No. 677,439. Patented July 2, 1901.

R. C. CONTARDO.

ELECTRIC ARC FURNACE.

(Application filed Aug. 24, 1900.)

(No Model.) 2 Sheets—Sheet 1.

FIG_1_

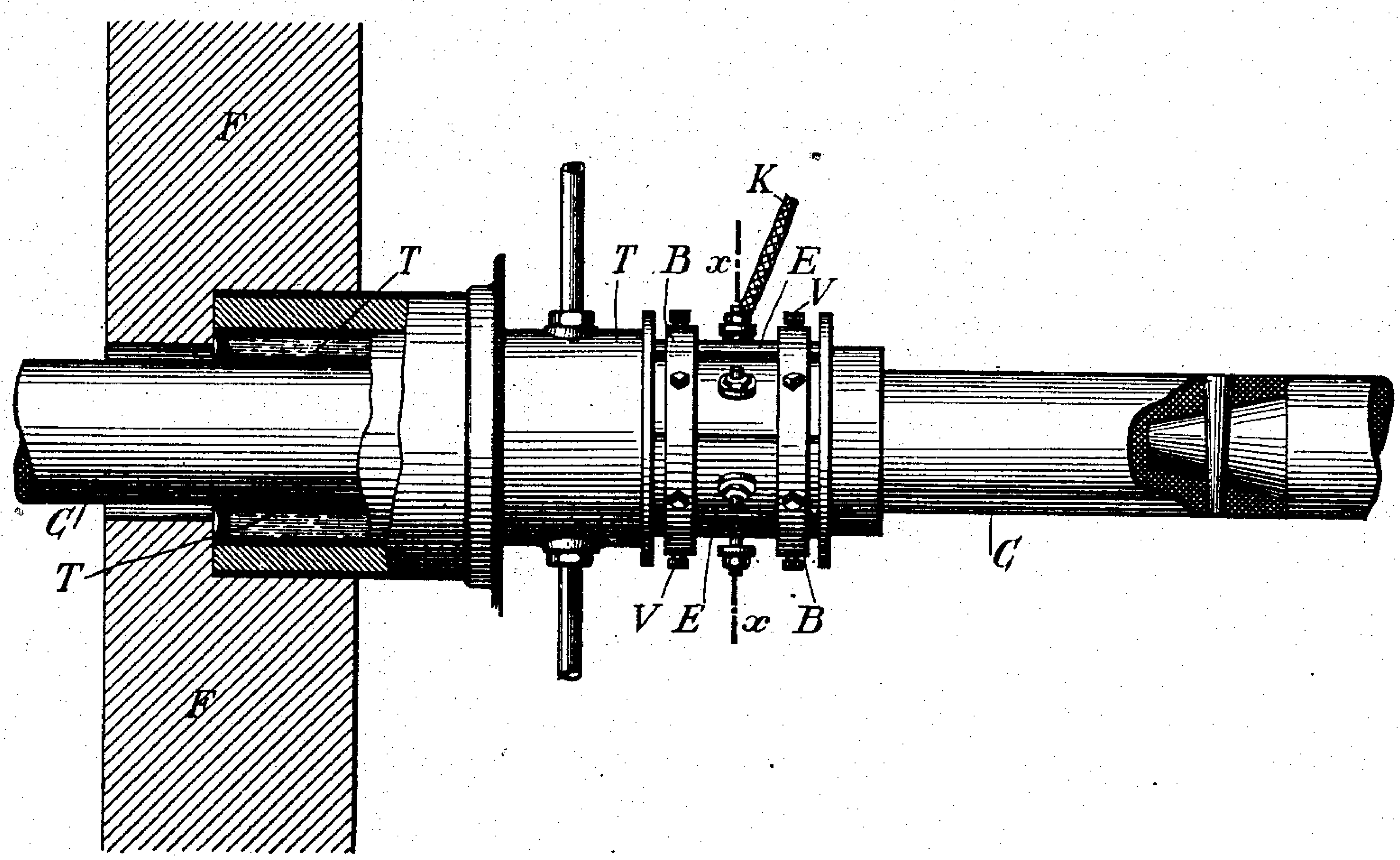
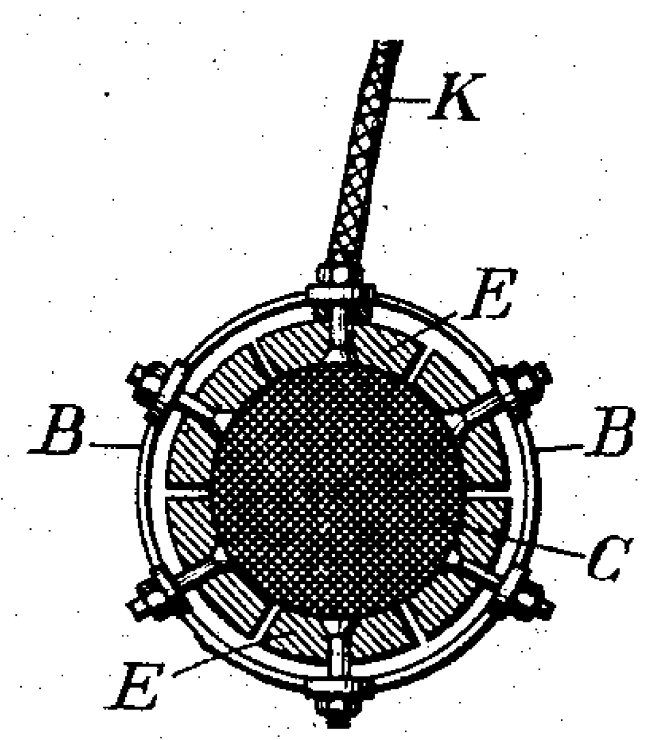


FIG_2_



Witnesses
E. Harrener
H. M. Freeman Jr.

Inventor
Rámon Chavarria Contardo
By
Foster Freeman
Attorneys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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FIG. 4.

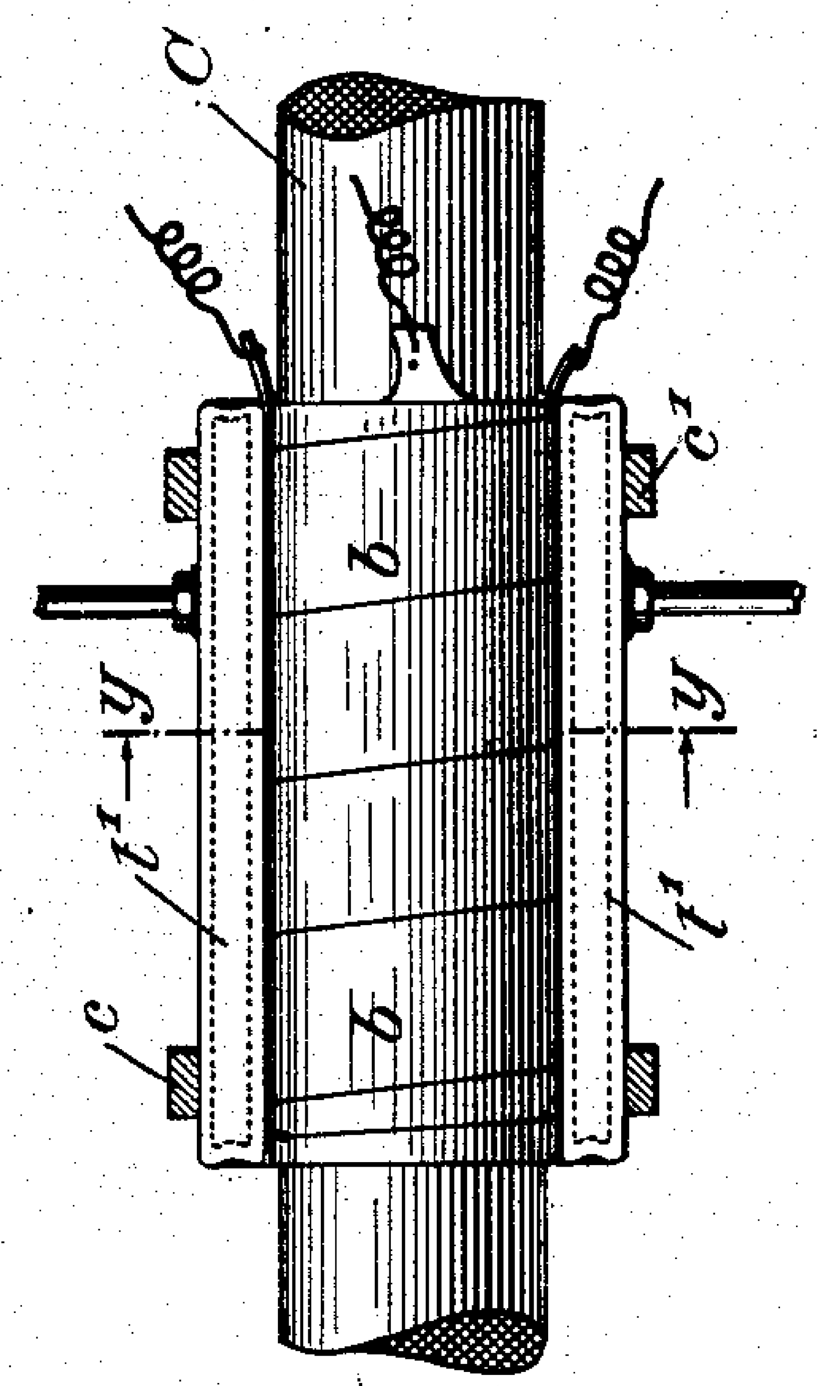


FIG. 6.

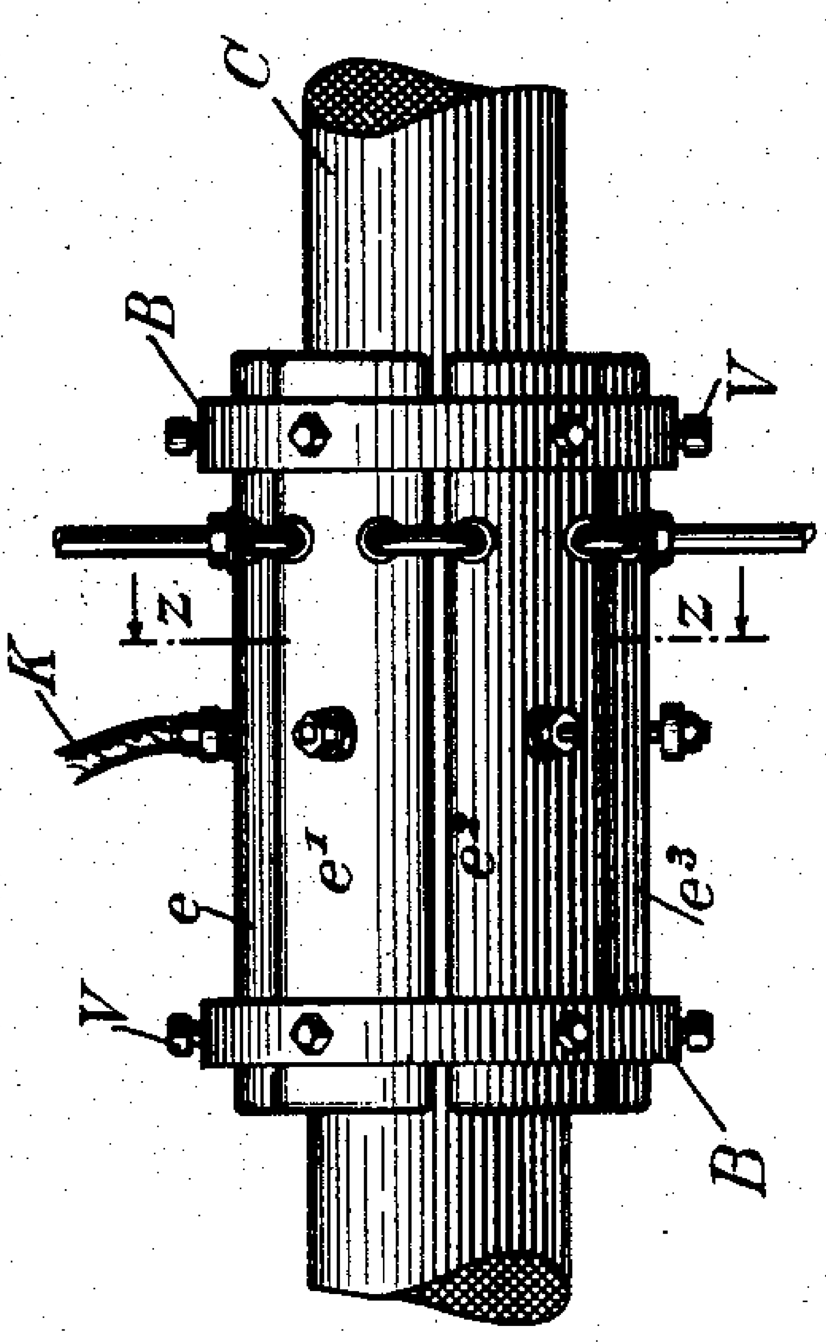


FIG. 3.

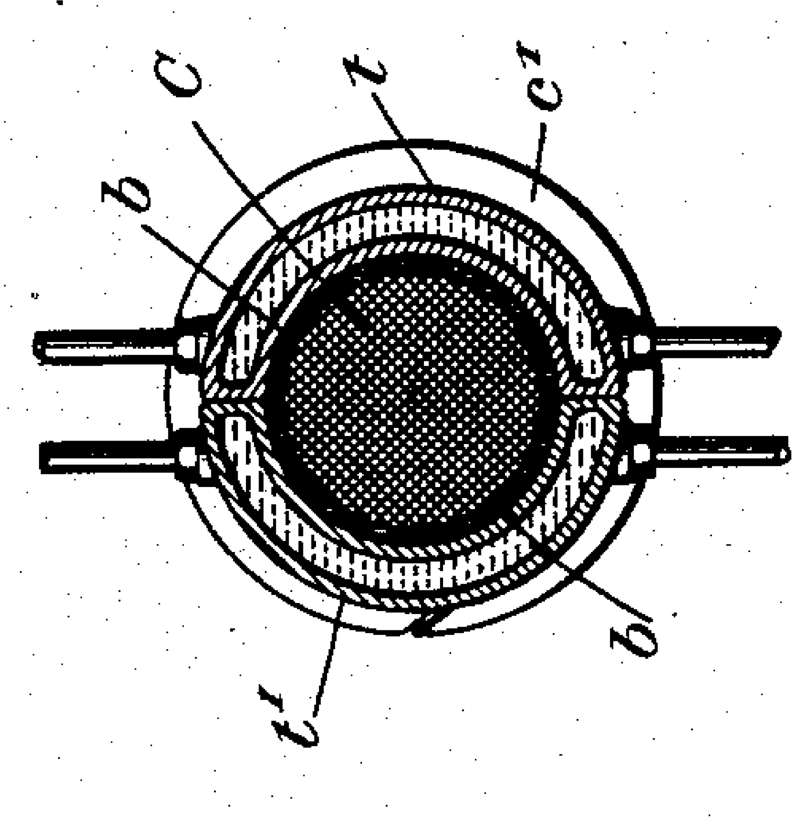
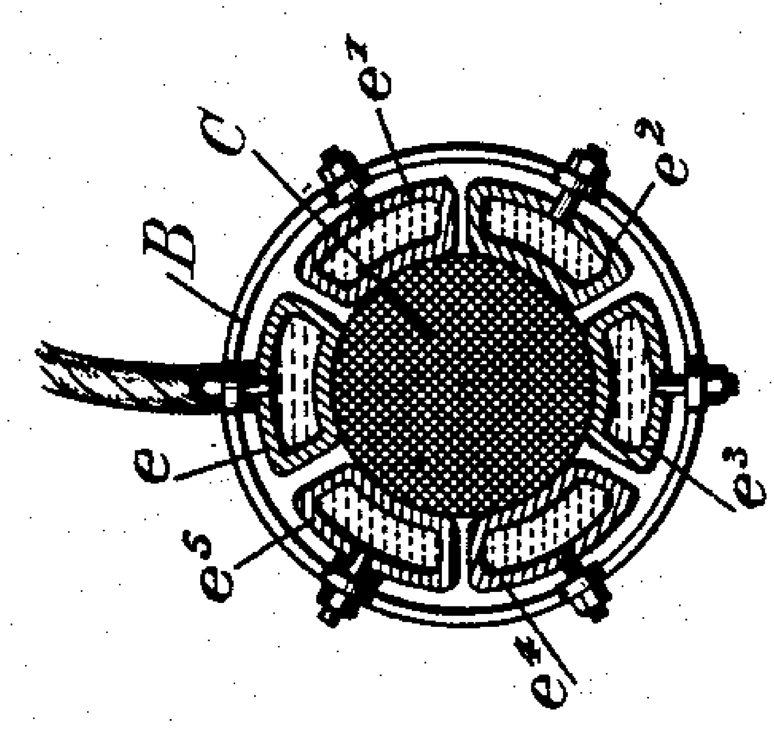


FIG. 5.



Witnesses
Georgia P. Kramer
J. J. McCarthy.

Inventor
Rámon Chavarria Contardo
by Foster Freeman
Attorneys.

UNITED STATES PATENT OFFICE.

RÁMON CHAVARRIA CONTARDO, OF SEVRES, FRANCE.

ELECTRIC-ARC FURNACE.

SPECIFICATION forming part of Letters Patent No. 677,439, dated July 2, 1901.

Application filed August 24, 1900. Serial No. 27,914. (No model.)

To all whom it may concern:

Be it known that I, RÁMON CHAVARRIA CONTARDO, doctor at law, a citizen of the Republic of Chile, residing at 19 Rue des Binelles, Sevres, department of Seine-et-Oise, France, have invented new and useful Improvements in Electric-Arc Furnaces, of which the following is a specification.

My invention relates to a general arrangement designed with a view of wholly preserving the portions of the electrodes outside the furnace and of obtaining the very important advantages that such preservation involves.

In electric furnaces after a few hours, sometimes even after a few minutes, the electrodes get red-hot outside of the furnace under the combined action due to conduction of the heat and electrical resistances. The electrodes are consumed and deformed in such a manner that their initial cross-section is completely modified. If this deformation be not avoided, it is impossible to use any device to introduce the current at a stationary point of the electrode by friction contact, which is desirable, for reasons which I will explain. As, on the other hand, in order to prevent the combustion of the electrodes and of the gases generated by the reactions inside the furnace it is important that no air should penetrate into the lower part, the orifices through which the electrode carbons pass into the furnace should be fitted with stuffing-boxes having a water-pressure circulation. The necessity of maintaining the packing of these stuffing-boxes in perfect condition has induced me to adapt a device to the ends of the carbon bars enabling one to be added to the other by a solid and definite joint. This arrangement of the electrodes in endless bars has induced me to introduce the current into these bars at a stationary point in close proximity to the stuffing-boxes. This leaves the hind end of the electrode free, and the joint can be made without difficulty while in full operation. In this manner, moreover, the resistance of the electrode remains constant, as the distance from the arc to the entry-point of the current remains invariable. The device which I am about to describe enables these important results to be fully obtained.

For the clearer comprehension of my invention I annex to the present specification drawings illustrating the same, and in which—

Figure 1 is an elevation, partly in longitudinal section; Fig. 2, a cross-section through line *x x* of Fig. 1. Fig. 3 is a transverse cross-section on the line *y y*, Fig. 4, of a modified form of the cooling-sleeve. Fig. 4 is a longitudinal vertical section of the same. Fig. 5 is a transverse cross-section on the line *z z*, Fig. 6, of a combined cooling and current-admitting sleeve, and Fig. 6 is a side view of the same.

The permanent cooling, and consequently the indefinite preservation, of each electrode C is obtained by means of a hollow metal sleeve T, through the center of which the electrode snugly slides. This sleeve is embedded in the refractory lining F of the furnace, so that its axis is exactly in line with the general axis of the electrode inside and outside the furnace. If the sleeve be carefully insulated from the mantle and other metallic fittings of the furnace and if rubber sections be interposed at any convenient point in the water-circulation pipes, there is no risk of any loss of current. Under these circumstances the electrode never gets red-hot outside of the furnace, and consequently no combustion, causing deformation, can happen. It thus becomes possible to introduce the current into the electrode at a point stationary as regards the whole, but variable as regards the electrode, which sliding in the current-admitting apparatus can penetrate into the furnace until it is completely consumed, if care be taken to add a new electrode to the one being consumed by means of any convenient joint—for instance, by the well-known coupling device illustrated in the drawings.

The current-admitting device which I at present consider the simplest and most practical consists of a thick bronze cylinder bored to the diameter of the electrode and then sawed lengthwise into a number of equal segments E E. These segments are pressed onto the electrode by concentric rings B. These rings, one at each end of the cylinder, carry set-screws V by which the segmentary blocks can be pressed more or less against the electrodes. The conducting-cable K is divided into the same number of strands as there are segmentary blocks, and each strand is fixed to a block by a clamp. It follows, therefore, that the electric carbons are completely utilized. It is only necessary to fashion the ends of each electrode so that the hind part of the one makes a solid and good conducting-joint with the forward end of the next. Various such joints may be imagined. As an example I give the following: The hind end of one electrode has a conical hole, into which is forced the correspondingly-shaped front end of another electrode. A cotter-hole is drilled through the thus-formed joint, into which is driven a carbon cotter.

In order to insure a good conduction of the joint, the two ends in contact are dipped in a varnish containing fine powdered graphite and some easily-carbonized material, such as sugar or tar. The excess of varnish being forced out, the joint is heated in a non-oxidizing medium—for instance, between two semicylindrical cast-iron blocks heated to bright red. The sugar is carbonized and transformed into a very good conducting-glue, whose conduction is increased by the powdered graphite, and the current passes the joint without any abnormal resistance.

The device of the cooling-sleeve embedded in the wall of the furnace and of the friction-sleeve made of bronze segments pressed against the electrode by set-screws may be modified as follows: The cooling-sleeve, Figs. 3 and 4, instead of being in one piece can be made of two half-sleeves *t t'*, with water circulation, as before. The diameter of the circle formed by the union of these two half-sleeves is a few millimeters larger than that of the electrode C. A number of very thin, very smooth, and perfectly-scoured copper plates *b b* are wound around the electrode, preferably in a spiral direction, as shown. This foliated sleeve is covered by the united half-sleeves *t t'*, slightly tightened by two spring-rings *c c'*. In this way I insure the admission of the current at a single point and also the cooling, and consequently the preservation, of the friction-sleeve. There is also a further gain in the notable diminution of the resistance of the electrode, as the point of admission of the current is several decimeters nearer to the extremity inside the furnace. Lastly, the cost of this device is sensibly less than the one described before, and the costly part—the cooling-sleeve—no longer runs any risk, not being in direct contact with the electrode. Again, instead of using separate cooling and current-admitting sleeves a single sleeve, Figs. 5 and 6, could be employed performing both functions and made of a series of hollow bronze segments e e' e^2, &c., connected to one another and with water circulation, each segment being electrically connected to a strand of the conducting-cable.

I claim—

1. In an electric-arc furnace, the combination with the refractory lining of the furnace, of a hollow sleeve, having an extended bearing-surface and means for a water-pressure circulation, a stationary friction contact-sleeve, connected thereto and in prolongation thereof, and an electrode adapted to pass through both sleeves, and in close contact with the extended bearing-surface of the hollow sleeve, substantially in the manner and for the purpose set forth.

2. An electric furnace, the combination with the refractory lining, of a hollow metal sleeve secured thereto, said sleeve being provided with means for a water-pressure circulation, and a stationary friction contact-sleeve comprising a number of segments adapted to compress the electrode, rings compressing the segments and adjusting devices between the rings and segments, and the segments being provided with cable-terminals, the whole being arranged substantially as described so that the electrode can move toward the interior of the furnace, insuring a constant electrical resistance, and the destruction of the exterior portion of the electrode avoided, as set forth.

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

RÁMON CHAVARRIA CONTARDO.

Witnesses:

CLAUDIUS LUSSON,
EDWARD P. MACLEAN.