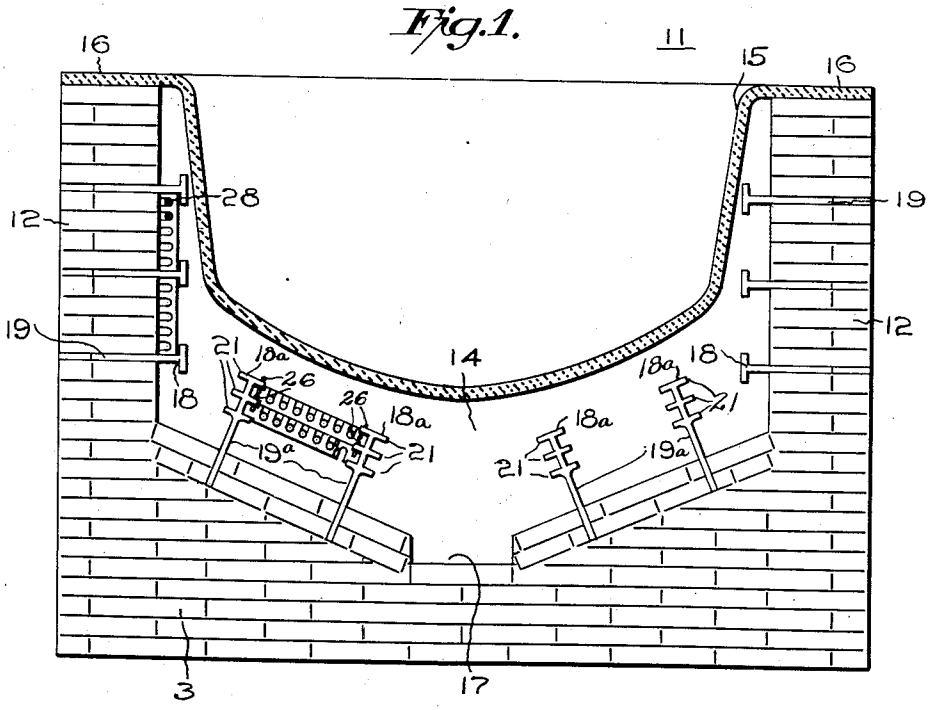


Fig.2.

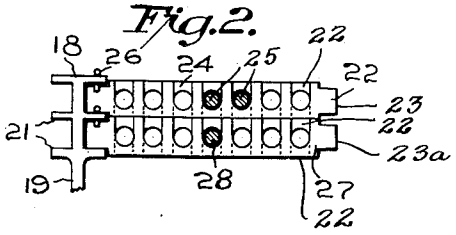


Fig.3.

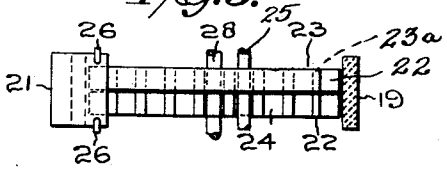
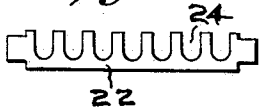


Fig.4.



WITNESSES:

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Patented Jan. 1, 1929. 1,697,486

UNITED STATES PATENT OFFICE.

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ELECTRIC FURNACE.

Application filed February 10, 1925, Serial No. 8,224. Renewed October 26, 1928.

My invention relates to electric furnaces and particularly to means for supporting electric resistor units in electric furnaces.

One of the objects of my invention is to provide means for supporting electric resistor units in an electric furnace in such manner that they are maintained in spaced relation relatively to the cooperating walls of said furnace.

Another object of my invention is to provide means for supporting electric furnace resistor units in such manner that they are interlocked in operative position.

A still further object of my invention is to provide means for supporting a plurality of electric furnace resistor units in such manner that double banking of the units may be obtained.

In practicing my invention, I provide an electric furnace chamber having the usual side and bottom walls and that is especially adapted for use in melting materials having relatively low melting temperatures. A suitable container of ceramic or other refractory material is provided, so shaped that it is supported in spaced relation, relatively to the bottom walls of the furnace. A plurality of refractory resistor unit supporting members are supported by the side and bottom walls of the furnace and comprises a substantially straight member that is secured in any well known manner to the supporting wall.

The resistor-unit supporting members employed in the bottom wall of the furnace chamber are so constructed that the resistor units supported thereby are maintained in skeleton-like spaced relation from each other and at a desirable distance above the bottom-wall structure. By supporting the resistors above the bottom wall in this manner, molten material which may leak through cracks or crevices in the container, which may develop therein from intermittent heating and cooling thereof or other causes, will pass through the resistors without solidifying therearound. The slope of the bottom wall structure is so arranged that any molten material that may fall into the furnace chamber will flow towards a convenient opening therein through which it may be drained.

The refractory members have a plurality of integral, oppositely-extending, transverse flanges between which cooperating pairs of slotted refractory members extend and are supported thereby. The slotted refractory members are adapted to receive an electric resistor member and to interlock therewith in operative position in a manner hereinafter more fully described.

In the drawing,

Figure 1 is a front elevational view, partially in section, of an electric furnace embodying my invention;

Fig. 2 is a fragmentary front elevational view of an electric resistor unit supporting member and an electric resistor unit cooperating therewith;

Fig. 3 is a top plan view thereof; and

Fig. 4 is a front elevational view of one of the refractory members comprised in the resistor unit embodying my invention.

An electric furnace represented by the numeral 11 comprises a vertical wall 12 and a bottom wall 13 enclosing a furnace chamber 14. A material receiving means 15 is supported in any suitable manner, but I have preferred to show a member having a substantially cup-shaped portion having outwardly extending flange portions 16 to cooperate with the top of the wall 12 to support the same in spaced relation relatively to the bottom wall 13 of the furnace chamber 14.

The upper surface of the bottom wall 13 is inclined towards the center thereof to permit draining of any molten material that may leak through from the material receiving means 15. A drain 17 is provided at the center of the bottom 13 and may be of any suitable construction as it constitutes no part of my invention.

A plurality of resistor unit supporting means 18 and 18*a* are supported in any suitable manner by the walls 12 and 13 respectively and extend inwardly therefrom into the furnace chamber 14. The resistor unit supporting members 18 comprise a substantially straight portion 19 that is secured in the furnace walls 12. The supporting members 18*a* comprise a plurality of oppositely extending transverse flanges 21 and a straight portion 19*a*. The resistor unit supporting means 18 and 18*a* may be constructed of any suitable refractory material either metallic or ceramic. The transverse flanges 21 are located in spaced relation relatively to the walls 12 and 13 of the furnace chamber and are adapted to support a plurality of refractory members 22.

The refractory members 22 have a plural-

ity of transverse slots 24 that are adapted to receive a resistor member 25. The refractory members 22 are substantially parallel extending and disposed in inverse relation to each other and are secured to the flanges 21 of resistor unit supporting members 18*a* by pin members 26 that are located in abutting relation thereto, whereby lateral movement relatively to the resistor unit supporting member is prevented.

The supporting members 18*a* located in the bottom wall 13 of the furnace chamber 14 may be so arranged that the refractory members 22 are supported at a desirable distance thereabove. Since the members 22 are located above the inclined wall 13, the resistor members 25 that are supported thereby will not come in contact with molten metals or the like that may flow along said wall so as to cause a short circuit thereof.

It is evident from Fig. 3, that, if the members 18*a* are located in abutting relation to each other in the inclined wall 13 of the furnace chamber 13, a clearance space (not shown) between the refractory members 22 will be provided, because the flanges 21 extend beyond the members 22 on both sides thereof. If metal or other molten substances contained in the material-receiving means 15 should accidentally leak into the chamber 14, it will pass through the clearance spaces referred to above without collecting around the resistor members so as to cause a short-circuit thereof. It is highly desirable to prevent a short-circuit of this nature because the resistors usually employed in electric furnaces are very expensive and are therefore worthy of protection.

The resistor members 25 which are supported by the refractory members 22 have sufficient stiffness and strength to maintain themselves in a substantially straight-line condition even when the members 22 are spaced at relatively great distances apart as compared with the dimensions of the resistor members 25. By spacing the refractory members 18*a* at suitable distances apart in accordance with the weight and dimensions of the resistor members 25, the heating units may be made as open and skeleton-like as desired.

The slots 24 of the refractory members 22 are located in corresponding faces thereof, thereby simplifying the assembly of resistor units as these members are substantially similar and interchangeable. In the particular embodiment of my invention illustrated in Figs. 2 and 3, I have shown two independent rows or banks 23 and 23*a* of the members 22 operatively engaging the resistor members 25 and a resistor member 28. Each of the rows or banks 23 and 23*a* comprises a pair of members 22 located in side-by-side relation operatively engaging a resistor member 25 and 28, respectively. The resistor members 25 and 28 are supported by the members 22 in which the slots 24 extend upwardly and are maintained in this position by the members 22 which partially enclose the resistor from above and in which the slots 24 thereof extend downwardly. The effect of the slots 24 of the refractory members 22 in enclosing the resistor members 25 and 28 from opposite directions is to interlock the members together, thereby preventing lateral movement of the resistor member 25 relatively to the refractory members 22.

Although I have shown a furnace structure of a type suitable for use in melting low temperature materials, I do not wish to be limited to this form of furnace structure as the methods of supporting resistor members in a furnace may be employed to advantage in structures of other types. By means of the structure hereinbefore described, a practical mounting for electric resistor members in an electric furnace is provided whereby the resistor member is securely held in operative position and may be easily removed in case of necessity of replacing any of the units.

In case it is desired to provide an increased amount of heat in the furnace, the resistor-supporting units have been constructed in such manner that a plurality of resistor members may be supported thereby. Another pair of refractory members 22 are located transversely between the resistor unit supporting members 18*a* and secured thereto beneath the refractory members 22. The refractory members 22 interlock in operative position with the resistor member 28 in the manner hereinbefore described whereby a double banking of resistor members is thereby obtained.

My invention is closely related to the co-pending application of A. D. Keene, Serial No. 4,236, filed Jan 23, 1925, which is assigned to the Westinghouse Electric and Manufacturing Company.

Various modifications and changes may be made without departing from the spirit and scope of the invention, therefore I desire that only such limitations shall be placed thereon as are imposed by the prior art or are set forth in the appended claims.

I claim as my invention:

1. In an electric furnace, the combination with a plurality of walls enclosing a furnace chamber, and a resistor unit supporting member supported by the bottom wall of said furnace, of a plurality of independent resistor members supported by said supporting member in substantially parallel rows and in open, skeleton-like spaced relation above said bottom wall and comprising a plurality of refractory members interlocked with said electric resistor members.

2. In an electric furnace, the combination with a furnace chamber and a material-receiving container supported therein, of a plu-

rality of resistor elements in said chamber, and means carried by the floor of said chamber for supporting said resistor elements in spaced skeleton-like formation beneath said container and spaced from the floor and side walls of said chamber.

3. In an electric furnace, the combination with a plurality of walls defining a furnace chamber, the bottom wall of said chamber being sloped toward the center thereof to form a trough-like depression, a material-receiving receptacle within said chamber and supported by the side walls thereof, of a plurality of resistor units within said chamber, and means severally carried by the sloping portions of said bottom wall for supporting said resistor units beneath said material-receiving receptacle and in spaced relation to the bottom and side walls of said furnace chamber.

4. In an electric furnace, the combination with a plurality of walls defining a furnace chamber, of a material-receiving receptacle within said chamber suspended from the side walls thereof, of a plurality of electrical resistor heating units within said chamber beneath said receptacle, and means for preventing injury to said resistor units by leakage from said receptacle, comprising a plurality of supports severally carried by, and extending above, the floor of said furnace, said supports being arranged to maintain said resistor units in open skeleton-like formation and spaced from the floor and side walls of said chamber.

5. In an electric furnace, the combination with a plurality of refractory walls enclosing a furnace chamber, and a material-receiving means adapted to contain molten metals therein located in said furnace chamber, of means for supporting a plurality of independent resistor members in parallel rows and in skeleton-like formation above a bottom wall of said chamber, to permit molten metals leaking from said material-receiving means into said chamber to pass between said resistor members.

6. In an electric furnace, the combination with a plurality of refractory walls enclosing a furnace chamber, and a material-receiving means adapted to contain molten metals therein located in said furnace chamber, of means for supporting a plurality of independent resistor members in parallel rows and in skeleton-like formation above a bottom wall of said chamber comprising a refractory member having a substantially straight portion, one end of which is located in said bottom wall, and having a plurality of opposed laterally-extending flanges located at the other end of said straight portion which extends above said bottom wall.

7. In an electric furnace, the combination with a plurality of refractory walls enclosing a furnace chamber, and a material-receiving means adapted to contain molten metals therein located in said furnace chamber, of means for supporting a plurality of independent resistor members in parallel rows and in skeleton-like formation above a bottom wall of said chamber comprising a plurality of refractory members having slots therein, said refractory members being located in pairs in side-by-side and in inverse relation to each other, one member of each of said pairs of refractory members having the slots therein extending upwardly for supporting said resistor members from substantially the underside thereof and the other member of each of said pairs having the slots therein extending downwardly for registering with said resistor members from the upper side thereof.

8. In an electric furnace, the combination with a plurality of refractory walls enclosing a furnace chamber, and a material-receiving means adapted to contain molten metals therein located in said furnace chamber, of means for supporting a plurality of independent resistor members in parallel rows and in skeleton-like formation above a bottom wall of said chamber comprising a plurality of independent substantially straight refractory members having a plurality of opposed laterally extending flanges located at one end thereof, the other end of said straight portion being located in the bottom wall of said furnace chamber, and a plurality of cooperating pairs of refractory members extending between said straight refractory members and supported by said flanges.

9. In an electric furnace, the combination with a plurality of refractory walls enclosing a furnace chamber, and a material-receiving means adapted to contain molten metal therein located in said furnace chamber, of means for supporting a plurality of independent resistor members in parallel rows and in skeleton-like formation above a bottom wall of said chamber comprising a refractory member having a substantially straight portion, one end of which is located in said bottom wall, and having a plurality of opposed laterally extending flanges integral therewith located at the other end of said straight portion which extends above said bottom wall.

10. In an electric furnace, the combination with a plurality of walls enclosing a furnace chamber, the surface of the bottom wall of said chamber sloping towards the center thereof, a material-receiving means supported in said chamber, and a plurality of resistor members associated with said furnace chamber, of means for supporting certain of said resistor members in an open, skeleton-like spaced relation above the surface of said bottom wall.

11. In an electric furnace, the combination with a plurality of walls enclosing a furnace chamber, the surface of the bottom wall

thereof sloping towards a drain located at the center thereof, a material-receiving means located in said chamber and supported by said walls, and a plurality of independent resistor members associated with said chamber, of means for supporting several of said resistor members in substantially parallel rows and in open skeleton-like formation above said bottom wall.

12. In an electric furnace, the combination with a plurality of walls enclosing a furnace chamber, the surface of the bottom wall thereof sloping toward a drain located therein, a material-receiving means located in said chamber and supported by said walls, and a plurality of independent resistor members associated with said chamber, of means for supporting several of said resistor members in substantially parallel rows and in open skeleton-like formation above said bottom wall.

In testimony whereof, I have hereunto subscribed my name this 9th day of February, 1925.

JAMES C. WOODSON.