A. P. SULLIVAN.

METHOD OF MAKING GRAPHITIZED MATERIAL.

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1,411,537. Patented Apr. 4, 1922.

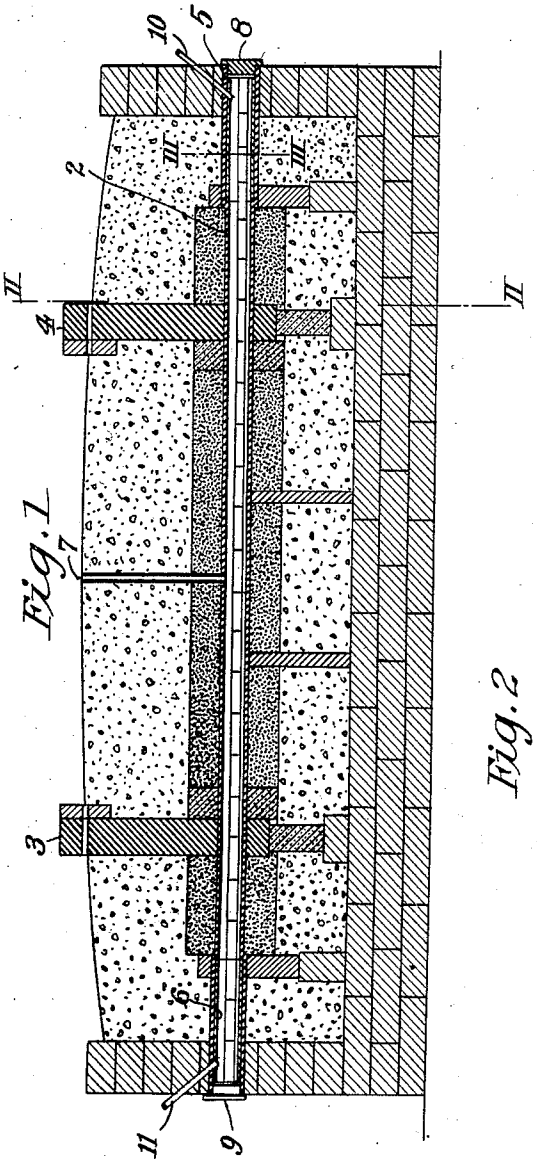


Fig. 1



Fig. 3

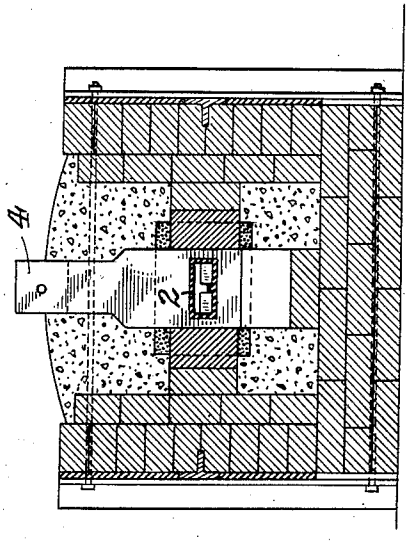


Fig. 2

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METHOD OF MAKING GRAPHITIZED MATERIAL.

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To all whom it may concern:

Be it known that I, ALAN P. SULLIVAN, a resident of St. Marys, Pennsylvania, have invented certain new and useful Improvements in Methods of Making Graphitized Material, of which the following is a specification.

My invention relates to the graphitization of molded plates for use as electrodes, brushes and the like, and the particular object which I seek to attain is a method of graphitizing in which a minimum of electrical energy is consumed and by which uniformity of properties may be obtained in the material treated, by the close control of the conditions to which the articles are subjected, and by being able to vary these conditions at will.

In accomplishing these results, I have developed a method of operation which is substantially continuous, that is, the molded material that is being treated is pushed intermittently into one end of the furnace and is taken out of the other end of the furnace in finished form. In order to permit of the furnace being operated thus continuously it is necessary to make provision for the carbon ash which is volatilized during the graphitizing operation and which would rapidly choke a continuous furnace if it could not be removed. Also, I find that I obtain the best results by using a furnace in which the material under treatment is heated to the graphitizing temperature by radiant heat and at the same time is subjected to the flow of an electric current which tends to generate heat within the material itself.

In order that a complete understanding of my invention may be had, reference is made to the accompanying drawings which illustrate one form of apparatus which may be used in connection with my invention, and in which Fig. I shows a longitudinal section of such a furnace, Fig. II shows a section of line II—II of Fig. I and Fig. III shows a section of the furnace tube on line III—III of Fig. I.

In the illustrative furnace shown in these drawings, there is a central chamber 2, composed of carbon preferably in the form of graphite. Intermediate the ends of the chamber 2 are electrodes 3 and 4. The central portion of chamber 2 has a uniform cross section but the end portions of this chamber have double walls, the internal walls comprising liners 5 and 6 which are removable.

Granular graphite is packed around chamber 2 inside of and in contact with electrodes 3 and 4. This serves to make a good electrical connection between these electrodes and the chamber. Surrounding the balance of chamber 2 for the greater portion of its length is insulating material such as lamp black. Again surrounding the lamp black there may be interposed a layer of some additional insulating material such as a mixture of coke and sand, and outside of this there may be walls of brick held together by metal beams. Extending upwardly from the ends of chamber 2 is an exhaust passage 7. The ends of chamber 2 are provided with plugs 8 and 9.

In operation the material to be treated is molded into shape and inserted at both ends of chamber 2 but in different grooves of the floor of the chamber. These grooves are clearly shown in Fig. III. At frequent intervals, additional pieces are put in, each one pushing its predecessor along in front of it until the furnace is full. When the furnace is full a piece is removed from the exhaust end of the groove before an additional piece is inserted at the feeding end of the groove. Of course, the plugs 8 and 9 must be removed each time that material is either fed into the furnace or removed from it.

As is readily apparent, the fact that the plates under treatment rest on the actual resistance element and are fed into the furnace in continuous succession will bring the material into the electrical circuit, with the result that some of the electricity will pass directly through the material, thereby increasing the heating action and permitting a high rate of production.

In operation I have found that using a chamber having a total length of eight feet and having electrodes placed four feet from center to center, it is possible to get good graphitizing when the material treated is fed into the furnace at intervals of not over five minutes. In one case carbon plates having a scleroscope hardness of about 75 were reduced to a hardness of about 35 and the electrical resistance became about .0014 ohm per inch cube with less than five minute intervals of charge and discharge.

It is desirable to arrange the furnace as shown with two grooves through which the

molded parts are pushed in opposite directions, for otherwise the cold articles tend to chill the ends of the furnace whereas the hot articles coming from the other end increase its heat very materially. By having the chamber extend a considerable distance outside of the electrodes and by providing grooves through which the material is pushed in opposite directions, the residual heat of the articles which have been graphitized is largely absorbed by the new articles which are being introduced into the furnace so that great economy is obtained.

During the graphitizing process a temperature in excess of 4000° F. is used and at this temperature a certain amount of the material is volatilized at the center of the furnace. This volatilized material quickly solidifies when cool and forms what is known as carbon ash. The liners 5 and 6 are provided so that when a substantial amount of ash collects at the cool ends of the furnace they can quickly be removed and others inserted so that the dirty ones may be cleaned. Also the deposits of ash at the ends of the furnace can be kept at a very low point by flushing the chamber either continuously or from time to time by a neutral gas such as natural gas which may be passed into both ends of the furnace as through the passages 10 and 11 and which passes out of the exhaust pipe 7. Under some conditions it will be found that either the use of liners alone or the use of the neutral gas alone will be sufficient whereas under the other conditions the use of both may be desirable.

It is to be borne in mind that the furnace described herein is given only by way of example and that many different forms of furnaces may be used and that the details of the operation may be modified in many particulars without departing from the spirit of my invention.

What I claim is:

1. In the manufacture of graphitized material the step of passing a continuous succession of pieces of molded carbon along and in contact with an electrically charged resistance element so that such pieces will be acted on by the heat of the resistance element and also will themselves conduct some portion of the electrical charge and be subject to the internal heat action thereof.

2. In the manufacture of graphitized material the step of passing a continuous succession of pieces of molded carbon through and in electrical contact with an electrically charged resistance element whereby such pieces are heated externally by the heat generated in the resistance element and at the same time such pieces will themselves conduct some portion of the electrical flow which will tend to heat them internally.

3. In the manufacture of graphitized material the step of passing a succession of pieces of molded carbon in a continuous manner through and in contact with a graphite tube heated to the graphitizing temperature by an electrical current passing through it.

4. In the manufacture of graphitized material the step of passing a succession of pieces of molded carbon in a continuous manner through and in contact with a graphite tube heated to the graphitizing temperature by an electrical current passing through it which tube is provided with means for removing matter that has been volatilized.

ALAN P. SULLIVAN.