T. F. BAILY AND F. T. COPE.

RESISTANCE ELEMENT.

APPLICATION FILED APR. 3, 1919.

1,372,330. Patented Mar. 22, 1921.

Fig. 1.

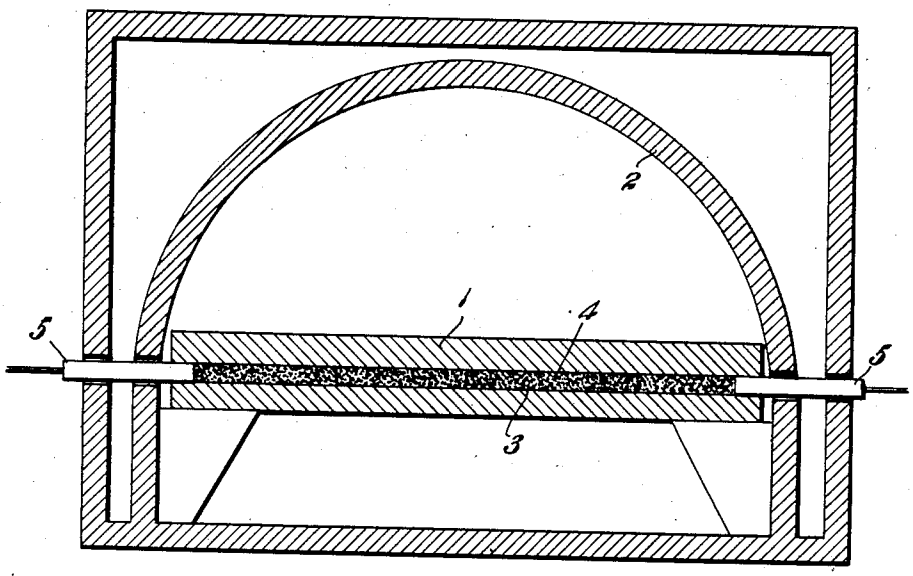


Fig. 2.

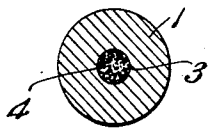
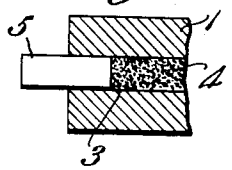


Fig. 3.



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UNITED STATES PATENT OFFICE.

THADDEUS F. BAILY AND FRANK T. COPE, OF ALLIANCE, OHIO, ASSIGNORS TO THE ELECTRIC FURNACE COMPANY, OF ALLIANCE, OHIO, A CORPORATION OF OHIO.

RESISTANCE ELEMENT.

1,372,330. Specification of Letters Patent. Patented Mar. 22, 1921.

Application filed April 3, 1919. Serial No. 287,280.

To all whom it may concern:

Be it known that we, THADDEUS F. BAILY and FRANK T. COPE, citizens of the United States, both residing at Alliance, in the county of Stark and State of Ohio, have invented a new and useful Resistance Element, of which the following is a specification.

This invention relates to resistance elements for electric furnaces, the object being to construct a resistance element of a material of high conductivity, inclosed within material of low conductivity, the said material of high conductivity being sealed within the material of low conductivity and being designed to function primarily as a heating element to raise the temperature of the material of low conductivity to thereby increase the conductive efficiency of the material of low conductivity.

With this and other objects in view the invention consists in the novel construction and arrangement of parts, hereinafter described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size and minor details of construction may be made within the scope of the appended claims, without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawings:

Figure 1 is a transverse section through an electric furnace of the resistance type showing our improved resistance element in position within the heating chamber.

Fig. 2 is a cross section through a resistance element constructed in accordance with our invention, said element being made in tubular form.

Fig. 3 is a fragmentary view showing a longitudinal section through an end portion of one of our improved resistance elements.

Similar numerals of reference indicate corresponding parts throughout the several figures of the drawing.

In electrical furnaces of the kind known as the granular carbon resistance type, the common practice employed in constructing resistance elements is to form a trough of material of an extremely high fusing point, fill the said trough with particles of cracked carbon or similar material and place electrodes at either end of the said trough in contact with the cracked carbon. The current is then passed from one of the electrodes through the cracked carbon to the other electrode and the particles of carbon are raised to the point of incandescence, by which means the heat is generated within the furnace. Loss of the carbon through oxidation as well as other objections are found to this type of element, but because of the fact that a material of high conductivity must be used to create the heat, this type of element continues to be used.

In our device we aim to obviate the objections which exist in the now known types of elements. The outer portion 1 of our resistance element is preferably formed of carborundum which is a material of very high fusing temperature, but of low electrical conductivity at atmospheric temperature. The element is placed within the heating chamber 2 in the ordinary way and may be formed, as shown in Fig. 2, of a single solid piece of carborundum with an aperture 3 extending longitudinally through its center portion. This aperture or bore is relatively small in comparison with the diameter of the carborundum portion of the element. Cracked carbon, shown at 4 or other suitable material is packed within the bore and the usual electrodes 5 are then inserted to form a sealed joint at each end, no air being permitted to contact with the particles of carbon. When the current is turned on it will readily flow from one of the electrodes 5 through the cracked carbon to the other electrode, since the carbon is a material of low conductivity, but little current will flow through the carborundum portion of the element until the temperature of the said carborundum has been raised to a high point due to the heating of the carbon. When, however, the temperature of the carborundum has begun to rise, its conductivity will also rise and upon reaching a high temperature, the carborundum itself becomes a conductor and the current will flow freely through the carborundum portion of the element. The cracked carbon being sealed within the carborundum portion of the element cannot be lost through oxidating and since the carborundum itself does not begin to oxidate until it reaches a temperature considerably higher than any working temperature needed within the fur-

nace chamber, there is no loss of carborundum due to oxidating thereof.

While we have shown the cross section in Fig. 2 of the drawings as using a solid cylindrical piece of carborundum with a cylindrical bore therethrough it is obvious that the carborundum portion can be made up in sections and fitted together to give any outside contour without changing the principle of the invention.

Having fully described our invention what we claim as new and desire to secure by Letters Patent, is—

1. A resistance element comprising an outer portion formed of material of low electrical conductivity and having a bore therethrough, and a material of high electrical conductivity within said bore.

2. A resistance element having a hollow portion formed of a material of low electrical conductivity, said hollow portion being filled with a material of high electrical conductivity.

3. A resistance element composed of a portion formed of material of relatively low electrical conductivity and a portion formed of material of relatively high electrical conductivity, the material of high conductivity being sealed within the material of low conductivity and electrodes in contact with the material of high conductivity.

4. A resistance element formed of material of low electrical conductivity with an aperture extending lengthwise of said element, a material of high electrical conductivity filling said aperture and electrodes in contact with said material of high conductivity, said material of high conductivity being sealed within the material of low conductivity.

5. A resistance element formed of carborundum or like material and having an aperture extending lengthwise therethrough, cracked carbon or like material filling said aperture and sealed therein.

6. A heating element which carries current at a high temperature and a resistance element within said heating element to bring the temperature of the heating element to the point where it will carry current.

7. A heating element which normally at low temperature is a poor electrical conductor and a resistance element embedded within the heating element to bring the temperature of the heating element to a point where it will carry current.

8. A primary conductor comprising a jacket of material having a high electrical resistance at low or normal temperatures and a secondary resistance contained within said jacket for heating the jacket to a point where the major portion of the electricity will flow through the jacket.

In testimony that we claim the above, we have hereunto subscribed our names.

THADDEUS F. BAILY.
FRANK T. COPE.