

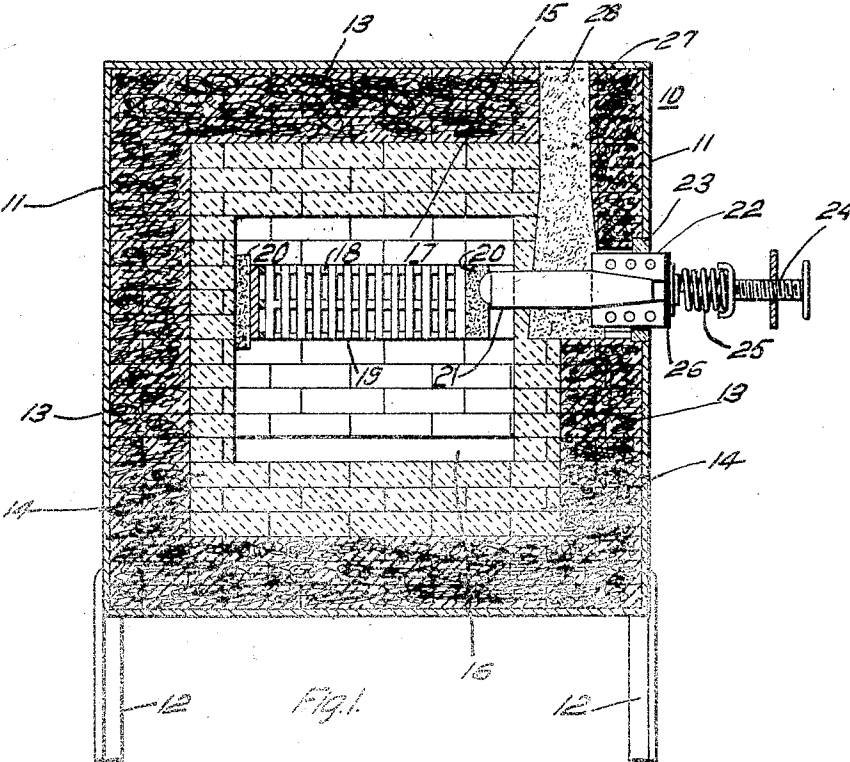
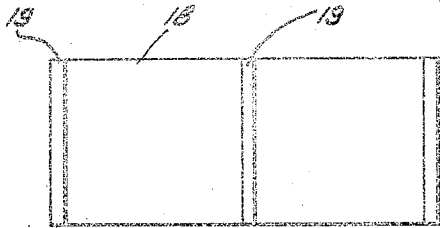
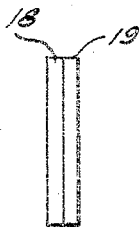
May 29, 1923.

1,456,891

G. M. LITTLE

ELECTRIC FURNACE RESISTOR

Filed May 24, 1921



WITNESSES:

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Patented May 29, 1923.

1,456,89

UNITED STATES PATENT OFFICE.

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ELECTRIC FURNACE RESISTOR.

Application filed May 24, 1921. Serial No. 472,091.

To all whom it may concern:

Be it known that I, GEORGE M. LITTLE, 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 Furnace Resistors, of which the following is a specification.

My invention relates to electric furnaces and particularly to electric-resistance furnaces, and it has for its object to provide a built-up resistor comprising a plurality of relatively large and relatively small carbonaceous elements resiliently compressed in the furnace chamber.

In my co-pending application, Serial No. 454,776, filed March 23, 1921, I have disclosed an electric-resistance furnace in which the heating element comprises a plurality of integral carbonaceous elements.

The resistance of a heating element of the above-described character is relatively low, thus requiring a source of energy of relatively low voltage and relatively high current capacity to energize the heating element to maintain the relatively high temperature desired. The losses in the contact terminals and in the current leads are relatively high, and it is desirable to increase the resistance of the heating element in order to obtain the same temperature in the furnace chamber when using a smaller current.

In practicing my invention, I provide a resistor which comprises a plurality of flat carbonaceous plates alternating with a plurality of relatively narrow thin strips of the same material. The compound resistor is maintained in its operative position in the furnace chamber by means of a resilient compressing means of substantially the character described in the hereinbefore mentioned application. The area of the flat plates and the area and number of the narrow strips are determined in accordance with the desired kilowatt input of the furnace.

In the single sheet of drawings:

Figure 1 is a view, in vertical cross section, of an electric-resistance furnace comprising the device embodying my invention:

Fig. 2 is a view, in side elevation, of one of the flat plates of the resistor upon which are mounted a plurality of thin strips, and

Fig. 3 is a view, in end elevation, of the members illustrated in Fig. 2.

An electric furnace 10 comprises a metallic

framework or casing 11, provided with suitable supporting members 12. Outer walls 13 comprise a plurality of bricks or blocks of a suitable heat-insulating material. Inner walls 14 comprise a plurality of bricks or blocks of a suitable high-temperature resisting material. The walls 14 are spaced apart to provide a furnace chamber 15 of any suitable or desired contour and dimensions.

As the furnace is to be employed in heating metallic articles, an opening 16 is provided in one of the walls, near the bottom of the chamber, to permit of introducing and removing the articles.

A heating element 17, which is located in the furnace chamber, comprises a plurality of relatively large flat carbonaceous plates 18 alternating with a plurality of relatively narrow, elongated strips 19 also made of carbonaceous material. As illustrated in the drawing, the narrow strips 19 are preferably placed transversely of the large plates 18 for a reason to be hereinafter set forth more in detail. End members 20 of graphite are provided, one of the members 20 being located against one of the inner walls 14. The other end member 20 is adapted to be operatively engaged by an elongated carbonaceous electrode 21, extending through one of the side walls of the furnace into the furnace chamber.

A water-cooled metallic contact terminal 22 is provided with a conical aperture which is adapted to be located on the tapering outer end of the electrode 21. In order to insulate the contact terminal 22 from the metallic framework of the furnace, an insulating member 23 is located in the outer face of the furnace wall immediately surrounding the terminal 22.

In order to resiliently compress the built-up resistor 17, I provide a threaded screw 24 and a helical spring 25. The inner end of the helical spring 25 engages an insulating member 26 placed between the end of the spring and the outer face of the contact terminal 22. While I have illustrated a specific resilient compressing means, I desire it to be understood that such means is illustrative only and that any suitable or desired resilient compressing means may be employed.

As the temperature of the inner end of the electrode 21 is relatively very high, the temperature of the electrode inside of the walls

13 and 14 is also relatively high and, if unprotected, would be oxidized by entering air. To protect the electrode over that portion of its length located in the walls 13 and 14, I provide a well or hopper 27 in which is placed a mass 28 of granular carbonaceous material which surrounds the electrode 21 over a portion of its length. Air flowing along the outer surface of the contact terminal 22 encounters the mass of granular material, and expends its oxidizing effect thereon. This arrangement is more fully described and claimed in my co-pending application Serial No. 472,093, filed May 24, 1921.

It is well known that the resistance of a column of resiliently compressed flat carbonaceous plates is relatively very low. By placing a relatively small number of narrow strips of carbonaceous material between two adjacent flat plates, I find it possible to materially increase the resistance of the resistor. This result is, obtained of course, because of the contact resistance existing between the narrow strips and the flat plates and also because of the very large decrease of contact area traversed by the current. I preferably use three narrow strips, locating them to extend transversely of the large plate and symmetrically disposed thereon. The center line of pressure exerted against the built-up resistor by the electrode is so located as to be between two of the symmetrically disposed narrow carbon strips.

The plates are so placed in the furnace chamber that the sides having the longer dimensions are in a substantially vertical position. The narrow strips 19 are, therefore, in substantially a horizontal position and I find this arrangement advantageous in preventing the entering air from oxidizing the upper portion of the flat plates and the upper two narrow strips. In case oxidation is effected by the entering air, the lower edge of the flat plates and the bottom strip are attacked but the built-up resistor is still maintained in its operative position in the furnace, by reason of the fact that the center line of compression is located between two upper narrow strips.

I have found that the amount of current which may be caused to traverse a built up resistor of the above indicated character may easily be regulated by varying either the number of the narrow strips or by varying the area thereof.

It is, of course, apparent that an increase in either the number of strips or of the area of the strips reduces the resistance and, therefore, permits a greater current to flow when the resistor is connected to a source of energy of a given voltage.

The resistor illustrated in the drawing

comprises two parallel parts substantially of the character described in the hereinbefore mentioned application. However, this is not an essential feature, as only one of such parts may be used, in which case terminal electrodes are located in opposite walls of the furnace instead of in the same wall.

It may be noted that the device embodying my invention provides a relatively simple built-up resistor, the resistance of which may be easily varied in accordance with the desired kilowatt input of the furnace. It may be noted also that this type of resistor provides a relatively simple means for varying the resistance either by a change in the number of connecting strips or in the area of such strips.

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. An electric-resistance furnace comprising a built-up resistor consisting of single flat carbonaceous plates of relatively large area of cross-section alternating consecutively with a plurality of flat carbonaceous plates of relatively small area of cross section, the area of cross-section of the small plates being in accordance with the kilowatt input of the furnace.

2. An electric-resistance furnace comprising a built-up resistor of alternating plates of carbonaceous material of relatively large area of cross-section and a plurality of narrow elongated bars of carbonaceous material, each of said bars extending laterally of said large plates and means for compressing said built-up resistor, the center line of compression being located between two of said bars and above the center of gravity of the area of the large plate.

3. An electric-furnace resistor comprising flat carbonaceous plates of relatively large area of cross-section, and a plurality of relatively narrow carbonaceous bars of relatively small area of cross-section located between adjacent plates of large area.

4. An electric-furnace resistor comprising flat carbonaceous plates of relatively large area of cross-section and a plurality of relatively narrow carbonaceous bars of relatively small area of cross-section located in spaced-apart relation between adjacent plates of large area.

In testimony whereof, I have hereunto subscribed my name this 18th day of May, 1921.

GEORGE M. LITTLE.