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H. C. PARKER.

INCANDESCENT ELECTRIC LAMP.

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Fig. 1

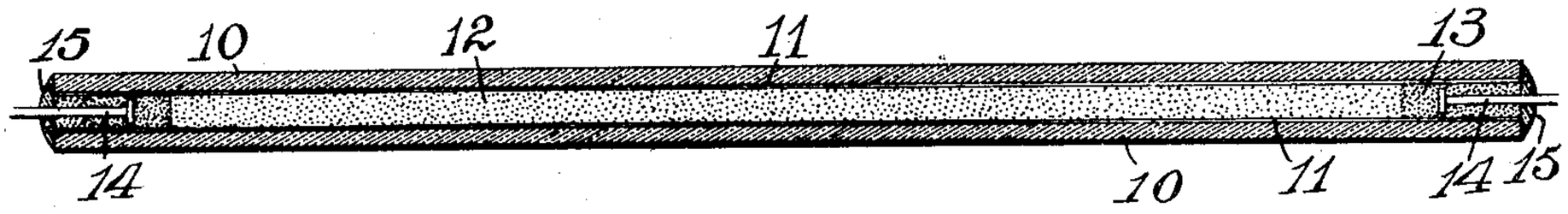
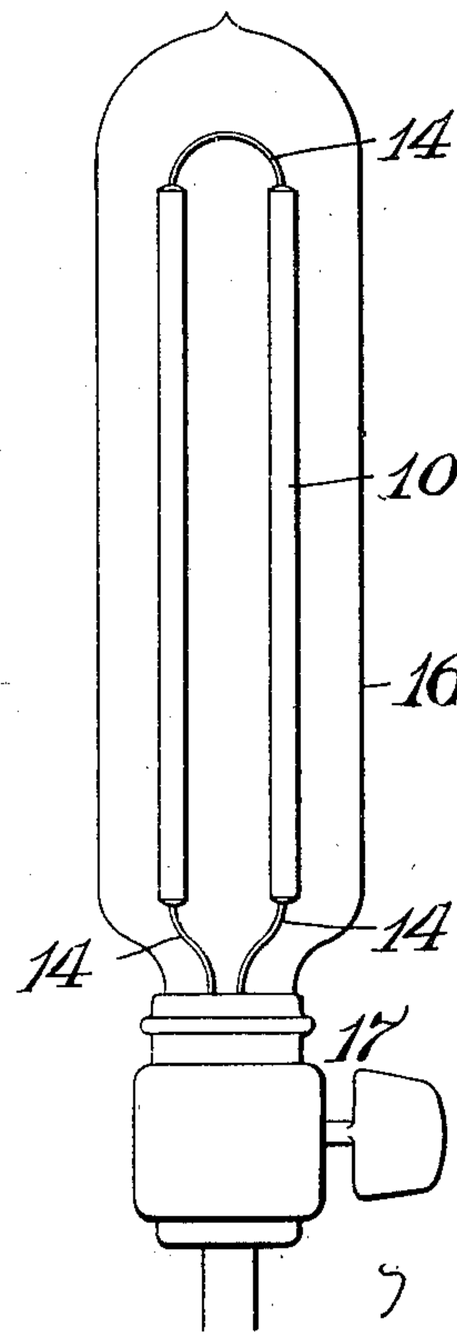


Fig. 2



WITNESSES:

Wm. H. Campfield.

Frank L. Stubbs.

INVENTOR.

Herschel C. Parker.

BY

W. B. Hutchinson.

ATTORNEY.

UNITED STATES PATENT OFFICE.

HERSCHEL C. PARKER, OF NEW YORK, N. Y., ASSIGNOR TO PARKER-CLARK ELECTRIC COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

INCANDESCENT ELECTRIC LAMP.

No. 812,872. Specification of Letters Patent. Patented Feb. 20, 1906.

Application filed April 8, 1905. Serial No. 254,587.

To all whom it may concern:

Be it known that I, HERSCHEL C. PARKER, of New York, in the county of Kings and State of New York, have invented a new and Improved Incandescent Electric Lamp, of which the following is a full, clear, and exact description.

My invention relates to improvements in incandescent lamps, and particularly to that variety of incandescent lamps in which the incandescent body is contained in a protective tube, which is highly refractory and permeable to light, as opposed to that class of lamp in which an incandescing filament is contained in a vacuum or in which a tube, which is a non-conductor at low temperature and a conductor at high temperature, is used with an inside conductive coating to heat the tube to incandescence and make it conductive, or in which a tube is used having an inside coating and a gaseous inner conductor.

It is well understood that the efficiency of an incandescent lamp increases greatly with the capacity to give to the incandescing material a high heat. It has been found that quartz tubing is a good material to contain the body which is to be made incandescent; but there are objections to relying on the incandescence of a central core contained in the tubing to produce the light. One objection is that the tubing required to withstand the effects produced by the heating or cooling of a solid core of material having a different coefficient of expansion than the outer tube must be very thick and another is that if, as is likely, there is any variation in the bore of the tube the resistance at the point where the bore is of relatively small diameter is greatly increased and the efficiency of light impaired. Another objection to the solid core is that few, if any, elementary substances or compounds that are refractory and conductors of electricity exist in nature that have a high enough resistance to construct a lamp for the usual voltage and with a solid core of this material. In fact, it is necessary in this construction to have the diameter of the tube extremely small and to use a tube of a considerable length. When this is the case, it is also found that any minute variation in the diameter which is likely to occur produces a very great variation in the resistance, so that at these constricted portions of the tube the material becomes highly incandescent, while the rest of the column of conducting material is at a very much lower temperature, so that only a small portion can be maintained at light-giving incandescence. Moreover, there are difficulties in obtaining and maintaining the right resistance in a core of the kind stated.

The object of my invention is to overcome these difficulties and to produce a lamp in which a thin highly-refractory tube can be provided with a film of refractory conductive material on its inner surface and in which this film may be perfectly maintained by packing the center of the tube with a refractory non-conductor, so that the conducting part is held between two indestructible members forming a stratum of circular section, the resistance of which can be easily controlled and which will give out its light efficiently through the thin tubing. The ends of the tube are packed with a good conductor, such as graphite, and the leading-in wires connected with the graphite and sealed. In this way I provide a lamp the life of which is very long and the efficiency of which is great. The efficiency is relatively large, because by the arrangement stated I am enabled to maintain a very high heat in the conductive part of the lamp. In practice I can arrange a tube or a plurality of tubes within a globe, and, if desired, I can exhaust the globe, so as to render the lamp still more efficient, as there will be little loss of efficiency by convection and radiation.

With these ends in view my invention consists of an electric incandescent lamp the construction of which will be hereinafter described and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar figures of reference indicate corresponding parts in both the views.

Figure 1 is a longitudinal section of the lamp embodying my invention, and Fig. 2 is an elevation showing how a plurality of the lamp-tubes can be combined in a globe and with the ordinary socket.

In the drawings the lamp is shown as very much enlarged in order that the relation of the several parts can be seen, and I use a tube 10 of a highly-refractory material and which is permeable to light, a tube of quartz serving

this purpose perfectly. This tube has on its inner surface and extending its whole length a thin film 11, which is of a refractory but conducting material and which may be carbon, iridium, or any suitable metallic or conductive matter. I find that the iridium works well and is preferable, because if there is any oxygen present the iridium film does not materially oxidize. The film can be placed on the quartz mechanically or chemically or electrically, as by electric deposition *in vacuo* or by plating. It will be understood that this film can be made more or less resisting either by changing its material or by varying its thickness. I prefer to have the film extend the full length of the tube, so that a good contact can be made between the film and the packing 13 of a good conductor, such as powdered graphite. If the connection between the graphite and the film were only made at the ends of the film, the contact would not be so good as if arranged as stated. After providing the tube with the film 11 the middle portion and, in fact, the greater portion of the tube is packed tight with powdered quartz or other refractory matter, as shown at 12, and this packing or inner core of non-conducting material serves as a binder to hold the film 11 in place, and the core or packing 12 should be of practically the same coefficient of expansion as the tube 10. For this reason I prefer to use powdered quartz as a packing. The graphite or other good conductor 13 is filled into the tube ends, as shown clearly in Fig. 1, the leading-in wires 14 are embedded in the graphite, and the tube ends are sealed tightly, as at 15. By having the non-conducting packing filling the bore of the tube the space which would otherwise be occupied by air or gas is filled, and, moreover, an abutment is provided to retain a good conductor, such as graphite. Obviously diaphragms might be substituted for the packing to hold the graphite in place, but such diaphragms would not fill the space and would not prevent the conductive film from cracking and falling off. When the current is turned on, the hollow tubular conductor 11 is heated quickly to incandescence and will give out an efficient light. Obviously several of these tubes 10 may be grouped where a relatively large light is required, and this can be easily done, as shown in Fig. 2, where I have shown a pair of lamps arranged in series, the lamps connecting at one end by the wire 14ª and the leading-in wires 14 at the other end connecting in the socket precisely in the usual manner. A series of lamps can be arranged in parallel, if desired.

The lamp, as shown, can be used either with or without a globe; but where especially-high efficiency is desirable a globe 16 can be placed over the lamp, the air exhausted, and the globe arranged in the usual socket 17. The only object in exhausting the air from the globe is to prevent convectional loss of efficiency and loss by radiation.

From the foregoing description it will be seen that I have produced a very simple and efficient lamp, that the same can be easily made, and that it is very durable.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. An incandescent electric lamp, comprising a tube of highly-refractory material which is permeable to light, a highly-refractory conductive film on the inner surface of the tube, and connections at the tube ends for the said conductive film.

2. An electric incandescent lamp, comprising a highly-refractory light-permeable tube, a highly-refractory conductive film on the inner surface of the tube, a non-conducting packing for the tube, and electrical connections at the tube ends.

3. An electric incandescent lamp, comprising a tube of highly-refractory material which is permeable to light, a conducting-film on the inner surface of the tube said film extending the whole length of the tube, a non-conducting packing for the tube, and electrical connections at the tube ends.

4. An electric incandescent lamp, comprising a tube of highly-refractory light-permeable material, a conducting-film covering the inner surface of the tube, a packing for the tube, the said packing being essentially of the same coefficient of expansion as the tube, and electrical connections at the tube ends.

5. An electric incandescent lamp, comprising a tube of highly-refractory material which is permeable to light, a conducting-film on the inner surface of the tube, a non-conducting packing filling the tube except at points near the ends, a packing of a relatively good conductor at the tube ends, leading-in wires connecting with the conductive packing, and a seal for the tube ends.

6. An incandescent electric lamp, comprising a hollow member of highly-refractory material which is permeable to light, a highly-refractory conductive lining for the member, and electrical connections at the ends of the member.

7. An incandescent electric lamp, comprising a tube of highly-refractory material which is permeable to light, a refractory conductive lining for the tube, a non-conductive core filling the bore of the tube, and electrical connections at the tube ends.

8. An incandescent lamp comprising a body portion of highly-refractory light-permeable material, and a film of iridium on the said body.

HERSCHEL C. PARKER.

Witnesses:
WARREN B. HUTCHINSON,
WILLIS A. BARNES.