No. 701,986. Patented June 10, 1902.

E. G. ACHESON.

TERMINAL FOR ELECTRIC FURNACES.

(Application filed May 24, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

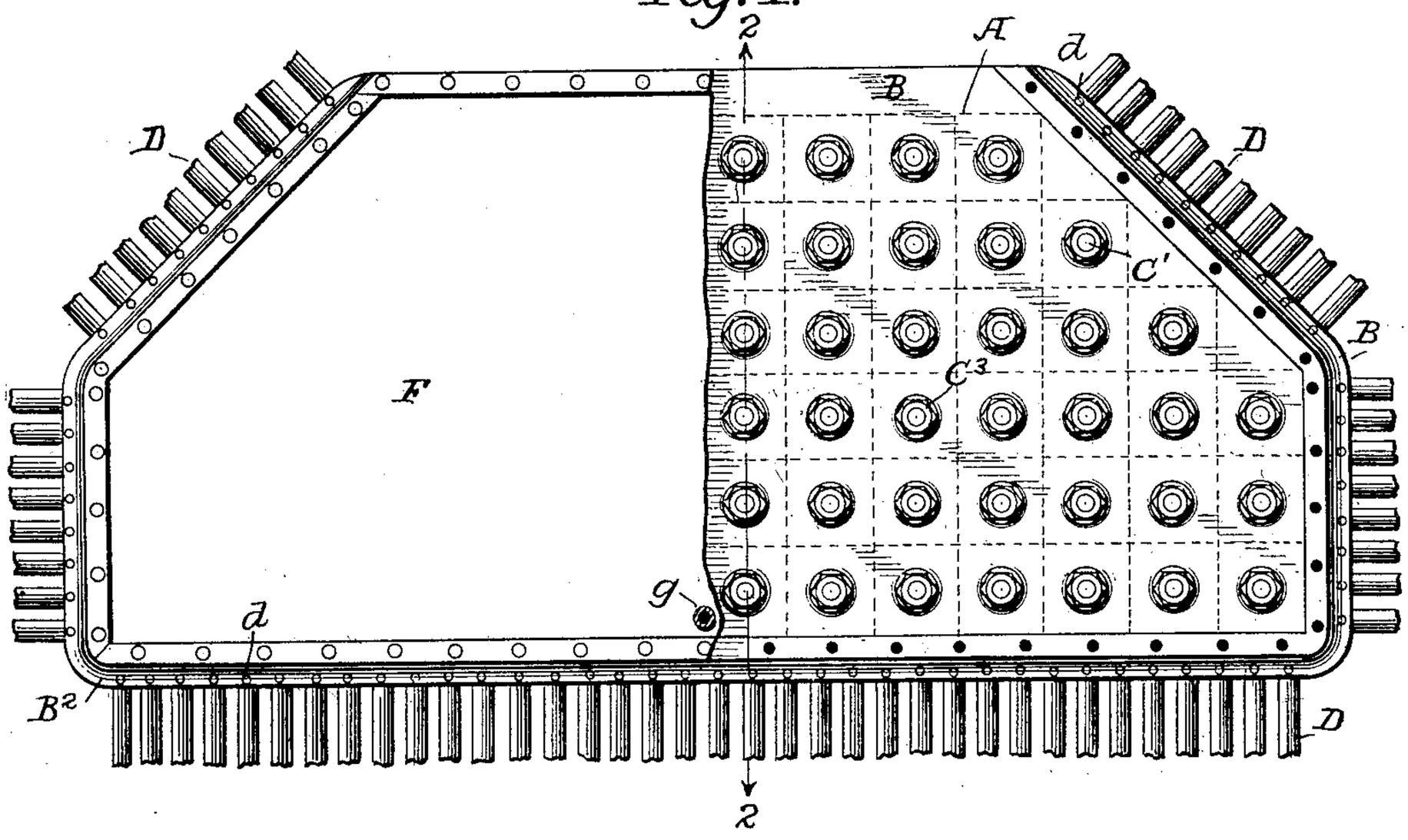

Fig. 2.

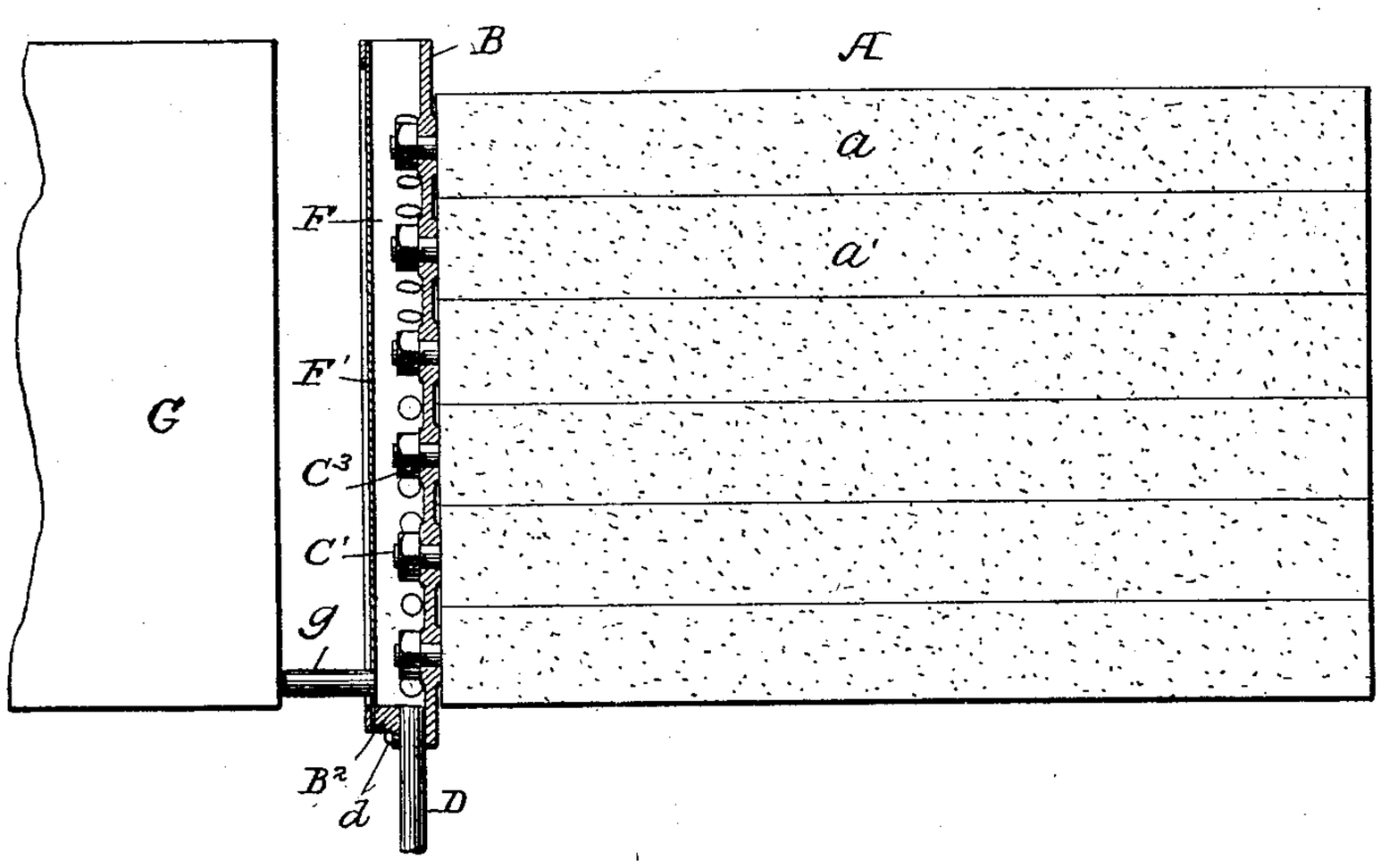

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Fig. 3.

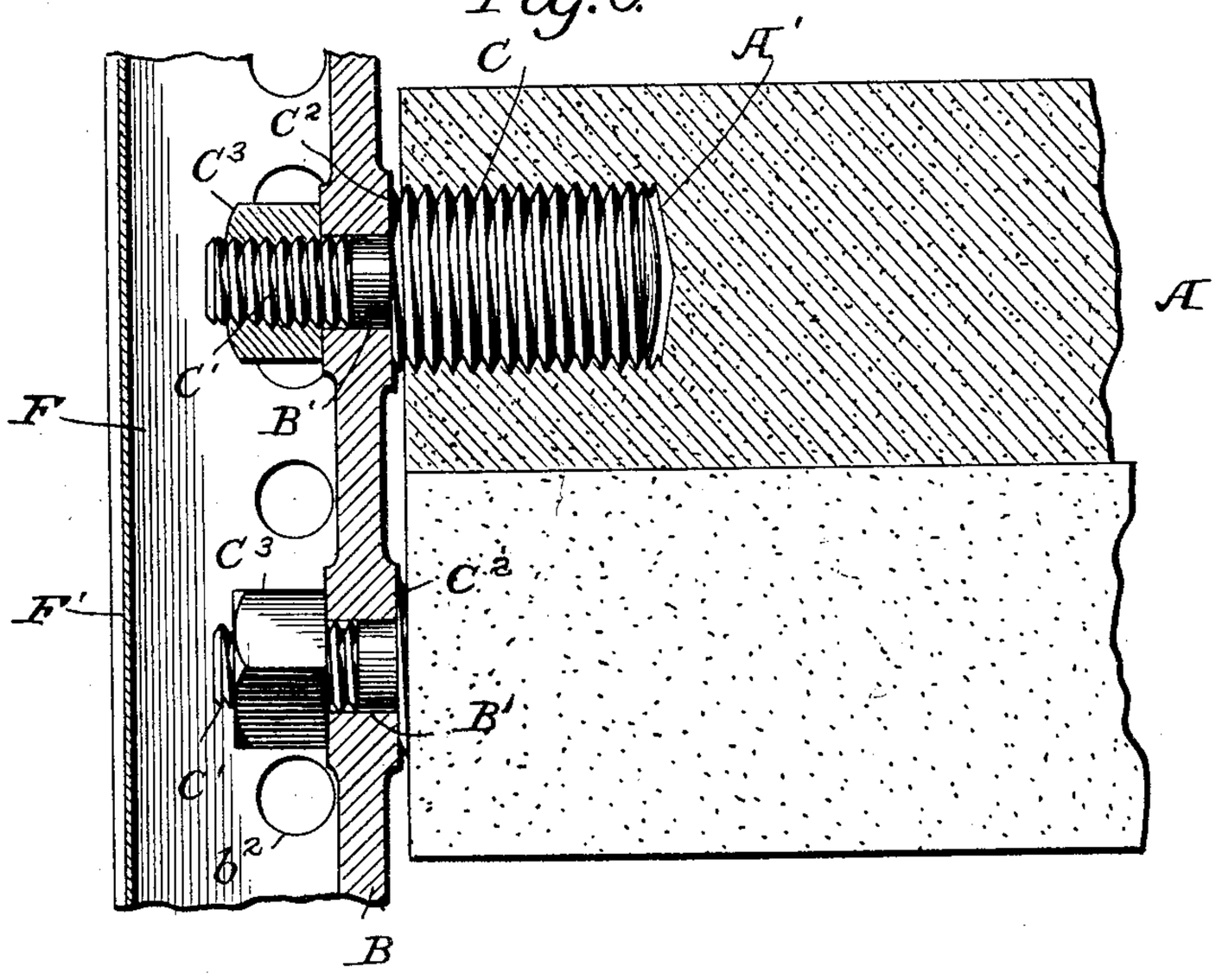


Fig. 4.

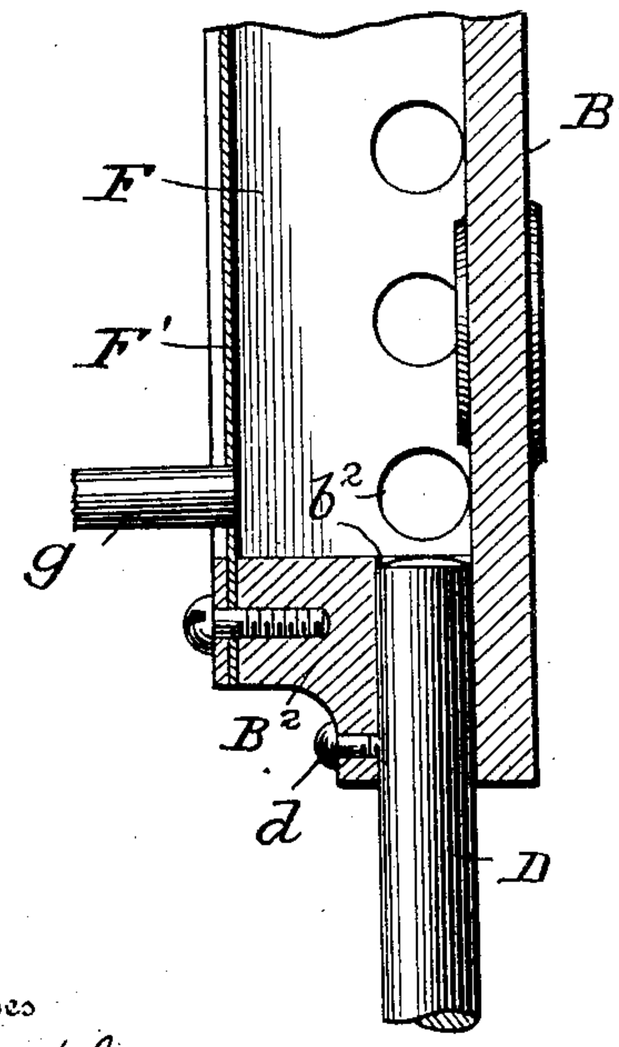
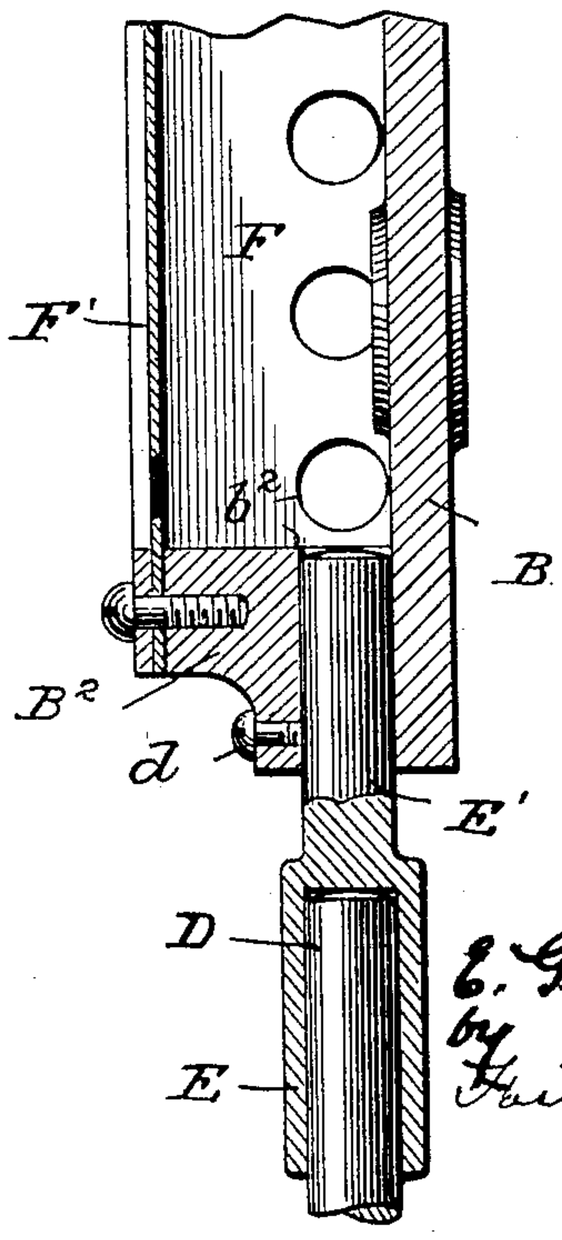


Fig. 5.



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UNITED STATES PATENT OFFICE.

EDWARD GOODRICH ACHESON, OF BUFFALO, NEW YORK.

TERMINAL FOR ELECTRIC FURNACES.

SPECIFICATION forming part of Letters Patent No. 701,986, dated June 10, 1902.

Application filed May 24, 1899. Serial No. 718,089. (No model.)

To all whom it may concern:

Be it known that I, EDWARD GOODRICH ACHESON, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Terminals for Electric Furnaces, of which the following is a specification.

My invention relates to improvements in electrodes or terminals, and more especially to those adapted to be used in connection with electric furnaces; and it has for its object to provide an improved construction of terminal having high conductivity that is specially adapted for use in connection with currents of high value; and to these ends my invention consists in a graphitic carbon electrode and its connections having the various features of construction and arrangement, substantially as hereinafter more particularly set forth.

Referring to the accompanying drawings, Figure 1 is a front view of an electrode or terminal embodying my invention, one-half of the terminal being shown as provided with a water-tank. Fig. 2 is a longitudinal vertical section on the line 2 2, Fig. 1. Fig. 3 is an enlarged sectional view of an electrode or terminal, showing the connections and position of the outer wall of the water-tank. Fig. 4 is an enlarged sectional detail showing the preferred manner of connecting the conductors and connectors and also showing the arrangement of the outer wall of the tank, and Fig. 5 is a modification of the construction shown in Fig. 4.

While features of my invention are applicable to electrodes or terminals used for various purposes and such use is within my invention, my invention is more especially intended to provide a suitable electrode or terminal for use in connection with electric furnaces where it is necessary or desirable to employ currents of large amperage producing great heating effects; and the object primarily is to provide a terminal capable of conducting such currents without excessive heating, to reduce the resistance at the joints between the several parts of the terminal and connections, and, further, to provide means for artificially cooling or taking care of such heat as may be produced in the terminal either through the resistance of the various parts to the passage of the current or through heat conducted through the electrodes or terminals from the inner portion of the furnace to the connections.

The electrode or terminal proper, A, consists of a single block or rod of graphite or graphitized carbon or of a number of blocks or rods of such material assembled together, so as to act as a single electrode. As it is difficult to form an electrode or terminal of sufficient size in a single piece when heavy currents are employed, it is necessary or desirable to make the electrode or terminal of a number of blocks or rods assembled together and preferably having as intimate contact with each other as practicable, and in the drawings the electrode or terminal A is shown as made up of a number of blocks or rods *a a'*, &c.

It is well known that difficulty has been experienced in providing suitable connectors for such electrodes—that is, connectors which offer the minimum amount of resistance to the passage of the current and which will withstand the high temperatures to which they are necessarily subjected, especially when used in connection with electric furnaces—and various means of overcoming these objections have been suggested. In my improved construction I provide a connector B in the form of a plate (preferably of copper) and unite the plate with the electrode at one or more points. In order to form this union in a stable way, I provide the electrode A with a recess A', (preferably in its end,) and this recess is also preferably screw-threaded, and into this recess I insert a plug C, suitably constructed to fit tightly in the recess, and if the latter is screw-threaded the plug is similarly threaded, and I have found that this provides not only a solid connection, but a good conductive connection. The plug is preferably made of copper or some similar material.

It has been found objectionable to secure the connector directly to the electrode—that is, so that it bears on the face of the electrode—as it is not only difficult to get good electric connection between them, but the passage of the current tends to disintegrate the electrode, and the strain necessary to get

good electric connection between the parts tends to draw the plug from its recess, weakening the connection. To overcome this, I provide the plug C with a reduced extension C′, preferably screw-threaded, and also with a seat or bearing-surface C^2 outside of the electrode, and I also mount the connector B on this extension C′, which extends through an opening B′ in the connector, and secure it in position by a suitable means, as a nut C^3. In this way it will be seen that the connector rests upon the bearing-surface and between that and the securing device or nut C^3, and I am enabled to adjust these parts tightly together, so as to get good electric contact, and, further, water-tight contact, without putting undue strain upon the electrode itself.

In the present instance I have shown the connector B as provided with numerous openings B′ and with numerous plugs C, mounted in the electrode or in the various parts composing the electrode, and in this way I am enabled to distribute the electric current evenly throughout the mass of the electrode and at the same time get a minimum amount of resistance to the passage of the current and avoid the objections above indicated.

It is of course understood that the conductor or conductors leading from the source of supply of electric energy must be connected to the connector in a manner to minimize the resistance, and while this can be accomplished in various ways I find it an advantage to provide the connector B with a rib or flange B^2 and form openings b^2 therein for the reception of the ends of the conductor or conductors D, and these ends are secured in the openings by any suitable means, preferably by soldering or sweating them directly to the mass of the flange, and in order to facilitate this process and hold the ends temporarily in place I provide a screw or pin *d*. In this way the end or ends of the conductors become practically an integral part of the connector. Sometimes, however, I find it advantageous to provide the conductor D (particularly when made of a flexible cable composed of a number of independent strands) with a terminal sleeve E, tightly fitting and united to the end of the cable by sweating or soldering, and this is provided with a solid extension E′, which can be inserted into the opening b^2 in the flange B^2, as indicated in Fig. 5.

When the electrode or terminal is used in electric furnaces, it is subjected, necessarily, to the influence of more or less heat, due largely to the conduction of heat from the interior of the furnace, and in order to prevent the accumulation of this heat I provide means for artificially cooling the connector, and in the form shown in the drawings the flange B^2 serves a double purpose of not only a connection for the ends of the conductors, but as the side and bottom walls of a tank or receptacle F, the front wall of which may consist of a plate F′, of any suitable material, but preferably of metal, united to the flange B^2. This tank F can receive any cooling or refrigerating material the change or evaporation of which tends to prevent the rising of the temperature of the terminal. If this material is water, it evaporates more or less rapidly, and it is desirable to maintain the level of the liquid in the tank, and in order to facilitate this I connect the tank F with a reservoir G, which is preferably insulated from the ground and is connected to the tank F by a suitable pipe *g*, and this reservoir of course can be of proper dimensions, so that the evaporation of the liquid in the tank F will not materially affect the level of the liquid in the reservoir and tank, owing to the relatively large amount of liquid in the reservoir compared with that in the tank, and, further, the tank can be supplied and its level practically maintained by any well-known devices.

While, as above indicated, the general features of my invention are applicable to electrodes or terminals of any size, I have shown in the drawings a terminal composed of seventy-two separate blocks or ribs. Each of these is united to the connector by a plug in the manner above described, and in order to supply the current to the connector I have shown it provided with a like number of openings b^2 in the flange B^2 for the reception of a similar number of ends D of the cables, and such a terminal is adapted to carry currents of enormous quantity—as, for instance, when these graphitized-carbon electrodes are individually sixteen inches in cross-section, so that the total cross-section of the terminal is eleven hundred and fifty-two square inches, a current of thirty-seven thousand five hundred amperes can be carried on the terminal with safety and efficiency.

What I claim is—

The combination with a graphitic carbon electrode, of a connector comprising a plate, means for connecting the electrode and connector, a flange on the connector, and a plate secured to the flange forming in connection therewith and the connector a tank, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDWARD GOODRICH ACHESON.

Witnesses:
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W. C. DUVALL.