(No Model.)

J. W. SWAN.

INCANDESCENT ELECTRIC LAMP.

No. 260,335. Patented June 27, 1882.

Fig. 1.

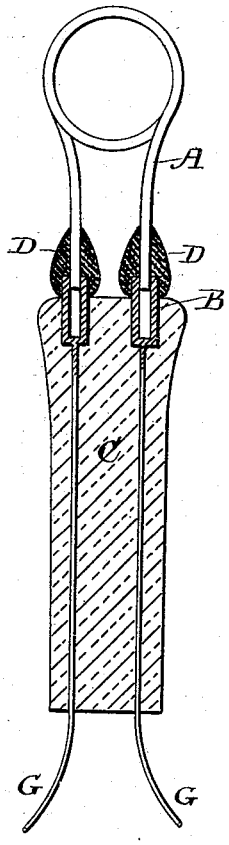
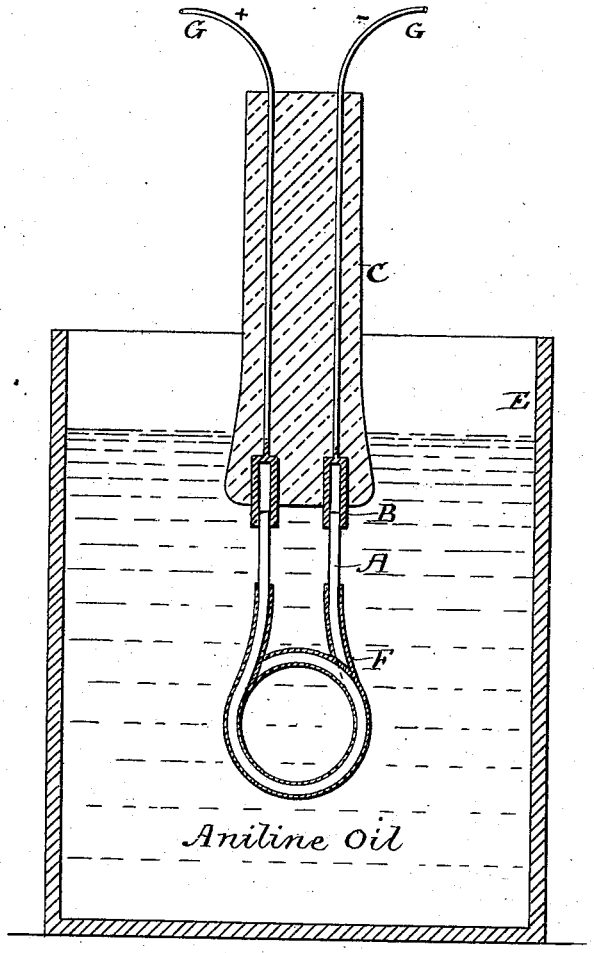


Fig. 2.



Witnesses:

E. E. Masson

Philip Mauro

Inventor:

Joseph W. Swan

by A. Pollok

his attorney

UNITED STATES PATENT OFFICE.

JOSEPH W. SWAN, OF NEWCASTLE-UPON-TYNE, ENGLAND.

INCANDESCENT ELECTRIC LAMP.

SPECIFICATION forming part of Letters Patent No. 260,335, dated June 27, 1882.

Application filed April 17, 1882. (No model.) Patented in England September 29, 1881, No. 4,202.

To all whom it may concern:

Be it known that I, JOSEPH WILSON SWAN, a subject of the Queen of Great Britain and Ireland, and residing at the town of Newcastle-upon-Tyne, England, chemist, have invented certain Improvements in and relating to Incandescent Electric Lamps, (for which I have obtained a patent in Great Britain, No. 4,202, dated September 29, 1881,) of which the following is a specification.

My invention relates to an improvement in electric lamps wherein light is produced by heating to a high degree of incandescence a thin filament of carbon contained in a vessel from which atmospheric air has been exhausted, or which contains gas which does not destroy the incandescent carbon filament.

The particular object of my invention is the rendering more perfect than hitherto the contact or connection between the ends of the carbon filaments and the metallic sockets and wires which convey the electric current to and from the filaments.

Hitherto it has been found almost impossible to make a sufficiently perfect contact between the filaments and the metallic sockets by the compression of the sockets on the filaments, the tendency being in that case to local action of the electric current at the points of contact, and consequent excessive heating of those parts and disintegration of the carbon, with the final result of the lamp-glass becoming obscured and the sockets fusing. To avoid this great difficulty and defect in the construction of the lamps referred to, I, so to say, weld or cement together by means of a deposit of hard carbon the ends of the filament and the metallic sockets into which the ends are inserted. My mode of procedure in accomplishing this object is as follows:

I make the metallic sockets which receive the ends of the carbon filament of any suitable metal, but preferably of platinum, and of a form varied to correspond with the shape of the filament. If it be a filament of a cylindrical section, I form the ends of the two wires to which the filament is to be attached into a tube of the size and shape of the end of the filament. If the filament be flattened so that its section is a line of greater or less length, then I shape the sockets so that the ends of the flattened filament are held between sockets which are flat surfaces of metal. The sockets having been formed as described, I attach them to a short stem of glass rod or tubing by fusion by means of a blow-pipe, so as to be connected together firmly in pairs, and with the sockets in the proper position relatively to each other to receive the ends of the carbon filament, which is usually of the form of a loop or arch, sometimes with one or more spiral convolutions. Into the sockets thus arranged I insert the ends of the carbon arch, the sockets and filaments being relatively of the proper form, so as to fit closely to each other. I then treat the mounted filaments in one or other of the following ways—that is to say, I coat the filament with copper by any well-known electrotype process in every part except the parts inserted in the socket and a very short length beyond, amounting to about one millimeter, or even less. After removal from the electrotyping-bath I carefully wash and dry the filament, and I then immerse it in a bath of aniline-oil, chloroform, benzole, benzoline, olive-oil, or any other suitable liquid or vapor from which carbon deposits by the action of heat, and while immersed in one or other of these liquids I pass an electric current through the filaments, the electric current being of such strength that the parts of the filaments on which there is no deposit of copper, and also the ends of the sockets and some distance from the ends of the sockets, become so strongly heated that a deposit of carbon takes place at and upon those parts; and I continue the operation until a considerable deposit of carbon, resulting in a bulbous enlargement of the parts on which it has taken place, is produced, and the welding together of the sockets and ends of the filaments already referred to is effected. The copper deposit is removed in any suitable way.

Instead of localizing the heating of the parts on which the carbonaceous deposit is required to take place, in the manner described, the same end may be obtained or effected as follows: I immerse the filaments in a bath of mercury or other suitable liquid metal nearly up to the point of attachment to the sockets, a suitable

carbonaceous liquid or vapor filling the bath above the mercury or other suitable liquid metal, and an electrical current of suitable strength, as before described, being then passed through the connecting-wires and the portion of the filament not immersed, the carbonaceous deposit before described will be produced; or a similar result may be obtained by placing a bridge, of metal or carbon, in the nature of a clip formed by two bars of metal or carbon held together by two slight springs, across the carbon filaments mounted, as already described, at a point very near to the point of attachment to the sockets, and so as to divert the current of electricity from passing entirely through the entire length of the filament, so as to confine such current to that portion of the filament adjacent to the socket, and which is required to be locally heated.

The mounted filament, with the bridging clip across it, is then immersed in the carbonaceous liquids or vapors already referred to, and electricity is passed through the connecting-wires, as before described, and so as to produce the desired local heating and the required deposit of carbon.

In the accompanying drawings, Figure 1 represents the finished article, A being the carbon filament; B, the sockets; C, the glass between the sockets, and D the carbon deposit; and Fig. 2 is a diagram illustrating the welding or uniting operation. In said latter figure the carbon filament, the socket, and the glass are lettered as in Fig. 1, while E is a vessel containing aniline-oil, in which the filament and ends of the socket are immersed; F, the copper deposit, and G the wires for conveying the electric current to the sockets.

Aniline-oil is preferably used as the medium from which carbon is deposited, as I have from my experiments found it to possess special advantages in this regard.

Having now fully described my said invention and the manner of carrying the same into effect, what I claim is—

1. In an incandescent electric lamp, a carbon filament united by a carbon deposit of the character described to the metallic sockets, substantially as set forth.

2. The method of uniting the ends of the carbon filaments to the metallic sockets by producing a local electrical heating, and thereby forming a coating or deposit over the junction, substantially as described.

3. In the production of a carbon deposit through electrical heating, the improvement consisting in immersing the article to be covered in aniline-oil and electrically heating it while so immersed, substantially as described.

4. In producing the local carbon deposit above mentioned, the improvement consisting in applying a metallic deposit by electrical action to the part of the filament required to be kept cool, and on which the carbon deposit is not to take place.

In witness whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOSEPH W. SWAN.

Witnesses:

ROBT. GREENE WALDEN,
Solicitor, Newcastle-upon-Tyne.

FREDERICK WALTER DENDY,
Solicitor, Newcastle-upon-Tyne, England.