A. BLONDEL & G. DOBKEVITCH.

MANUFACTURE OF ELECTRODES FOR ARC LAMPS.

APPLICATION FILED OCT. 15, 1903.

991,475. **Patented May 9, 1911**

FIG. 1.

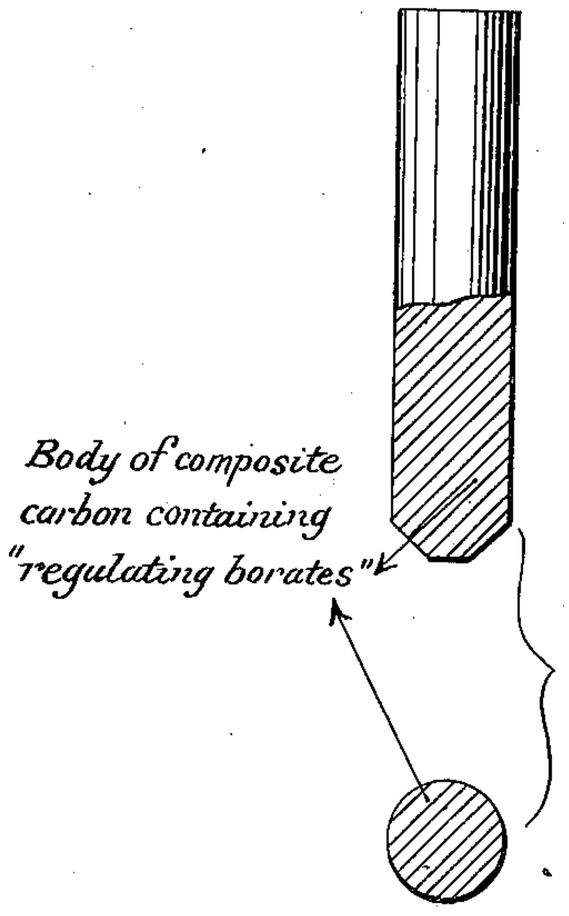


FIG. 2.

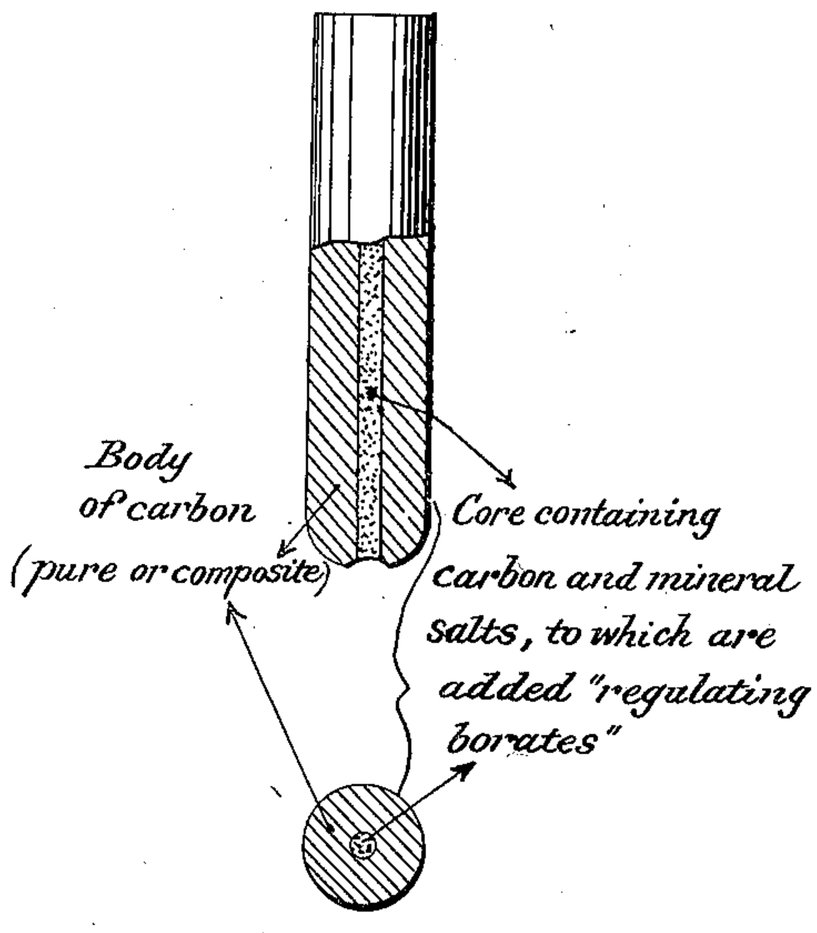


FIG. 3.

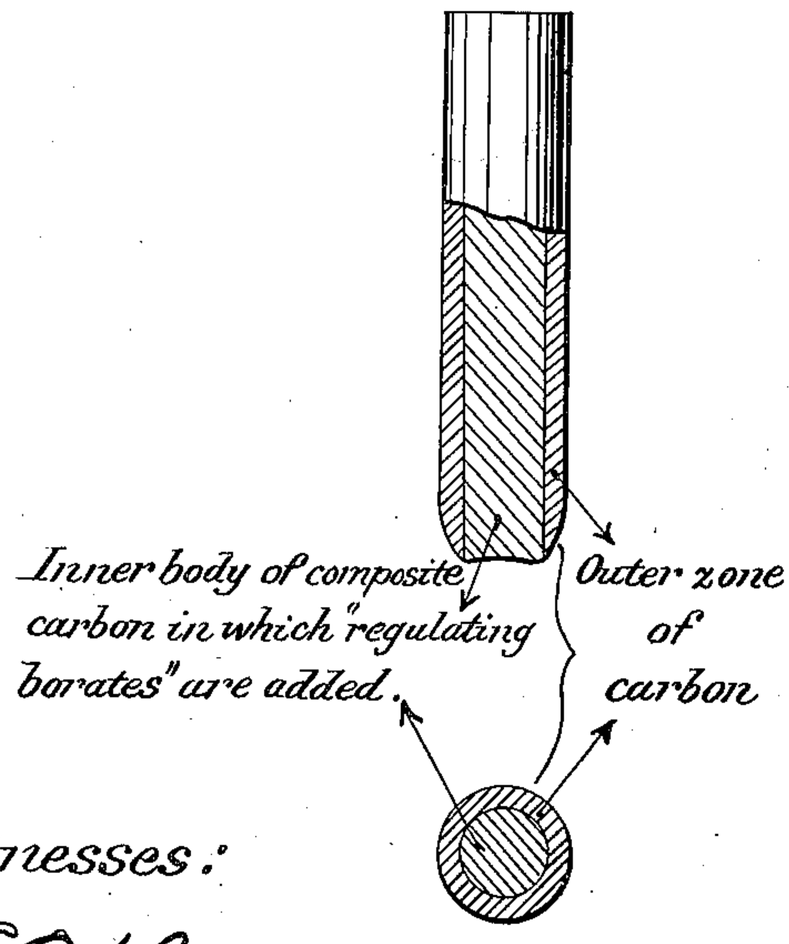
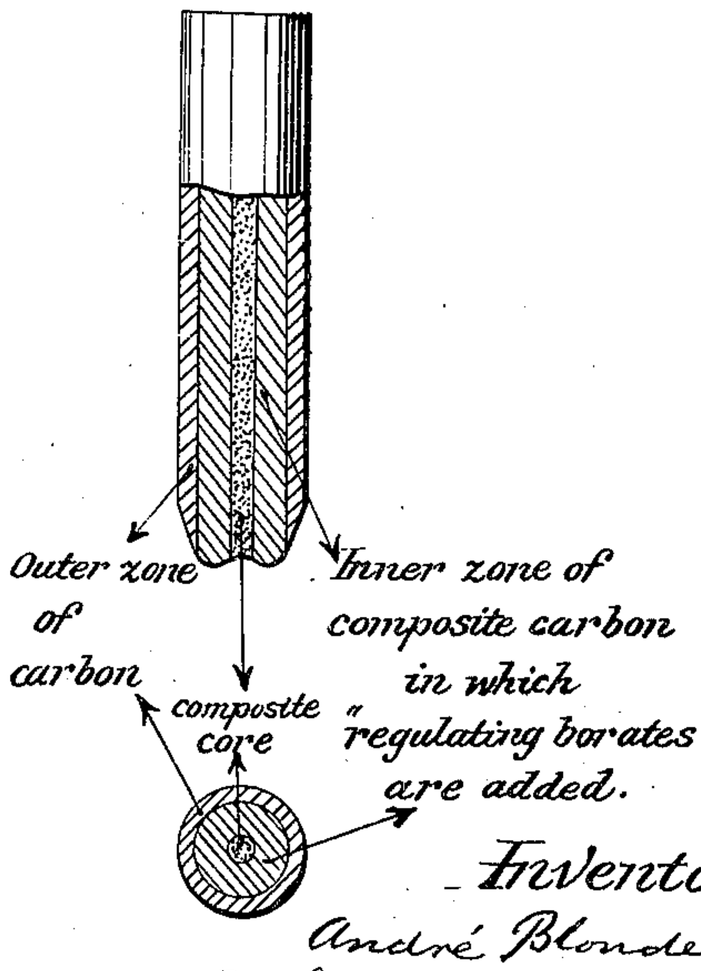


FIG. 4.



Witnesses:

E. O. Hildebrand

F. H. Schott

Inventors:

André Blondel

and Gaëtan Dobkevitch

by Georgii Massie

his attorneys.

UNITED STATES PATENT OFFICE.

ANDRÉ BLONDEL AND GAËTAN DOBKEVITCH, OF PARIS, FRANCE, ASSIGNORS, BY MESNE ASSIGNMENTS, TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

MANUFACTURE OF ELECTRODES FOR ARC-LAMPS.

991,475. Specification of Letters Patent. **Patented May 9, 1911.**

Application filed October 15, 1903. Serial No. 177,216.

To all whom it may concern:

Be it known that we, ANDRÉ BLONDEL, engineer, of 41 Avenue de La Bourdonnais, Paris, a citizen of the Republic of France, and GAËTAN DOBKEVITCH, engineer, of 81 Rue de l'Assomption, Paris, France, a subject of the Emperor of Russia, have invented a new and useful Improvement in or Relating to the Manufacture of Electrodes for Arc-Lamps and the Like, which improvement is fully set forth in the following specification.

This invention relates to arc electrodes and consists in a new and useful type of arc electrodes composed of or comprising shaped masses of a composition comprising carbon, light-giving mineral substances and various borates having the property of regulating and controlling the light; all as more fully hereinafter set forth and as claimed.

It has long been known that the addition of various mineral substances, and particularly compounds of calcium, barium, strontium, magnesium, etc., to the carbon used for arc electrodes is advantageous in producing certain lighting effects. Numerous tests by various experimenters have shown that the best results are afforded by calcium compounds, compounds of aluminum and magnesium having a smaller illuminating power, while strontium compounds give the light too reddish a color. With feeble current intensities, calcium compounds also give a hue too yellow, or even too red. Moreover, carbons admixed with calcium fluorid or other calcium compounds, give a light which is very variable and is disturbed by sudden luminous flashes, a fact which has prevented the use of such carbons for interior lighting. Various fluxes have heretofore been incorporated in these mineralized carbons in order to give a liquid slag, such fluxes containing various fusible compounds containing silicates or compounds of boron, fluorin, sodium, potassium, etc., but these fluxes have not tended to improve the light as regards whiteness and steadiness. Sodium and potassium and their compounds also make the slag too fusible and they are besides too volatile, so that they leave the electrodes too quickly in the form of vapors instead of remaining with the metallic salts.

According to the present invention electrodes are produced from carbon, light giving mineral salts and the relatively infusible borates of the alkaline earths. As the light giving mineral salts, the calcium compounds in the form of fluorids, oxids, carbids and phosphates are especially applicable. The borates of the alkaline earths may include for the purposes of this invention the borates of barium, calcium, strontium, magnesium and the like. These act as the regulating borates in the electrode and hence will herein be referred to as such.

The regulating borates are incorporated in the electrodes in relatively small amounts and constitute about 10% of the other mineral substances present. Their proportion may, however, be as low as 5% or as high as 20% of the other mineral substances. A further addition of borates would weaken the illuminating power and render the slag too viscous and non-volatile. The borates mentioned are not to be confused with the usual fluxes, the use of which is to be looked upon as detrimental. Their effect in addition to the particular coloring of the light, consists rather in the improvement of the radiation of light and the regulation of the melting and vaporization of the metallic salts with which they are mixed and hence the prevention of the disturbing flashing which occurs in the use of the ordinary mineralized electrodes, and which can not be avoided by the fluxes. If the relatively infusible borates in combination with fluor-spar are added to the electrodes, it is possible to operate the electrodes at higher temperature and thus lengthen their time of burning in the lamp as distinguished from such electrodes to which fluor-spar is added without the borates of the alkaline earths.

In order to further increase the yield of light, to insure an even consumption of the electrode and to increase the conductivity of the arc, it is advisable to add more readily fusible borates of the alkali metals (sodium, potassium, lithium, rubidium, cæsium) in addition to the difficultly fusible borates of the alkaline earths, either singly or mixed with one another, so that their total mass amounts to 20% of the light yielding calcium compounds. By the addition of the borates of the alkali metals the color of the light is at the same time influenced without affecting the advantageous

working of the borates of the alkaline earths and without resulting in an unsteady light or too volatile slag which occur in the otherwise known use of the borates of the alkali metals.

Of the borates of the alkaline earths in connection with the calcium borate, the borate of barium which tends to whiten the color of the arc flame, is especially suitable. If sodium borate is employed with barium borate, the light becomes yellowish. If potassium borate takes the place of a part of the barium borate, it becomes rich yellow and dull; if magnesium borate is used in place of a part of the barium borate, it becomes greener or when strontium borate is used it becomes more rosy.

As an example of a suitable composition for the carbon, may be mentioned 50 to 70% carbon combined with 50 to 30% of a mixture of fluor-spar and the borates of the alkaline earths in which mixture the borates form about 10% of the fluor-spar. One of the borates alone or several mixed together may be employed according to the color of light which is desired. If borates of the alkali metals are used in addition to the borates of the alkaline earths, a good mixture is obtained by taking for example 1. kg. fluor-spar, 0.1 kg. of one or several of the borates of the alkaline earths and 0.1 kg. of one of the borates of the alkali metals or several of these latter mixed together. This mixture can be worked in the ordinary manner and in the usual relations with carbon. An especially good result is obtained, however, by introducing the mineral substancees into the inner part of the electrode and surrounding it with a mantle composed of essentially pure carbon, as described in United States Letters Patent No. 714,277 granted to André Blondel, on November 25th, 1902.

In making the new composition, the regulating borates are preferably mixed with the light-giving mineral substances before incorporating the carbon, such mixture being performed either wet or dry. The pulverized substances may be stirred together with water, or they may be fused together and the melt powdered. The carbon paste is made in the ordinary manner. After mixing it with the mineral substances, the mass is forced out through a die plate or the like in the usual manner and cut into lengths. The cut pieces may then be burned in the usual manner. Cores or coatings may be added in the known manner. The operation may be strictly according to the method described in the cited patent, electrodes being formed with two or three concentric zones.

In the accompanying illustrations, we have shown, more or less diagrammatically, electrodes made according to the present invention.

In this showing: Figure 1 illustrates a homogeneous composite carbon made of our new composition; Fig. 2 is a cored electrode; Fig. 3 an electrode having two zones or layers, of which the inner is a body of our composite carbon and the outer a body of carbon alone; and Fig. 4 an electrode having a cored composite carbon with an outer layer of carbon.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is,

1. An electrode for electric lights containing an intimate mixture of mineral substances consisting of 95 to 80% of a light giving mineral substance and 5 to 20% of borates of alkaline earths adapted to remain in and be consumed with the other constituents of the electrode and thereby regulate the light.

2. An electrode for electric lights containing an intimate mixture of mineral substances consisting of 90 to 80% of a light giving mineral substance and 5 to 10% of borates of the alkaline earths and 5 to 10% of borates of alkaline metals adapted to remain in and be consumed with the other constituents of the electrode and thereby regulate the light.

3. An electrode for electric lights containing a light giving mineral substance and borate of barium.

4. An electrode for electric lights containing a light giving mineral substance, a borate of an alkali metal and borate of barium.

In testimony whereof we have signed this specification in the presence of two subscribing witnesses.

ANDRÉ BLONDEL.
GAËTAN DOBKEVITCH.

Witnesses:
AUGUSTUS INGRAM,
PAUL MATHIEU.