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T. A. REID

ELECTRIC FURNACE

Filed Nov. 1, 1922

Fig. 1.

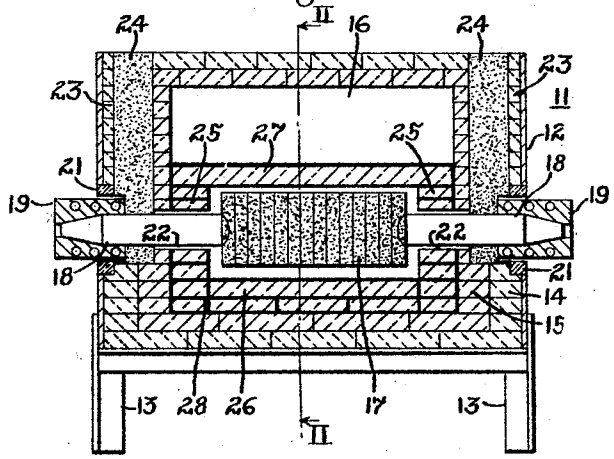
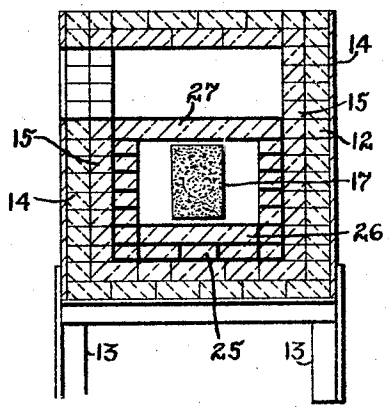


Fig. 2.



WITNESSES:

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UNITED STATES PATENT OFFICE.

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ELECTRIC FURNACE.

Application filed November 1, 1922. Serial No. 598,296.

To all whom it may concern:

Be it known that I, THOMAS A. REID, a citizen of the United States, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Electric Furnaces, of which the following is a specification.

My invention relates to electric furnaces and particularly to electric-resistance furnaces.

The object of my invention is to provide an electric furnace having a carbonaceous resistor that is surrounded by a substantially air-tight vitreous envelope.

In practicing my invention, I provide a furnace structure comprising a plurality of refractory walls enclosing a furnace chamber within which is located a carbonaceous resistor. A built-up muffler is provided for the resistor comprising a plurality of bricks or blocks of a suitable refractory high-temperature-resisting material laid in an initially granular cement or binder, which cement becomes plastic upon being heated and constitutes a substantially air-tight vitreous envelope for the resistor. The resistor is heated, at its first operation, to a temperature higher than normal, to insure that any changes effected in the state or condition of the cement shall be substantially permanent and that its condition shall not be materially changed by the subsequent heating and cooling during the ordinary operation of the furnace.

In the single sheet of drawings,

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

Fig. 2 is a vertical lateral section thereof, taken on the line II—II of Fig. 1.

An electric-resistance furnace, designated generally by the numeral 11, comprises an outer metallic casing 12 which is provided with a plurality of supporting members 13 suitably secured thereto. An outer lining 14 comprises a plurality of bricks or blocks of any suitable heat-insulating refractory material usually employed in the art. An inner lining 15 comprises a plurality of bricks or blocks of any suitable high-temperature-resisting refractory material.

The bricks or blocks constituting the two linings are so located and spaced as to provide a furnace chamber 16, of any suitable or desired contour and dimensions. The construction of the furnace proper is not illustrated in any particular detail, as any construction usually employed in the art, both of the casing and of the refractory walls, may be employed in my invention, which relates more particularly to details of the heating element to be hereinafter described.

An electric heating element 17 comprises a plurality of refractory carbonaceous members of relatively small size, illustrated in the drawing as relatively thin, flat plates having their flat sides in operative engagement and being built up to a length in accordance with the dimensions of the heating chamber proper.

At each end of the heating element, the end plate is operatively engaged by an elongated carbonaceous electrode 18, the inner end of which is suitably rounded to fit into a co-operating depression in the end plate. The outer tapering end of the electrode 18 fits into a co-operating opening provided within a water cooled electric-circuit-terminal member 19. In order to insulate the terminal member 19 from the structure of the furnace, I provide an insulating ring 21 of asbestos or other similar material, so located as to surround the terminal electrode 19 and supported adjacent the outer surface of the furnace structure, substantially as illustrated in Fig. 1 of the drawing. Any suitable compressing means (not shown) may be employed to maintain the terminal members, electrodes and the flat plates in close operative engagement.

Suitable openings 22 are provided in the refractory linings to permit of the electrodes 18 extending therethrough, and it has been found necessary to make these openings larger than the electrode itself in order to permit free movement of the electrode relatively thereto, as is required by the varying expansion of the different portions of the furnace during repeated heating and cooling cycles of operation. As this would permit air to flow along the outside of the electrodes, I provide wells or chambers 23 in the furnace structure located within the two end walls immediately surrounding the terminal electrodes and extending vertically thereabove to the top of the furnace structure. I place in each of these wells a mass 24 of finely divided carbonaceous material,

such as ground coke or charcoal. This structure permits of tightly packing the granular material around the intermediate portion of the electrodes 18 whereby any air flowing past the electric-circuit-terminal members 19 is caused to expend its oxidizing action upon the mass of material 24 and is prevented from entering the furnace chamber and causing oxidization of the resistor.

In order to still further reduce the oxidization of the resistor, I provide a built-up muffle located within the hereinbefore mentioned chamber 16 and comprising a plurality of bricks or blocks 25 of a high-temperature-resisting refractory material which constitute the side and end walls of the muffle and a portion of the floor thereof.

A refractory plate 26, of a suitable high-temperature-resisting material may be employed to constitute the floor of the muffle located immediately below the heating element 17. A refractory plate 27 is located above the heating element and is supported by the side and end walls of the muffle. The plate 27 constitutes a diaphragm which divides the furnace chamber 16 into two compartments, one within which the heating element is located and another within which material to be heat treated may be placed. The bricks 25 and the plates 26 and 27 are laid in a relatively thick binder 28 of an electric insulating fusible cement, such as alundum.

The alundum cement or binder 28 is employed, in building up the muffle, in its granular condition or state and, after the entire furnace structure has been permitted to thoroughly dry, an electric current of a greater intensity than normal is caused to traverse the heating element 17 to the effect that the temperature of the resistor, of the muffle and of the cement, shall be raised to a value higher than that ordinarily experienced during the operation of the furnace. The alundum binder becomes plastic and provides, in effect, a vitreous coating which constitutes a substantially air-tight envelope around the resistor, whereby air is prevented from reaching the resistor and causing oxidization thereof. As the cement was heated, at its first operation, to a temperature higher than normal, it will receive, in effect, a "set" and further operations will not cause any substantial change in its condition, thereby insuring a substantially permanent condition as to the air-tight envelope around the resistor.

Various changes in detail and arrangement may be made without departing from the spirit and scope of the invention and such modifications are intended to be covered by the appended claims.

I claim as my invention:

1. In an electric furnace, in combination, a carbonaceous resistor, a plurality of refractory blocks operatively engaging each other and spaced to enclose a heating chamber, and a binder of a fusible and initially granular material operatively connecting said blocks to constitute a substantially air tight envelope for said chamber.

2. In an electric furnace, in combination, a refractory resistor, a plurality of refractory blocks built up to enclose a heating chamber within which said resistor is located, and a binder of initially granular material operatively connecting said blocks, said binder being changed to a substantially vitreous coating upon the application of heat thereto and constituting a substantially air tight envelope for said chamber.

3. In an electric furnace, in combination, a plurality of refractory blocks enclosing a furnace chamber, a refractory diaphragm for dividing said chamber into a work-receiving and a heating chamber, a refractory resistor in said heating chamber, initially granular material in the form of a layer on said diaphragm and a binder operatively connecting said blocks, said granular material being changed to a substantially vitreous coating upon the application of heat thereto and constituting a substantially air tight envelope for said chamber.

4. The method of protecting an oxidizable resistor member in a furnace chamber which comprises surrounding said chamber by a relatively thin layer of an initially granular material and heating said granular material to change the same to a substantially vitreous air-tight envelope.

5. The method of protecting an oxidizable resistor member in a furnace chamber which comprises surrounding said chamber by a relatively thin layer of an initially granular material and heating said granular material to a temperature higher than the normal operating temperature of the furnace to change the same to a substantially vitreous and air-tight envelope.

6. The method of protecting an oxidizable resistor member in a furnace chamber defined by a plurality of refractory blocks which comprises the use of an initially granular material as a binder for said blocks and heating said blocks and binder to a temperature higher than the normal operating temperature thereof to change the binder to a substantially vitreous and air-tight envelope.

In testimony whereof, I have hereunto subscribed my name this 25th day of October, 1922.

THOMAS A. REID.