(No Model.)

R. A. FESSENDEN.

MANUFACTURE OF INCANDESCENT ELECTRIC LAMPS.

No. 453,742. Patented June 9, 1891

Fig. 1

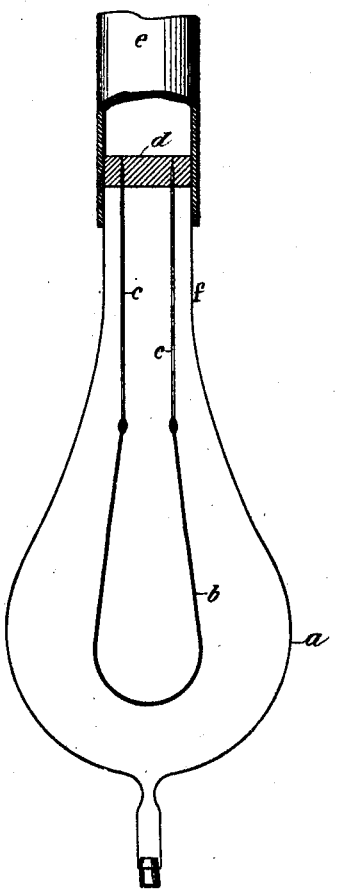


Fig. 3

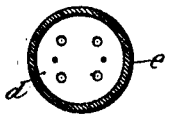
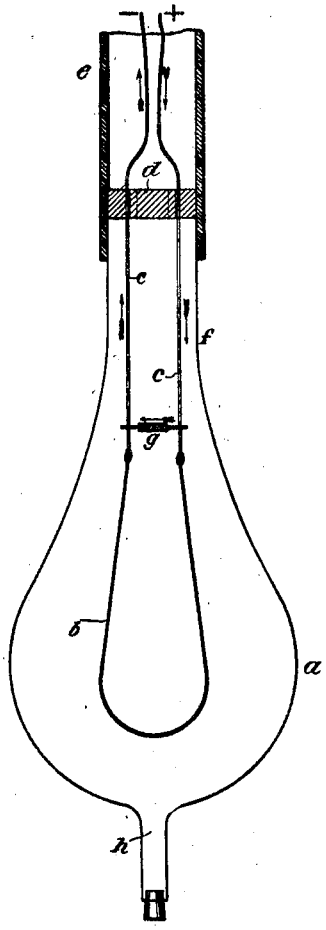


Fig. 4

Fig. 2



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UNITED STATES PATENT OFFICE.

REGINALD A. FESSENDEN, OF ROSEVILLE, NEW JERSEY.

MANUFACTURE OF INCANDESCENT ELECTRIC LAMPS.

SPECIFICATION forming part of Letters Patent No. 453,742, dated June 9, 1891.

Application filed February 18, 1891. Serial No. 381,907. (No model.)

To all whom it may concern:

Be it known that I, REGINALD A. FESSENDEN, a citizen of Canada, residing at Roseville, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in the Manufacture of Incandescent Electric Lamps, of which the following is a specification.

Platinum wire is generally used for leading the electric current into incandescent lamps, because it does not oxidize, and because it stands a high temperature and has a low coefficient of expansion. There are other metals whose expansion is but slightly greater than that of platinum—for instance, iron—and which stand a high temperature; but these metals have the defect of oxidizing, so that they do not make a good joint with the glass. I have discovered a process whereby such metals may be used. I take wire made of iron, nickel, or similar oxidizable metals capable of standing a high temperature and having a low coefficient of expansion, and, having properly cleaned the same and attached the carbon filament thereto, I place them within the neck of the bulb of the incandescent lamp, and maintain them in position by a suitable clamp or holder. A tube of rubber or other material is attached to the lamp-bulb, preferably at the neck, and a vacuum is created within the bulb by any suitable means, such as connecting the other end of the rubber tube to an air-pump. The neck of the bulb is then heated at the part it is desired to seal on the wires, and the softened glass is closed together on the wires by the use of a suitable tool or by the pressure of the atmosphere, and the wire, being prevented from oxidizing by the absence of air within the bulb, forms a clean joint with the glass. The lamp is then removed from the rubber tube, and the rest of the manufacture is completed in the ordinary way.

The wires may be heated by a current of electricity while being sealed in the glass for the purpose of forcing any oxide which may form on their surfaces to combine with the glass, so as to make a perfectly tight joint. This can be conveniently done by placing a removable bridge or conductor between the inner ends of the leading-in wires, so that if a current of electricity is passed through them while they are being sealed in it will pass from one wire to the other by the bridge without going to an injurious extent through the filament. This current is sufficient to heat the wires to redness and reduce any oxide which forms upon them. The heating also drives off the occluded gases of the wires. This operation of heating may be carried out while the bulb is being exhausted and at any desired degree of exhaustion, and the sealing may then be done. The removable bridge can be removed by a suitable tool through a hole in the apex of the bulb after the leading-in wires have been sealed in.

To enable others skilled in the art to make use of my invention, I will now describe it by reference to the accompanying drawings, in which—

Figure 1 is a view illustrating the method of sealing-in the wires in a vacuum. Fig. 2 is a like view illustrating the method of heating and sealing-in the wires in a vacuum. Figs. 3 and 4 are detail views.

Like letters of reference indicate like parts.

The lamp-bulb *a* is of the usual form. The filament *b* is attached to the leading-in wires *c*, of iron, nickel, or similar oxidizable metal. These leading-in wires are secured in a suitable clamp or holder *d*, which is placed against the open end of the bulb *a*, with the filament *b* projecting into it in the position it should occupy in the finished lamp. A tube *e*, of rubber or other suitable material, connected with a suitable exhausting apparatus, is placed over the end of the bulb and holder, and the air is exhausted more or less perfectly from the bulb, the idea being to effect such a removal of the oxygen in the bulb that when the glass neck of the bulb is heated to seal it to the wires no oxide shall be formed on the surface of the wires, or at least no such a quantity as shall prevent the formation of a proper seal or subsequently attack the carbon filament. When the proper degree of exhaustion has been attained, heat is applied to the neck *f* and the glass melted down onto the wires *c*, or it is softened so that it can be molded onto them, all in the usual way. The bulb is then taken out of the tube *e*, the holder *d* removed, and the lamp is finished in the usual way.

The same apparatus and method may be

used where it is desired to heat the wires *c* during the operation of sealing. It is desirable to prevent the current used for this purpose from passing through the filament *b* to any injurious extent, and hence I place a metal bridge or conductor *g* between the outer ends of the wires *c*, so that the greater portion of the current shall cross from one to the other without going through the filament and in its passage shall heat the wires to a red heat. The heating of the wires *c* during the exhausting operation drives off the occluded gases, which pass out with the air, and when the hot glass of the neck closes down on the wires in the sealing operation any oxide which may form thereon is caused to combine with the glass, so as to make a perfect joint. The bridge can be removed through the opening *h* in the top of the bulb. This opening is made for the purpose of tubulating and exhausting the lamp after the leading-in wires have been sealed in. It is usually made before the wires *c* are sealed in, and in such case it must be closed by a stopper, as shown, or by sealing or otherwise during the operation of sealing-in the wires hereinbefore described.

By my improved method, in which the air is exhausted from the bulb to prevent the oxidation of the wire from the heat of sealing the glass, as well as from the heat caused by passing a current therethrough, I am able to use cheaper wires than platinum, and thereby effect a great saving in the manufacture of incandescent electric lamps.

What I claim as my invention is—

1. The process of sealing oxidizable leading-in conductors into incandescent electric lamps, which consists of exhausting the air from the bulb and then fusing the glass to the oxidizable conductors, substantially as described.

2. The process of sealing-in the leading-in conductors of incandescent electric lamps, which consists in exhausting the air from the bulb, heating the conductor by passing an electric current therethrough, and fusing the glass to the hot conductors, substantially as described.

In testimony whereof, I the said REGINALD A. FESSENDEN, have hereunto set my hand this 14th day of February, A. D. 1891.

REGINALD A. FESSENDEN.

Witnesses:

THOMAS B. KERR,

EDWIN HOPKINSON.