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RESISTOR

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The object of my invention is the production of an electric resistor that will stand high temperature and may be used in high temperature smelting in place of the electric arc, thereby avoiding the addition of carbon in the production of the smelting from the carbon of the arc.

A further object of my invention is the production of a resisting material of high refractory nature suitable for use in electric furnace work, especially where a crucible is used packed within a surrounding body or mass of my resistor.

A further object of my invention is an improved process for making the ingredient zirconium carbide used in the formation of my resistance material.

A further object of my invention is the method of treatment of my resistance material for forming resistors.

My resistor is especially adapted for electric furnaces, muffles, calcining, tempering, and tempering furnaces and melting; also, for heating bars (space heaters), electric ranges, electric irons and stoves, and, in fact, for any apparatus in which an electric resistance element may be used.

With the foregoing and other objects in view, my invention consists of the methods employed, combination and arrangement of systems and means as hereinafter specifically provided, but it is understood that changes, variations and modifications may be resorted to which come within the scope of the claims hereunto appended.

I physically mix boron nitrid and zirconium carbide, and if for use in formed resistors I crush, grind and mix the ingredients; if it is to be used as a loose resisting material, I crush or grind to a desired size or mesh, depending upon the resistance required. The boron nitrid acts as a non-conducting, highly-resistance and highly-refractory substance; the zirconium carbide acts as a conductor and as a high refractory.

When these two substances are mechanically mixed in granular form, they form a resistance material capable of producing intense heating effect, the finer the ingredients the less the resistance.

One method I use in making my resistor consists of reducing the mixed ingredients to a fine powder and then packing the same into an iron mould under rather high pressure; as an example, using a 1 in. iron pipe about 1 ft. long,

packing the powder into this pipe under about 4000 lbs. pressure, then heating to approximately 2900° F. and allowing to cool, resulting in a very tenacious yet brittle resistance.

In this specification and claims, when I use the term, "resistor", I mean either a formed, rigid article, or a loose, granular mass.

In a resistance furnace I make large bars in formed or moulded shape with the powder above mentioned moistened with water, or a binding material such as, starch, or molasses, and trowel the same into moulds under a considerable pressure or tamping. These moulds are thoroughly dried, heated or calcined and produce a resistance element that will stand approximately 3000° C.

I make my zirconium carbide, used as above, as follows: I fuse together zirconium oxide (ZrO_2) and carbon; I mix ZrO_2 and graphite, in the proportion of $\frac{1}{2}$ lb. graphite with 4 lbs. ZrO_2 , and fuse in an arc furnace provided with a neutral, or zirconium, content lining.

I have found that a considerable variation in the percentage of the ingredients used may be allowed without affecting the utility of the resistor; also, that practically any fluid or cementing ingredient may be used, as in the extremely high temperature the binding material is probably eliminated and a cohesion of the primary elements is sufficient to maintain the entity of the product.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. The process of forming an electric resistor comprising mechanically mixing boron nitrid and the product obtained from fusing zirconium oxide and carbon at a high temperature, then compacting the mixture so formed and heating to a temperature approximately 2900° F.

2. A process of manufacturing a resistance element which comprises mixing substantially $\frac{1}{2}$ lb. of graphite with 4 lbs. of ZrO_2 , fusing the same my an electric arc, then reducing the resultant to sufficient fineness to co-mingle with other ingredients, then co-mingling said resultant with boron nitrid in the substantial ratio of 75% of boron nitrid and 25% of the said resultant, compacting the same and then heating to approximately 2900° F.

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