Sept. 15, 1925. 1,553,379

R. E. HELLMUND

REFRACTORY RESISTOR ELEMENT

Filed Feb. 8, 1923

Fig.1.

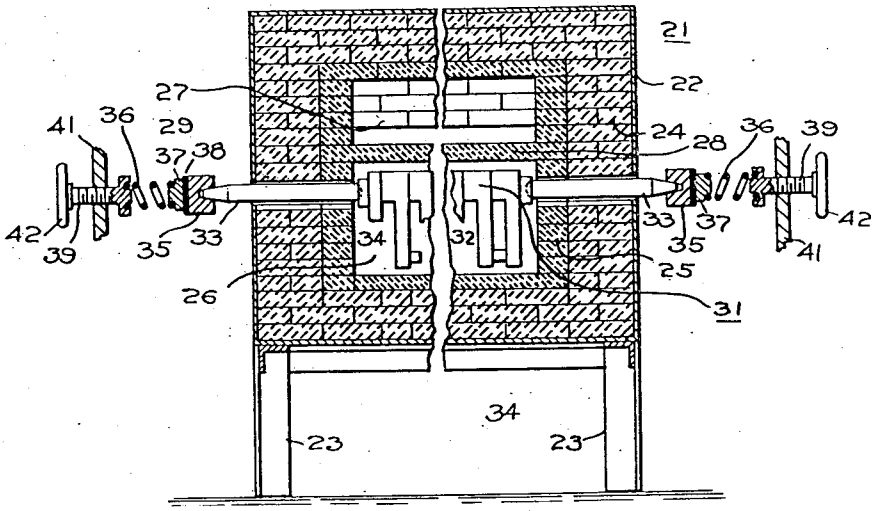


Fig.2. *Fig.3.* *Fig.4.* *Fig.5.* *Fig.6.*

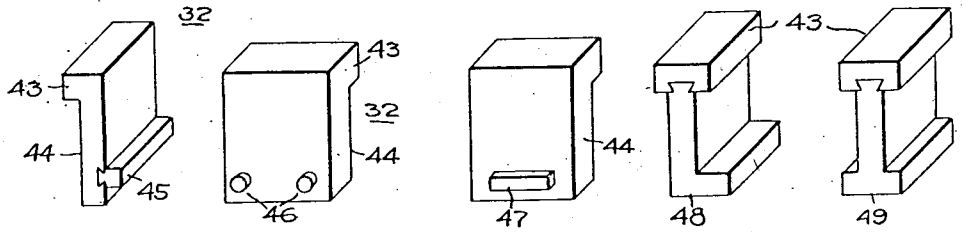
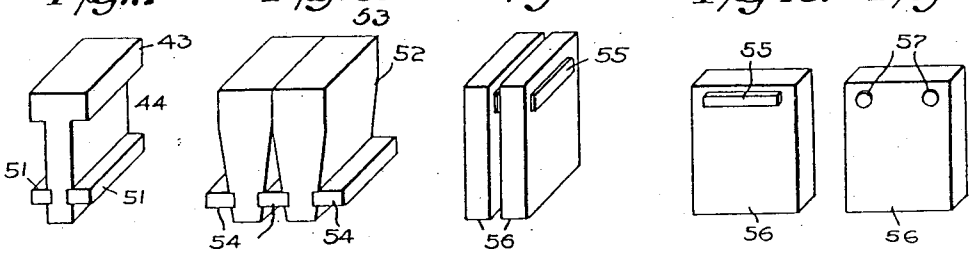


Fig.7. *Fig.8.* *Fig.9.* *Fig 10.* *Fig.11.*



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UNITED STATES PATENT OFFICE.

RUDOLF E. HELLMUND, OF SWISSVALE, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

REFRACTORY RESISTOR ELEMENT.

Application filed February 8, 1923. Serial No. 617,758.

To all whom it may concern:

Be it known that I, RUDOLF E. HELLMUND, a citizen of the United States, and a resident of Swissvale, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Refractory Resistor Elements, of which the following is a specification.

My invention relates to electric furnaces and particularly to refractory resistance elements for such furnaces.

The object of my invention is to provide a relatively simple construction for refractory resistance elements for electric resistance furnaces.

In practicing my invention, I provide a furnace structure comprising a plurality of heat-insulating walls enclosing a furnace chamber, in which is located a built-up heating element comprising a plurality of individual refractory resistor members. Suitable resilient compressing means is provided to maintain the plurality of resistor members in close operative engagement with each other.

Each of the refractory resistor members comprises a current-conducting portion, of suitable area in lateral section, and comprising a position-stabilizing portion integral therewith or suitably secured thereto.

In the single sheet of drawing,

Figure 1 is a view, in vertical section, of an electric resistance furnace embodying my invention,

Fig. 2 is a view, in perspective, of one form of refractory resistor member comprising my invention,

Figs. 3 and 4 are views, in perspective, of a modified form of refractory member embodying my invention,

Figs. 5, 6 and 7 are views, in perspective, of further modifications,

Fig. 8 is a view, in perspective, of a plurality of refractory resistor members illustrating another modification,

Figs. 9 and 10 are views, in perspective, of refractory resistor members illustrating a further modification of my invention, and

Fig. 11 is a view, in perspective, of a modification of the construction illustrated in Fig. 9 of the drawing.

An electric resistance furnace 21 comprises an outer sheet metal casing 22 and a plurality of supporting members 23 suitably secured thereto. An outer layer 24 comprises a plurality of bricks or blocks of suitable heat-insulating refractory material usually employed in the art. An inner layer 25 comprises a plurality of bricks or blocks of suitable refractory high-temperature-resisting material. The two linings are so located and spaced as to enclose an oven chamber which may be divided into a heating compartment 26 and a work-receiving compartment 27 by a suitable refractory plate or diaphragm 28 which is supported by the inner lining 25. An opening 29 permits of placing material within and removing it from the work-receiving compartment 27.

A heating element 31, located within the heating compartment 26, comprises a plurality of refractory resistor members 32 to be hereinafter described in detail. The resistor members 32 are located in abutting relation and are maintained in close operative engagement to each other by elongated refractory electric-conducting electrodes 33 which operatively engage the ends of the built-up heating element 31, suitable contact plates 34 being provided at each end of the heating element. A metallic electric-circuit terminal member 35 operatively engages the outer end of the electrode 33, suitable provision being made in the co-operating members to permit of close operative engagement therebetween.

Resilient compressing means for each of the electrodes comprises a helical spring 36, one end of which engages a block 37 located adjacent to the outer surface of the electric circuit terminal 35, a block 38 of a suitable electric-insulating material being placed therebetween to insulate the compressing structure from the electrode and the terminal. Adjusting means for the compressing means comprises a threaded rod 39, which is adjustable in a fixed member 41 by hand wheel 42.

While I have illustrated a specific construction of compressing means, I do not desire to be limited thereby, as I have shown a specific construction for illustrative purposes only.

Each of the refractory electric conducting resistor members 32 comprises a current-conducting portion 43 located adjacent to one edge of the member 32 and a position-stabilizing or position-maintaining portion

44 depending from the portion 43 and either integral therewith or suitably secured thereto. As illustrated in Fig. 2 of the drawing, the portion 44 comprises a relatively thin depending portion and a member 45 extending laterally from the portion 44 adjacent to the lower edge thereof and having a dove-tail connection therewith. The member 45 may be of material that is substantially the same as composes the portions 43 and 44, but of higher electrical resistance than these portions, or it may be of refractory electrical non-conducting material. The object of this construction is to cause substantially all of the current traversing the heating element 31 to flow through the electric-conducting portions 43, whereby substantially all of the heat is generated in a predetermined portion of the heating element 31, which portion in this case is that located closely adjacent to the diaphragm 28, which, as above stated, divides the oven chamber into two compartments.

As the resistance of the position-stabilizing portion of each of the refractory resistor members is relatively high only a very small portion of the current will traverse the respective position stabilizing portions, it being understood, of course, that the member 45 extends beyond the surface of the portion 44 a distance that is substantially the same as the thickness of the projecting part of the portion 43 that extends beyond the portion 44.

If it is found that the use of a member 45 that is substantially co-extensive with the width of the member 32 results in permitting too large a current to traverse this portion of the heating element, a plurality of rods 46, of a suitable refractory material, may be employed, as illustrated in Fig. 3 of the drawing, preferably two rods being employed. The rods 46 may either be molded in place in the portion 44 or suitable openings may be provided in this portion to permit of loosely placing the rods 46 in their proper operative position in the portion 44 when building up the heating element.

In place of the rods 46 I may employ a relatively short bar 47 which is mounted in the portion 44 adjacent the lower edge thereof, a suitable groove or chamber being provided in the portion 44, to permit of seating the bar 47 therein.

In Figs. 5 and 6, I have illustrated modifications which I may employ, and in which the current conducting portions 43 has secured thereto either a position-stabilizing member 48 of substantially L-shape in section, or a member 49 of substantially T-shape in section. The members 48 and 49 are respectively secured to the portion 43 by a dove-tail joint and the material constituting portions 48 and 49 is either of relatively high electric resistance or is electrically non-conducting.

In the modification illustrated in Fig. 7, the current-conducting portion 43 and the depending portion 44 are integral and together constitute a member of substantially T-shape in section. Two bars 51 are secured to the portion 44 adjacent to the lower edge thereof, a suitable groove being provided on each face of the portion 44 to permit of placing therein an edge portion of the members 51. The members 51 comprise either a relatively high electric resistance material or a material which is electrically non-conductive, even at high temperatures. It is, of course, understood that the spacing members hereinbefore described, constituted by the laterally projecting portions of the members 48 and 49 and the members 51 are respectively of such lateral thickness that they will cooperate with the current conducting portion 43 to build up a heating element wherein the portions 44 are in substantially parallel alinement throughout.

Fig. 8 illustrates another modification which I may employ in which the members 52 comprise refractory electric-conducting members of wedge shape in lateral section, the upper portions of which are provided with parallel extending surfaces 53 which are located in abutting relation in the built-up heating element.

The wedge shaped portions of the members 52 constitute the position stabilizing portions and are provided with laterally extending plates or bars 54 secured to the members 32 adjacent the lower edge thereof, the projection of the bars 54 being such as will cause the surfaces 53 of adjacent members 52 to be parallel to each other.

In Figs. 9 and 10, I have illustrated a still further modification in which a plurality of current-conducting members 55 of relatively small area in cross-section are molded into position-stabilizing portions 56 of relatively larger area. The members 55 may comprise bars of a suitable refractory electric-conducting material, the thickness of the bars being slightly greater than the thickness of the position-stabilizing portions 56. The portions 56 comprise refractory material which is either of relatively high electric-resistance or is electrically non-conducting.

In Fig. 11, I have illustrated a modified form of the construction illustrated in Figs. 9 and 10, which I may employ if the resistance of the bars 55 is found to be relatively high. In this case, I employ a plurality of spaced rods 57 which are molded into the position-stabilizing portions 56 as hereinbefore described and are slightly longer than the thickness of the portions 56.

The device embodying my invention may

be built in a variety of forms, each of which comprises a current conducting portion, a position stabilizing portion either integral therewith, secured to or molded around such current conducting portion. A plurality of such members may be built up into a heating element which is located between resilient compressing means and is effective to localize the path of the current therethrough and, therefore, localizes the portion in which the heat is generated by the current traversing it.

Various modifications and changes may be made herein without departing from the spirit and scope thereof, and I desire such modifications to be limited to the prior art or the appended claims.

I claim as my invention:

1. An electric furnace resistor comprising a plurality of refractory electrical-conducting members located in abutting relation, each member having a position-stabilizing portion of large area relatively to said conducting member and integral therewith.

2. In an electric furnace resistor, in combination, a plurality of unitary refractory members, each member comprising an electrical-conducting portion and a position-stabilizing portion.

3. In an electric furnace resistor, in combination, a plurality of unitary refractory members, each member comprising an electrical-conducting portion and a position-stabilizing portion extending at substantially a right angle to said conducting portion.

4. In an electric furnace resistor, in combination, a plurality of unitary refractory members, each member comprising an electrical-conducting portion and a position-stabilizing portion having inherent means for reducing the amount of current traversing the same.

5. In an electric furnace resistor, in combination, a plurality of refractory electrical-conducting members, of relatively small transverse area, located in abutting relation, each member having an integral position-stabilizing portion of large transverse area relatively to said conducting members, said position-stabilizing portion extending at substantially a right angle to said conducting member and comprising inherent means for reducing the amount of current traversing the same.

6. In an electric furnace, in combination, a resilient compressing means, a resistor comprising a plurality of refractory electrical-conducting members of relatively small transverse area maintained in close operative engagement with each other by said compressing means, each of said conducting members having means integral therewith for maintaining said members in proper operative positions relatively to each other.

7. In an electric furnace, in combination, a resilient compressing means, a resistor comprising a plurality of refractory electrical-conducting members of relatively small transverse area maintained in close operative engagement with each other by said compressing means, each of said conducting members having means integral therewith for maintaining said members in proper operative positions relatively to each other, and for reducing the amount of current traversing said position-maintaining means.

8. In an electric furnace resistor, in combination, a plurality of refractory electrical-conducting members, each member having an integral portion extending at substantially a right angle to said conducting member and comprising a spacing member adjacent its other end.

In testimony whereof, I have hereunto subscribed my name this second day of February 1923.

RUDOLF E. HELLMUND.