No. 740,379. PATENTED SEPT. 29, 1903.

W. L. VOELKER.

ELECTRIC FURNACE FOR THE MANUFACTURE OF FILAMENTS.

APPLICATION FILED APR. 10, 1903.

NO MODEL.

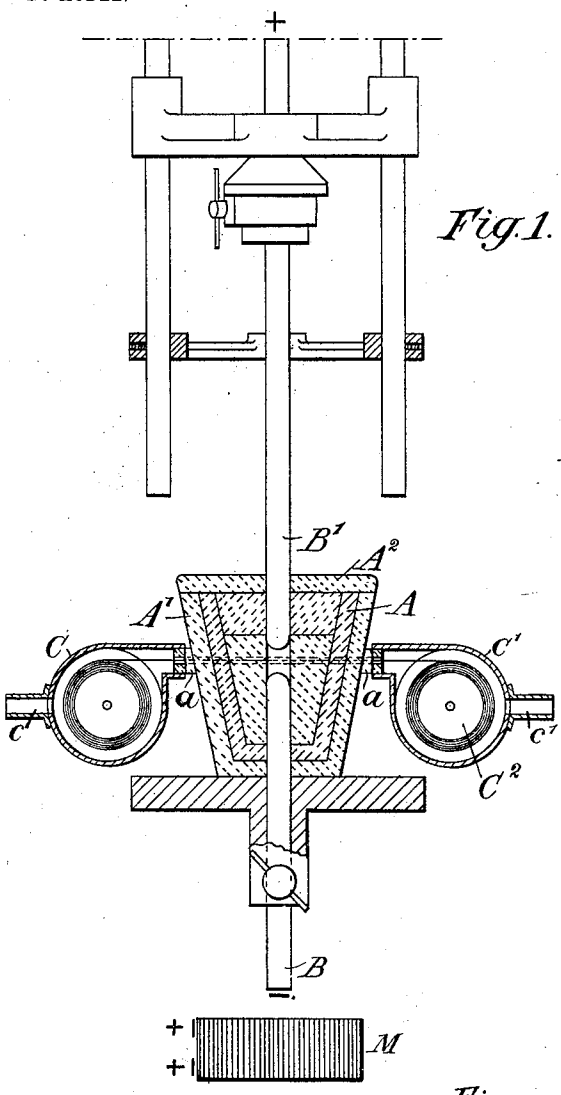


Fig. 1.

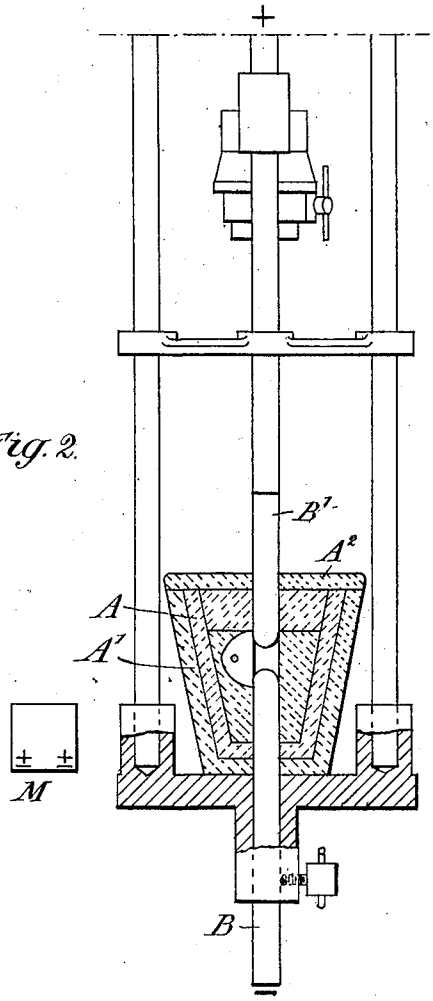


Fig. 2.

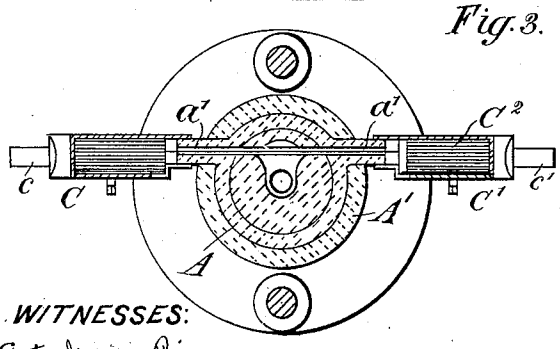


Fig. 3.

WITNESSES:

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

No. 740,379. Patented September 29, 1903.

UNITED STATES PATENT OFFICE.

WILLIAM LAWRENCE VOELKER, OF ERIE, PENNSYLVANIA, ASSIGNOR TO THE ELECTRO CARBIDE LAMP SYNDICATE, LIMITED, OF HOLBORN, LONDON COUNTY, ENGLAND.

ELECTRIC FURNACE FOR THE MANUFACTURE OF FILAMENTS.

SPECIFICATION forming part of Letters Patent No. 740,379, dated September 29, 1903.

Original application filed March 15, 1902, Serial No. 98,421. Divided and this application filed April 10, 1903. Serial No. 152,050. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM LAWRENCE VOELKER, a citizen of the United States of America, residing at Keystone Electrical Co., Erie, State of Pennsylvania, have invented new and useful Improved Means Applicable for use in the Manufacture of Filaments for Incandescing Electric Lamps, of which the following is a specification.

This invention (a division of my application for Letters Patent filed March 15, 1902, Serial No. 98,421) relates to means applicable for use in the manufacture on a commercial scale of filaments composed, first, of the carbids of certain metals; secondly, of graphite, and, thirdly, of certain salts which have been reduced from their corresponding oxids with the aid of carbon vapor, such filaments being intended for use in incandescing electric lamps.

In the accompanying drawings I have illustrated apparatus adapted for use in the manufacture of filaments according to my improved method.

Figure 1 is a vertical section through the axis of the reels and the carbon electrodes; Fig. 2, a view similar and at right angles to Fig. 1, and Fig. 3 a horizontal section through the axis of the passage for the filament.

In the process of converting (I) the baked carbon filament into graphite (which has a higher resistance owing to its crystalline structure) or (II) converting the baked carbon filament that has been treated with the salt or salts of metal in solution into carbid or (III) converting the baked carbon filament into carbid in the presence of vapor of the metal desired certain precautions have to be taken. In the case of a graphite filament, (I,) the baked carbon filament must be subjected to a very high temperature in the presence of a carbon vapor such as carbon monoxid, or of a hydrocarbon reducing-gas and protected from contact with the atmosphere. For a treated filament (II) the method employed for the production of a graphite filament is applicable, but for the direct conversion of a baked carbon filament into a carbid (III) there must be present an atmosphere of the vaporized metals or metals desired.

For use in conversion processes, such as above referred to, I have devised a special form of crucible or furnace and means for controlling the heat and the position of the electric arc which produces it. This crucible comprises a vessel A, which may be of hopper-like form and composed of black-lead. The opposing sides of this vessel are formed with perforated projections *a a*, which constitute conduits or passages *a' a'*, whereof the common axis passes transversely through the crucible at a short distance from the vertical axis thereof, the said vessel A being inclosed in an outer vessel A' of similar formation, which latter may be composed of some suitable refractory material and through which the perforated lateral projections *a* extend. The electrodes B B' for producing the arc are arranged in the vertical axis of the crucible. The lateral conduits or passages *a a'* in addition to leading the filament through the arc serve to conduct the gas or vapor to the interior of the crucible by way of the boxes C C', the latter being connected at *c c'* with the source of hydrocarbon gas or vapor supply. The upper carbon may, however, be perforated axially for this purpose, the lower carbon being in the form of a rod and making a close joint with the material of the crucible. The carbon monoxid may, however, be passed into the crucible by way of an axial perforation in the lower carbon. The crucible may be provided with a lid or cover A^2, formed of the same material as the lining of the furnace.

I will now describe the various precautions employed by me to secure the requisite reaction.

In making a graphite filament the interior of the crucible or furnace is lined with a consolidated purified sugar carbon which extends about half-way up the crucible. Above that is placed a highly-refractory oxid, such as thorium oxid, which serves to insulate the upper electrode, and the crucible is then closed by means of the lid or cover A^2. Having drawn the arc and raised the temperature

of the interior of the furnace to a white heat, the filament is drawn through the conduits a' a' transversely to the axis of the electrodes B B'.

The same arrangements are appropriate in the formation of a carbid filament, except that in this case the filament may or may not have been treated while in the raw state in a solution of the metallic salt. The carbon or the graphite filament is passed through; but in these two cases, the entire crucible or furnace is lined with the oxid of the selected metal or metals, and before passing the filament through the lining immediately surrounding the arc must be converted into a carbid and then into a metal. The time occupied in such conversion depends upon the degree of fusibility of the metals and the temperature of the electric arc due to the number of amperes in action. To insure success, it is also necessary that the materials employed—such as the gases, the electrodes, the lining of the furnace, &c.—should be pure and that pure carbon or pure cellulose filaments should be employed to commence with.

For use in passing the filament through the electric arc I employ apparatus of the following character: On each side of the crucible or furnace A opposite each of the perforated projections a a is mounted the box or drum C C', of brass or other metal, a rod running through the center of each. It is assumed that one of the boxes—say C—contains a reel C^2, of carbonized or graphitic filament. The end of this filament is pushed through the transverse conduit a a, thus passing through the furnace at right angles to the vertical axis of the carbon electrodes B B' and is then attached in any suitable manner to the reel C^2, mounted in the box or drum C', situate on the opposite side of the crucible, same being connected in any suitable manner with clockwork or other convenient means for rotating the said reel. The space between the electrodes having been heated, as before mentioned, the current is again turned on and the reel C^2 set in motion, the speed of rotation being governed by the intensity of the current. Thus the filament is drawn through the electric arc transversely to the axis of the electrodes. Thick filaments will stand a longer exposure to the heat of the arc than thin ones. Owing to the arc being deflected in a definite direction and held there, the filament may in traversing the arc travel either parallel with or at right angles to the course of the current. The arc should not be allowed to move, but should be centralized, as in a unifocal lamp. The arc is drawn into the path of the filament and there maintained by means of a magnet, (shown diagrammatically at M.)

What I claim as my invention, and desire to secure by Letters Patent, is—

For use in the manufacture of filaments for incandescing electric lamps, apparatus constructed substantially as described and comprising a pair of carbon electrodes, a crucible inclosing the extremities of the said electrodes, means for passing the filament through the crucible at a short distance from the axis of the electrodes, means for deflecting the arc into the path of the filament and holding it there, and provision for enabling the crucible to be maintained charged with carbon vapor or a hydrocarbon reducing-gas, substantially as set forth.

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

WILLIAM LAWRENCE VOELKER.

Witnesses:
ARTHUR MUNROE PIERCE,
ARTHUR F. VOELKER.