April 14, 1925.

1,533,266

T. A. REID

DOUBLE CHAMBER ANNEALING FURNACE

Filed Feb. 6, 1922

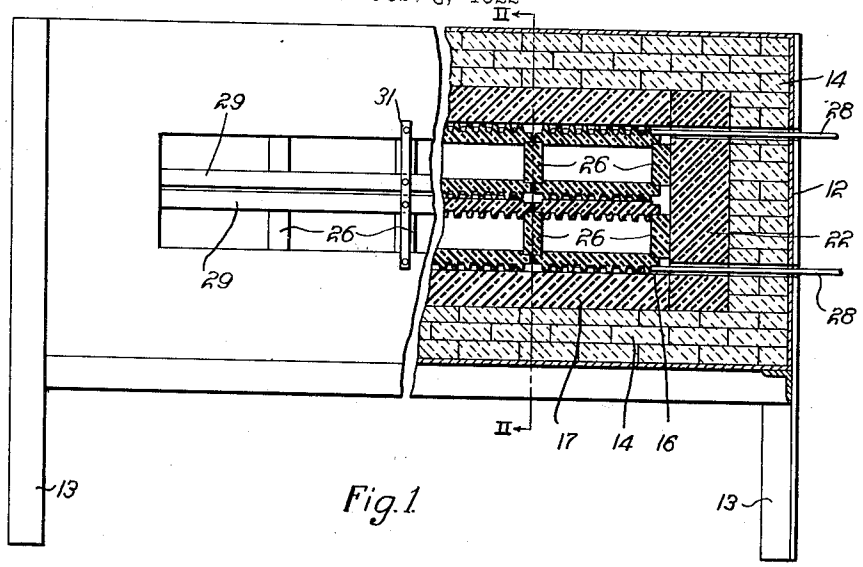


Fig. 1.

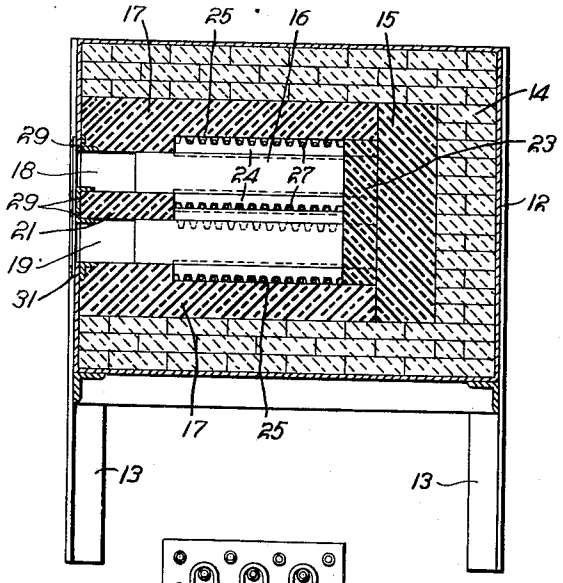


Fig. 2.

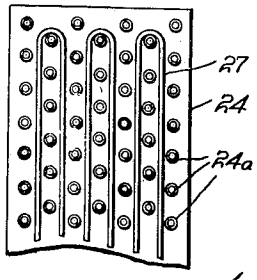


Fig. 3.

WITNESSES:

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# UNITED STATES PATENT OFFICE.

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## DOUBLE-CHAMBER ANNEALING FURNACE.

Application filed February 6, 1922. Serial No. 534,447.

*To all whom it may concern:*

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

My invention relates to electric furnaces and particularly to electric-resistance furnaces and it has for one of its objects to provide a relatively simple, inexpensive and easily assembled and disassembled heating element for a multiple-chamber furnace.

Another object of my invention is to provide a multiple-chamber furnace, for annealing or otherwise heat treating relatively small pieces of material, which shall have a relatively small heat loss.

In practising my invention, I provide a refractory heat-insulating casing, a plurality of superposed heating chambers located therein, each chamber being of relatively low height and great width. A plurality of relatively thin refractory plates, each having a plurality of relatively small spaced-apart, alined, integral projections on one surface thereof, are located above, between, and below the two chambers constituting the top and the bottom lining thereof. A preformed relatively heavy resistor member is located in operative engagement with that surface of each of the plates having the integral projections thereon, and the adjacent portions of the resistor are maintained in proper operative positions relatively to each other thereby.

In the single sheet of drawings,

Figure 1 is a view, partly in front elevation and partly in longitudinal section, of an electric furnace embodying my invention;

Fig. 2 is a view, in vertical lateral cross-section, of a furnace embodying my invention, taken on the line II—II of Fig. 1;

Fig. 3 is a fragmentary top plan view of a heating element constituting a part of my invention.

An electric-resistance furnace, designated generally by the numeral 11, comprises an outer metallic framework or skeleton 12 having a plurality of supporting members 13 suitably secured thereto. An outer lining 14 comprises a plurality of bricks or blocks of a suitable heat-insulating refractory material. A plurality of bricks or blocks 15 constitute the back wall of a chamber 16, and a plurality of bricks or blocks 17 constitute the top and the bottom wall of a plurality of superposed chambers 18 and 19 which are separated at their front portions by suitable refractory bricks or blocks 21. The side walls of the chamber 16 may comprise a relatively large brick or block 22, and the blocks 17, 21 and 22 may be of any suitable refractory high-temperature-resisting material usually employed in the art.

The rear wall or lining of the chambers 18 and 19 comprise a plurality of fire bricks 23 to protect the rather brittle bricks 15.

The top and bottom lining of the two chambers 18 and 19 comprises a plurality of relatively thin refractory plates 24, each plate having a plurality of relatively small spaced-apart, alined, integral projections $24^a$ on one side thereof. The bricks or blocks 17, constituting the bottom of the chamber 19, are provided with a depressed portion 25 in which the plates 24, constituting the bottom lining of the chamber 19, may be located, that face of the plates 24 having the integral projections thereon being so placed as to operatively engage the upper surface of the bricks 17, thus providing a substantially smooth bottom lining or floor for the chamber 19. The plates 24, constituting the lining for the top of the upper chamber 18, are located in a depressed portion 25 of the layer of bricks 17 constituting the top wall of the chamber 16, and the smooth surface of the plates 24 face the chamber 18. Two layers of plates 24 constitute the lining intermediate the chamber 18 and the chamber 19, and the surfaces of the plates 24, provided with integral projections, are so located as to have the substantially smooth surface of the upper of the two layers of plates constitute the bottom wall of the upper chamber. A plurality of spaced-apart firebrick members 26 serve to maintain the respective layers of plates 24 in proper operative spaced-apart positions, relatively to each other, in a vertical plane. The lower layer of plates 24 constituting the floor of the lower chamber 19 rests directly upon the bottom lining 17, and the lower layer of the double lining between the two chambers rests upon the plurality of firebrick spacers 26. The upper of the two layers between the two chambers rests upon the roof or top lining of the chamber 19, and the

top lining or roof of the chamber 18 rests upon the firebricks 26 which, in turn, rest upon the lining between the two chambers.

A resistor member 27 comprises a relatively heavy rod or bar preformed to have a plurality of substantially parallel-extending, end-connected convolutions engaging the surface of the plates 24 provided with the integral projections, which serve to maintain the convolutions in proper operative positions relatively to each other. The heating element is more particularly disclosed and claimed in a copending application, Serial No. 449,685, filed March 5, 1921, by O. A. Colby and myself and assigned to the Westinghouse Electric & Manufacturing Company. One of the resistor members 27 is located on the upper surface of the plates constituting the top lining of the chamber 18, another resistor member being located on the under side of the plates constituting the bottom lining of the chamber 19 and a third resistor member being located between the two sets of plates constituting the intermediate lining. By suitably selecting the area of cross-section of the resistor members 27, I may connect all of them in series-circuit relation, thus requiring only two end portions 28 being brought out through the furnace structure to be connected to a suitable source of supply.

If found necessary or desirable, I may employ angle members 29 at the front of the chambers 18 and 19 and members 29 of angle-iron section therebetween to protect the relatively fragile bricks or blocks 17 and 21 against injurious effects of the material placed in the furnace chambers 18 and 19. I provide a plurality of vertically extending metallic strips 31 at the front of the furnace structure to hold the member 29 in its proper operative position, bolting them against the casing 12. While I have illustrated a particular means for holding the bricks or blocks constituting the lining 17 and the metallic members 28 and 29 in their proper operative positions, any other desired means may be employed.

By locating two furnace chambers relatively close together and in superposed relation, I provide a double-deck furnace in which heating means is provided for both the top and the bottom of each of the chambers and, instead of employing two resistor members for each chamber, I am enabled to dispense with one of the resistors and to employ only three such resistor members while still obtaining substantially the same heating results. The percentage of heat loss in such a double-deck type of furnace is relatively small, as compared with the percentage of heat lost where only one heating chamber is employed. This is mainly for the reason that the external dimensions of the furnace structure comprising such a double-deck type of furnace is not much larger than that comprising only a single furnace.

The device embodying my invention thus provides a relatively simple and easily assembled and disassembled heating element for a double-deck type of furnace which may be employed to heat treat small metal objects and it provides, also, a relatively compact furnace having a relatively small percentage of heat loss.

This application is closely related to my copending application, Serial No. 527,643, filed January 7, 1923, and assigned to the Westinghouse Electric & Manufacturing Company.

Various modifications may be made in the device embodying my invention without departing from the spirit and scope thereof and I desire that only such limitations shall be placed thereon as are imposed by the prior art or are specifically set forth in the appended claims.

I claim as my invention:—

1. In an electric-resistance furnace, in combination, a refractory casing enclosing a plurality of superposed chambers, a plurality of relatively thin refractory plates constituting the bottom wall of the lower chamber, a plurality of relatively thin refractory plates constituting the top wall of said chamber and the bottom wall of said upper chamber, a plurality of relatively thin refractory plates constituting the top wall of said upper chamber, all of said plates having a plurality of relatively small, spaced, alined, integral projections thereon and a resistor member operatively engaging one surface of each of said refractory plates.

2. An electric furnace comprising two superposed heating chambers, a plurality of relatively thin refractory plates constituting the top and bottom walls of said chambers, each of said plates having a plurality of relatively small, spaced-apart, alined, integral projections on one surface thereof, a resistor for heating the bottom of the lower chamber, a resistor for heating the top of the upper chamber and a resistor for heating the top of the lower chamber and the bottom of the upper chamber, each of said resistors having integral portions maintained in proper operative positions relatively to each other by said alined integral projections.

In testimony whereof, I have hereunto subscribed my name this 10th day of January, 1922.

THOMAS A. REID