J. L. K. SNYDER.

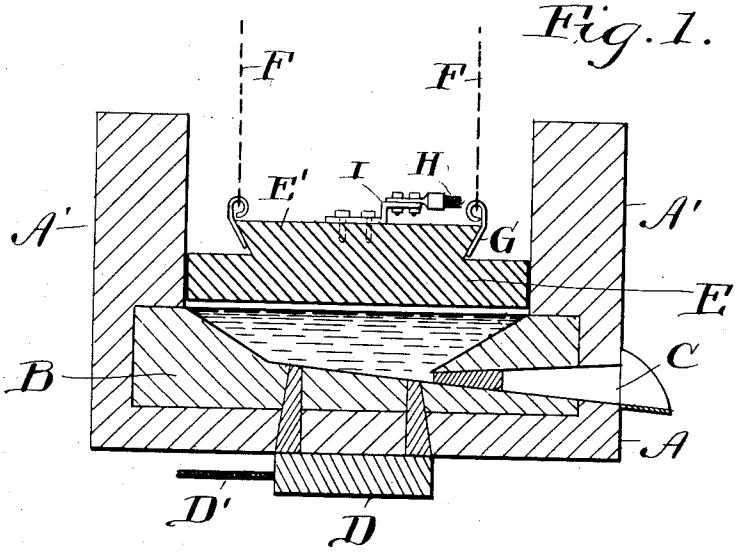
ELECTRODE COVER FOR ELECTRIC FURNACES.

APPLICATION FILED SEPT. 5, 1911.

1,010,001.

Patented Nov. 28, 1911.

Fig. 1.



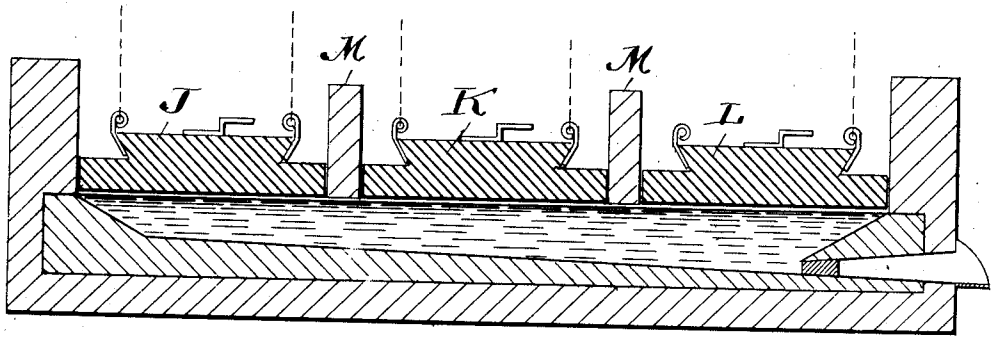
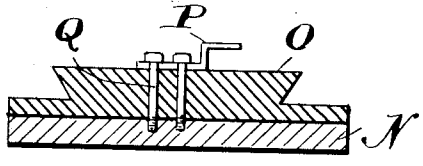


Fig. 2.

Fig. 3.



Witnesses.
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UNITED STATES PATENT OFFICE.

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ELECTRODE-COVER FOR ELECTRIC FURNACES.

1,010,001. Specification of Letters Patent. Patented Nov. 28, 1911.

Application filed September 5, 1911. Serial No. 647,465.

To all whom it may concern:

Be it known that I, JOSEPH L. K. SNYDER, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Electrode-Covers for Electric Furnaces, of which the following is a full, clear, and exact description.

This invention relates to electric furnaces and the object is to provide a furnace, the cover for which, forms at least one of the electrodes for introducing the electric current within the furnace.

Generally speaking, the invention comprises the elements and combinations thereof set forth in the accompanying claims.

Reference should be had to the accompanying drawings forming a part of this specification which show one form that the invention may assume.

Figure 1 is a sectional elevation of a furnace using a single phase current and embodying my invention; and Fig. 2 is a sectional elevation of a furnace employing a three-phase current and showing my invention applied thereto.

In the furnace shown in Fig. 1, the body of the furnace is represented at A and the vertical side walls thereof at A′. It will be understood that the body, as well as the side walls of the furnace are made of suitable refractory material, and in addition, such material as will form a good insulation against loss of heat by radiation.

The hearth of the furnace is represented at B and is formed of suitable refractory material. A tapping hole or opening is indicated at C, which is of the usual construction.

One of the electrodes with which the furnace is provided is indicated at D, and the electric current is conducted to the same through the conducting agent D′. This construction is such as is ordinarily used in electric furnaces.

The cover E is of such proportions that it fits between the walls A′ and at the same time may easily be moved up and down within the space between the walls. In length, the cover is terminated by the end walls of the furnace. This cover is formed of some material or mixture of materials which produce a cover that will conduct electricity and at the same time will be highly refractory. The material most completely filling the requirements enumerated, is carbon or carbon mixed in suitable proportions with some such material as carborundum or alundum, or similar substances. The cover may conveniently be formed in a mold in which is placed granular carbon mixed with a suitable binder, the same being tamped to form a compact structure which is subsequently removed from the mold and baked.

The cover is suspended upon flexible hangers F by means of suitable clamps G which engage with a projecting portion E′ of the cover. This construction is but suggestive and other structures may be used which will accomplish the same purpose.

It will be apparent that the cover may be adjusted with respect to its height above the hearth of the furnace by increasing or diminishing the length of the flexible members F.

The current is conducted to the cover E by means of the conductor H and terminal member I, which latter member is securely fastened to the cover E so as to make good electrical contact therewith.

In Fig. 2 there is shown a type of furnace employing a three-phase current and in this connection, the furnace may be provided with a cover having three sections represented at J, K and L, each section being separated from its adjacent section by means of an insulating wall of refractory material, such as is represented at M. These cover sections are likewise suspended upon flexible members, the same as is indicated in Fig. 1, and the current may be introduced into each section in a manner similar to that shown in Fig. 1, and each of the sections is electrically connected to one of the three wires of a three wire circuit carrying a three-phase current. This furnace is but one form which a furnace embodying the principle of this invention and using a three-phase current may assume, and it will be understood that the cover electrode idea may be worked out in connection with any polyphase current it is desired to use.

In each form of the furnace shown, the cover is maintained above the bath in the

furnace a distance only sufficient for the maintenance of the arc, it being understood that the arc is formed between the electrode cover and the bath of materials which are being acted upon.

Suitable mechanism will be provided to maintain the covers at the proper distance from the bath of material within the furnace to maintain the arc. However, this mechanism forms no part of the invention, and is not shown.

In the ordinary electric furnace, the cover is maintained at some distance above the surface of the material being treated and this is necessarily so because the cover although composed of refractory material will nevertheless be melted if the cover is brought too near to the surface of the molten bath within the furnace. Even at the distances at which covers for electric furnaces are customarily placed, the inside of the cover usually melts and flows somewhat and must frequently be renewed. Hence, there is of necessity a certain dead space which must be heated and the heat passing through this space and being again reflected upon the bath loses its intensity because of the distance through which it must pass.

A furnace of the present invention may have the cover as near the surface of the bath as is possible without touching it, for carbon or carbon mixed with such substances as indicated is substantially a perfectly refractory material and the most intense heat which might be developed in the furnace would not be sufficent to cause even a flowing of the material of which the cover is composed. It will thus be apparent that the space between the cover and the bath becomes a minimum and the heat developed by the current flow is all confined within a comparatively small space and hence accomplishes its maximum usefulness. It should further be noted that in the usual electric furnace employing the ordinary electrodes, these electrodes become spindling or pointed upon that end which is adjacent the material within the furnace. This is objectionable, inasmuch as it reduces the area of the electrode which is adjacent the furnace bath and by so much restricts the area of the bath over which the arc may play as it travels upon the face of the electrode which is adjacent the bath. As the electrode becomes more spindling, it will eventually confine the arc to substantially a single spot, thus reducing the area of the bath in the furnace directly affected by the arc and by so much reducing the efficiency of the furnace.

The electrode cover of this invention being so near to the surface of the bath within the furnace, as has before been said, provides only a small space between the bath and the electrode cover, and the atmosphere within this space will be substantially reducing. Hence, the electrode will not be consumed at least with any such rapidity as is the case with electrodes as at present constructed and used. Therefore, the cover electrode will present substantially the same area to the surface of the bath within the furnace at the end of a given operation as at the beginning thereof. A further advantage is obtained by the use of the cover electrode here proposed, due to the fact that the electrode cover is of as great area, as the bath being treated. Hence, the arc traveling as it does over all the surface of the cover electrode which is opposite or adjacent the materials in the furnace, will directly and successively act upon different portions of the material being treated, and in fact will in the course of the treatment of a given bath of material play over substantially the entire surface thereof, and hence the distribution of heat will be substantially uniform throughout the material treated. As will be apparent, this result is highly desirable, and it cannot be obtained in the furnaces using the ordinary electrodes.

While the electrode covers thus far described have been shown as made entirely of a given material or mixture of materials, it is to be understood that it is entirely within the scope of my invention to have only the lower portion, or that portion which is adjacent the material being treated, made of conducting material, and the upper portion may, if desired, be made of suitable refractory material, and further suitable heat insulating material may be employed in connection with the cover to prevent the radiation of heat as much as possible. Such a cover is shown in Fig. 3, the conducting portion being indicated at N and the other part of the electrode at O. The electric current is conducted to the portion N of the cover through the plate P and pins Q. This cover is used in a furnace in the same manner as indicated in Figs. 1 and 2. Therefore, where in this specification and claims I speak of the cover as being of conducting material or of carbon or a mixture of carbon with other materials, it is intended to include all forms of the cover herein shown and described.

Having thus described my invention, what I claim is:

1. The combination with an electric furnace of the arc type, of an electric current conducting cover therefor, and means for conducting an electric current thereto whereby the cover forms at least one of the electrodes for the furnace.

2. The combination with an electric furnace, of an electric current conducting cover therefor, said cover being adjustable with respect to the furnace, and means for leading an electric current to said cover.

3. The combination with an electric fur-

nace of the arc type, of a cover therefor, said cover being adapted to conduct an electric current, that portion of the cover which is toward the material within the furnace being composed substantially of carbon.

4. The combination with an electric furnace of the arc type, of a cover therefor, that portion of the cover which is toward the material within the furnace, at least being composed of conducting material, and means for leading an electric current to the cover.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

JOSEPH L. K. SNYDER.

Witnesses:
RICHARD H. HARVEY,
L. O. BROOKS.