(No Model.) 2 Sheets—Sheet 1.

W. CROOKES.

INCANDESCENT ELECTRIC LAMP.

No. 264,517. Patented Sept. 19, 1882.

Fig. 1.

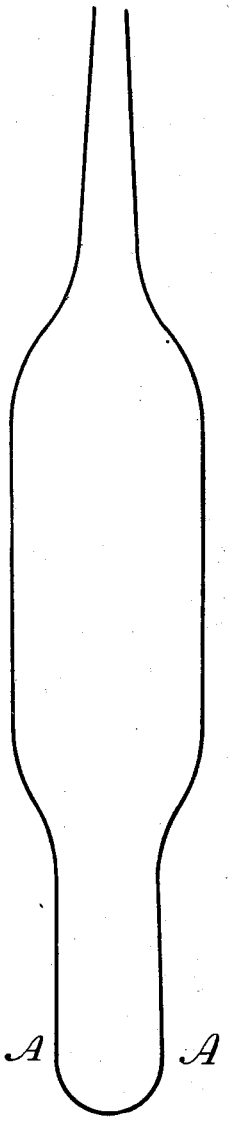


Fig. 2.

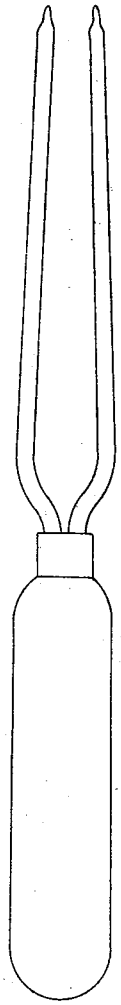
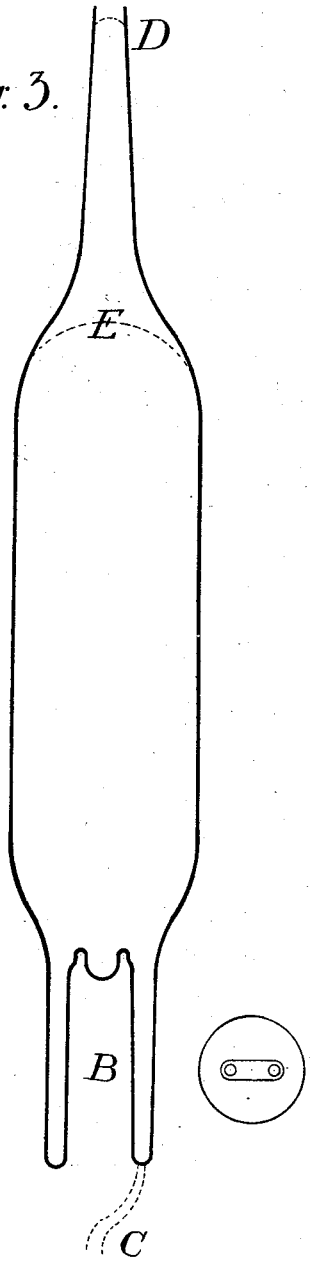


Fig. 3.



Witnesses
James Young.
Lloyd B Wright

Inventor.
William Crookes,
by his Attorneys
Baldwin, Hopkins & Peyton.

(No Model.)

2 Sheets—Sheet 2.

W. CROOKES.

INCANDESCENT ELECTRIC LAMP.

No. 264,517. Patented Sept. 19, 1882.

Fig: 4.

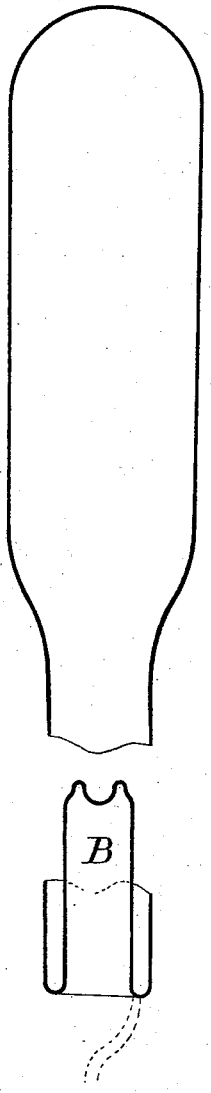


Fig: 5.

Fig: 6.

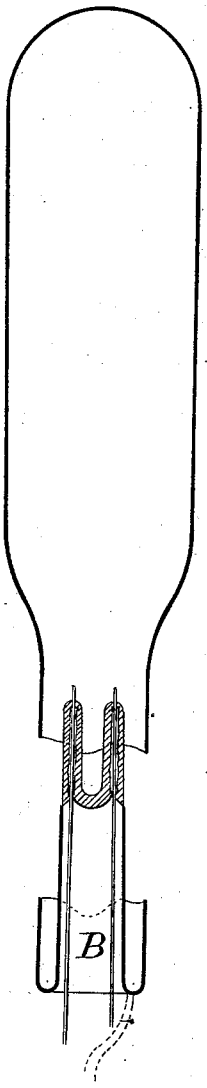
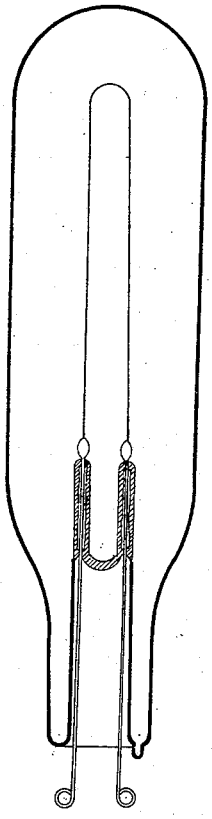


Fig: 7.



Witnesses
James Young.
Lloyd B. Wright.

Inventor.
William Crookes,
by his Attorneys
Baldwin, Hopkins, & Peyton.

UNITED STATES PATENT OFFICE.

WILLIAM CROOKES, OF LONDON, ENGLAND.

INCANDESCENT ELECTRIC LAMP.

SPECIFICATION forming part of Letters Patent No. 264,517, dated September 19, 1882.

Application filed August 1, 1882. (No model.) Patented in England August 31, 1881, No. 3,799; in France September 30, 1881, No. 145,080, and in Italy May 26, 1882, No. 14,225.

To all whom it may concern:

Be it known that I, WILLIAM CROOKES, F. R. S., a subject of the Queen of Great Britain, residing at Boy Court, Ludgate Hill, in the city of London, England, have invented certain new and useful Improvements in the Construction and Manufacture of Electric Lamps, (for which I have received Letters Patent in Great Britain, No. 3,799, dated 31st August, 1881; in France, No. 145,080, dated 30th September, 1881; and in Italy, No. 14,225, dated 26th May, 1882,) of which the following is a specification.

This invention relates to that class of electric lamps in which the light is produced by the heating of a continuous conductor that is usually composed of a fine filament of carbon inclosed in a glass globe or vessel, and protected from combustion by being surrounded by a vacuous space or by an atmosphere that will not support combustion.

In order to form the glass inclosure of the lamp, I take a cylinder of glass of any convenient size, and after drawing down one end in the blow-pipe, I draw the other end out into a wide neck and seal off its end in a blow-pipe. The neck will then have been brought approximately to the form shown at A, Fig. 1. While the glass neck is still hot, or after reheating it, I press the end inward with a two-pointed metal tool like a two-pronged fork, which may be of the shape shown in Fig. 2, so as to make a hollow projection, B, stretching a convenient distance into the neck of the tube, and terminating in two hollow points or nipples of glass. The tube then has the appearance shown in Fig. 3. At this or some other convenient stage of the process a small glass tube, C, (shown in dotted lines in Fig. 3,) is sealed onto the lamp, (preferably at the lower edge where the glass is bent inward,) for the purpose of exhausting the lamp and filling it with a suitable protective atmosphere, if such is desired. It is desirable that the mouth of the drawn-down end of the cylinder should be previously sealed, as shown by the dotted line D, so as to facilitate the blowing on of the tube. If this tube be sealed onto the lamp at this stage, it will present the appearance shown in Fig. 3; but it is not necessary that the small tube last described should have the particular position there shown. The top of the lamp should now be sealed off before the blow-pipe and formed into a hemispherical end, as shown by the dotted line E. It is not, however, necessary that this should be done at this stage, but any other convenient stage of the process may be selected for doing it. When the glass is cool I cut the tube in two across the neck at such a distance from the end as to leave the two glass points projecting from the bottom piece of the tube, as shown at Fig. 4. This division of the tube may easily be effected by slightly scratching it with a file or cutting with a diamond and applying a hot iron or hot piece of glass. When this has been done the two hollow points at the top of the projection B are opened in the blow-pipe, or by breaking off their ends, or in any other convenient way, and conducting-wires are passed through the openings so made, and then sealed in the glass by means of white enamel, or what is technically known as "arsenic glass." If platinum wires are used to pass through the glass for the purpose of acting as conducting-wires, they can be sealed into the glass in the usual way without the use of such enamel. The most convenient method of fixing the wires in the lamp is to coat them with enamel or arsenic glass, and to pass each wire through a separate short cylinder of glass of small section and heating it in the blow-pipe, so as to melt the glass and enamel, and then seal them together. A conducting-wire having a short cylinder of glass so sealed onto it is shown at Fig. 5. The wire is now passed through the open point of the glass projection above mentioned until the glass cylinder on the wire rests against the end of the glass projection, and the two are then sealed together in the blow-pipe, either with or without the interposition of arsenic glass or enamel. The parts will then have the appearance shown in Fig. 6. The carbon filament can now be attached to the conducting-wires. Afterward, the two portions of the tube forming the lamp are sealed together in the blow-pipe at the place where the tube was cut open. The lamp is now in a fit condition for exhaustion, which is effected through the small tube, which has been sealed onto it for the purpose, and when the exhaustion has been effected this tube is sealed off preferably close to the point of junc-

tion with the lamp. The finished lamp then presents the appearance shown in Fig. 7.

The hollow at the base of the lamp may be filled with plaster-of-paris or any other like cement for the purpose of giving strength to the lamp and protecting the conducting-wires and their attachments. The pores of the cement may, if thought advisable, be filled in with a fusible cement.

If a carbon filament in a lamp breaks, the neck of the lamp can be again cut across and a fresh filament attached and the lamp sealed up and exhausted or filled with a protective atmosphere, as before. It will, however, be convenient to insert a small tube for exhaustion in one of the portions of the lamp before it is opened, as it is more difficult to do it afterward.

What I claim is—

1. My improvement in the manufacture of the glass inclosures for incandescent lamps, consisting in preparing the vessel to receive the wire by, while the glass is hot, deflecting inward a portion, then detaching the said portion, and, after fixing the wires, again completing the vessel by sealing in the detached portion, substantially as described.

2. My improvement in the manufacture of the glass inclosures for incandescent lamps, consisting in forming upon the glass a cup-like cavity with a nipple or nipples by means of a pointed tool, and in perforating such nipples and passing and sealing in the wires, substantially as described.

WILLIAM CROOKES.

Witnesses:

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JNO. DEAN,

Both of No. 17 *Gracechurch Street, London.*