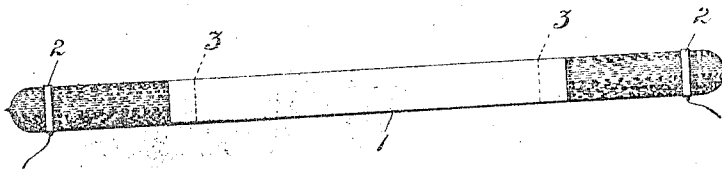


D. McF. MOORE.
VACUUM TUBE LAMP.
APPLICATION FILED JUNE 15, 1904.

Patented July 16, 1912.

1,032,562.



WITNESSES:

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DANIEL McFARLAN MOORE, OF NEWARK, NEW JERSEY, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

VACUUM-TUBE LAMP.

1,032,562.

Specification of Letters Patent.

Patented July 16, 1912.

Application filed June 15, 1904. Serial No. 212,618.

To all whom it may concern:

Be it known that I, DANIEL McFARLAN MOORE, a citizen of the United States, and a resident of Newark, in the county of Essex and State of New Jersey, with post-office address as above, have invented certain new and useful Improvements in Vacuum-Tube Lamps, of which the following is a specification.

10 My present invention relates to that class of devices employed for lighting and other purposes, and comprising essentially a sealed receptacle containing a rarefied gas through which electric energy is passed for the purpose of rendering the contents of the receptacle luminous, or for other purposes. In this class of devices as ordinarily constructed, the receptacle consists of a tube of translucent material, like glass, and hence when employed for lighting, such devices are ordinarily termed "vacuum tube lamps." The means for transferring energy to the gaseous contents of the tube consist, in some cases, of exterior conducting caps or sleeves by which alternating or vibrating electric energy is transferred electrostatically to the contents of the tube, while in other cases, the transfer is accomplished by electric conduction from electrodes sealed into the receptacle and located within the inclosure but suitably connected through the walls of the receptacle with the source of energy.

35 While for brevity, I employ in the subjoined description and in the claim the term "vacuum tube lamp", and while I have described my invention as applied to a tube with terminals suitable for electrostatic transfer of the energy, I do not limit myself to any particular form of receptacle or of electrodes, but by the term "vacuum tube lamp" include all forms of receptacle and constructions of electrode.

45 My invention further includes all devices of the general character above described, irrespective of the contents of the receptacle, and hence includes Röntgen ray tubes.

50 Briefly stated, my invention consists in a vacuum tube lamp whose contents embrace pure carbon in a finely divided state whether amorphous or graphitic, in addition to a tenuous gas or its equivalent, of any character which may or may not be, derived from the carbon. If the tenuous conducting medium is derived solely from the carbon, it

is impossible to state its exact nature, since all authorities agree that carbon has never been gasefied.

By the expression "pure carbon in a finely divided state" I do not include lamp 60 black and soots resulting from flames from whatever source, because they are so impure that they come under my application filed Sept. 2nd, 1903, Serial No. 171,587, but which has since been subdivided. Soots and 65 all compounds of their class seldom contain more than 80% carbon, the remainder consisting of resinous matter and oily substances containing hydrogen, oxygen, nitrogen, sulfur, &c., depending, of course, upon 70 their source. But one way of obtaining pure amorphous carbon is to pass carbon tetrachlorid CCl_4 vapor over pure hot metallic sodium in a hard, glass tube, and then heating the carbon obtained to a little un- 75 der the temperature at which burning begins. Another method of obtaining finely divided amorphous carbon is to pass electric sparks through acetylene gas which is decomposed into its elements carbon and 80 hydrogen.

Although I prefer to use amorphous carbon, because of its lightness, nevertheless my invention broadly covers also the use of finely divided graphitic carbon, such as can 85 easily be obtained in the open market.

The finely divided carbon is introduced within the vacuum tube in any desired way but preferably near or within the electrodes. In exhausting such a vacuum tube, it seems 90 best to exhaust the tube before the electric current is applied, in order to avoid the possible formation of any compound of carbon with the nitrogen or oxygen or other gases present in the atmosphere, the idea 95 being to retain finely divided carbon only within the walls of the vacuum tube to act as the gaseous conductor. However, if desirable, after such treatment, any gas or gases can be admitted. After applying the 100 electric current the exhaustion is continued until the vacuum reaches the critical stage at which the luminosity is the maximum and beyond which the luminosity would decrease, as well understood in the art. 105

In the accompanying drawings, the figure shows a side elevation of a vacuum tube lamp in which my invention may be embodied.

The terminals of the lamp consist of 110

the usual conducting caps, preferably of graphite, which are provided with the contact ring or sleeve 2, for the application of the electric current. The carbon in a finely divided state is introduced into the end sections so as to lie preferably within the conducting terminals, and said terminal sections can be sealed to the intermediate section 1, to produce a complete lamp. The sealing off is done in the usual way. The lines of junction of the end section to the middle sections are indicated at the dotted line 3.

What I claim as my invention is:
15 The herein described improvement in

manufacturing vacuum tube lamps consisting in introducing into the tube carbon in a finely divided state, sealing and pumping the tube to a high vacuum and subsequently applying the electric current while continuing the exhaustion in order to avoid formation of compounds of carbon with nitrogen and oxygen.

Signed at New York in the county of New York and State of New York this 13th day of June A. D. 1904.

DANIEL McFARLAN MOORE.

Witnesses:

C. F. TISCHNER, Jr.,
Zo ANNA B. TALLMAN.