P. L. T. HÉROULT.

APPARATUS FOR GRAPHITIZING LARGE ELECTRODES.

APPLICATION FILED OCT. 18, 1909.

1,029,121. Patented June 11, 1912.

Fig. 1.

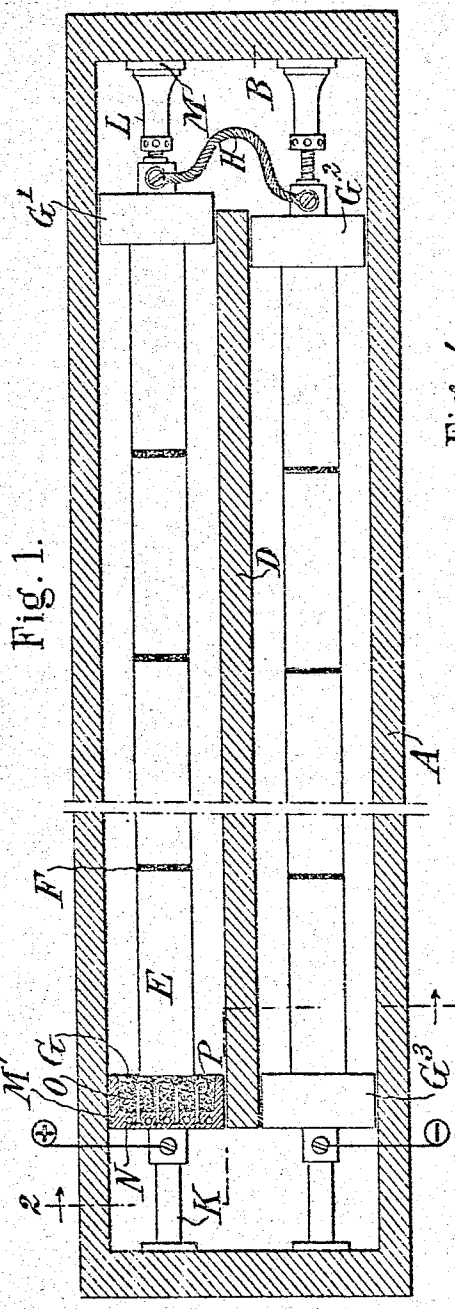


Fig. 4.

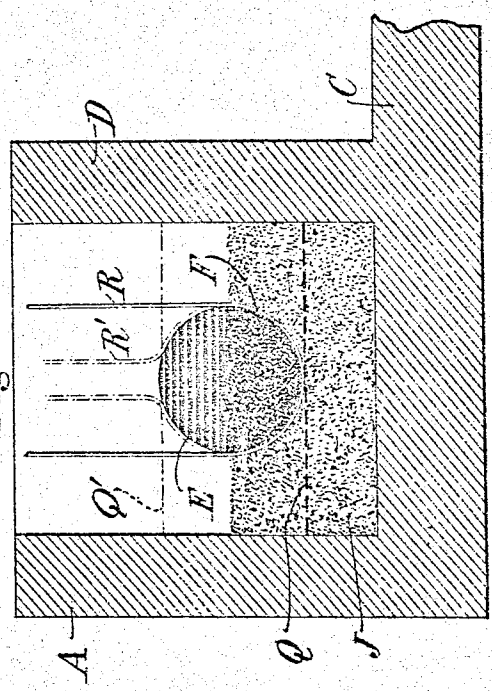


Fig. 2.

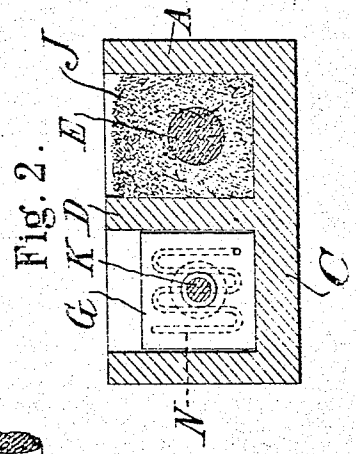
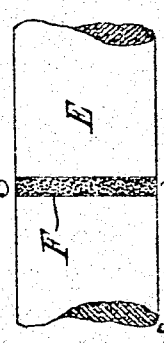


Fig. 3.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR GRAPHITIZING LARGE ELECTRODES.

1,029,121. Specification of Letters Patent. Patented June 11, 1912.

Application filed October 18, 1909. Serial No. 523,194.

To all whom it may concern:

Be it known that I, PAUL LOUIS TOUSSAINT HÉROULT, a citizen of the Republic of France, residing at La Praz, Savoy, France, have invented certain new and useful Improvements in Apparatus for Graphitizing Large Electrodes, of which the following is a specification.

In graphitizing, according to the Acheson process, it is customary to arrange the articles to be graphitized in piles separated from each other along the length of the furnace with resisters of suitable material between the successive piles. According to this process articles of great length, such as large electrodes for electric furnaces, have to be placed crosswise of the direction of the current. The current in passing through such electrodes from one resister to the next, tends to concentrate near the middle of the lengths of the electrodes to such an extent as to cause cracks and breakages. It has been impracticable to apply this process to electrodes of great size and such electrodes have been made in short sections screwed together at their ends in order to obtain the desired length.

According to this invention I propose to graphitize electrodes of the largest size integrally, by passing the current longitudinally through a series of them arranged end to end with good electrical connections between them.

The accompanying drawings illustrate an embodiment of the invention.

Figure 1 is a plan partly in section of a furnace at work, omitting the blanketing material. Fig. 2 is a cross-section on the line 2—2 Fig. 1. Fig. 3 is a plan, and Fig. 4 is a cross-section, on a larger scale than Figs. 1 and 2, of parts of the furnace.

Referring to the apparatus illustrated, the furnace is a rectangular box with side walls A, end walls B and a bottom C of brickwork and with a central longitudinal partition D also of brickwork for retaining the granular material which is used as a blanket to keep the heat in. The central partition D divides the furnace into two longitudinal compartments in which the process is carried on. In each of the compartments there is a long line of electrodes E arranged end to end with a packing F of graphite forming a good electrical connection between them. Each of the chambers is closed at its ends by a pair of terminal blocks approximately fitting the rectangular cross-section of the chamber. These terminals are indicated at G, G′, G^2, and G^3. The terminal G is connected to the positive cable and the terminal G^3 to the negative cable. The terminals G′, G^2 are connected to each other by means of a flexible cable H. The passage of the current from the terminal G through the terminals G′ and G^2 to the terminal G^3 is through the electrodes which constitute the resistance and carry all the graphitizing current within themselves, so that there is no tendency to an irregular action of the current at different parts of an electrode. The same quantity of current flows through each cross-section of the electrode, and the cross-sections are substantially identical.

The column of electrodes is surrounded by a heat-retaining blanket J which may be, for example, of pulverized charcoal. It is retained at the sides by the longitudinal walls A and the partition D, and at the ends by blocks G, G′, G^2 and G^3 which, as stated above, serve also as terminals for conveying the current to the ends of the columns. These blocks are designed to facilitate the making of a good electrical connection between the adjacent ends of the successive electrodes. For this purpose the blocks G and G^3 are supported by struts K bearing against the adjacent end wall of the furnace, and the opposite blocks G′ and G^2, between which is the flexible connection H, are backed by jacks L of any suitable type, such as screw jacks or hydraulic jacks, with which a constant pressure may be maintained against the ends of the electrodes, blocks M of wood or other yielding material being arranged behind the jacks so as to automatically provide for the dilatation which occurs when the current is first turned on, and the shrinkage which subsequently follows.

The construction of one of the blocks is indicated in the sectional view at G, Fig. 1. A cup-shaped shell M′ of cast iron is cast with a circulating pipe N therein for cooling it with water, and with prongs O of wrought iron embedded in the bottom of the shell, and projecting therefrom to bind the shell firmly to the filling of carbon P which is compressed within the shell.

It is important to secure a good connection between the ends of the electrodes E, and this I accomplish by introducing powdered graphite and tamping it between the ends of the electrodes, and pressing the electrodes together during the graphitizing process by means of the jacks L. The method of introducing the graphite is indicated in Fig. 4. The powdered charcoal J is first introduced to the level Q and the electrodes E laid thereon with a strip R of paper, sheet metal or other flexible material passed around under the joint. The ends of the strip are brought upward, as shown in full lines, after which the powdered charcoal is also introduced to the level indicated in full lines, and the powdered graphite F introduced from the top and tamped. The paper is then brought together in the manner indicated in dotted lines at R′ and the powdered charcoal raised to the level Q′ and the graphite tamped to the same level; and so on until the tamping is completed throughout the joint, after which the ends of the strip R are removed and the charcoal filled in upon the top of the electrode to the desired height. The jacks are then used to compress the joints and the current applied.

In a specific example of the invention electrodes 20 inches in diameter and 7 to 10 feet long, are treated in a furnace of the relative dimensions indicated in the drawings. Such a furnace takes about 120 volts at the start, the voltage being gradually reduced to about 35, and the greatest efficiency being between 70 and 35 volts. Under these conditions the electrodes are thoroughly graphitized in about 40 hours.

I make no claim herein to the method of graphitizing which is made the subject of my application, No. 543,067, filed February 10, 1910.

What I claim is:—

1. A furnace for graphitizing electrodes having means for containing a plurality of electrodes placed end to end, and means spaced apart a distance greater than the length of a single electrode, for making electrical connections with the endmost electrodes, whereby the current is conducted endwise through the column of electrodes.

2. A furnace for graphitizing electrodes having means for containing a plurality of electrodes placed end to end, means for making electrical connections between such electrodes, and means spaced apart a distance greater than the length of a single electrode, for making electrical connections with the endmost electrodes, whereby the current is conducted endwise through the column of electrodes.

3. A furnace for graphitizing electrodes having means for containing a plurality of electrodes placed end to end, means spaced apart a distance greater than the length of a single electrode, for making electrical connections with the endmost electrodes, and means adapted to press the endmost electrodes toward each other, whereby the current is conducted endwise through the column of electrodes.

4. A furnace for graphitizing electrodes comprising a pair of chambers alongside of each other and adapted to contain a plurality of electrodes placed end to end, and a block at each end of each of said chambers, said blocks spaced apart a distance greater than the length of a single electrode for making electrical connections with the endmost electrodes, and means for pressing the blocks at one end forward to press the electrodes toward the blocks at the other end, whereby the current is conducted endwise through the column of electrodes.

5. The combination with a furnace for graphitizing electrodes including a pair of chambers adapted to contain a plurality of electrodes placed end to end in each of said chambers, a stationary terminal block at one end of each of said chambers, and a movable terminal block at the opposite end of each of said chambers, said blocks spaced apart a distance greater than the length of a single electrode for making electrical connections with the endmost electrodes, and means for pressing said movable blocks forward.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

PAUL LOUIS TOUSSAINT HÉROULT.

Witnesses:
D. ANTHONY USINA,
FRED WHITE.