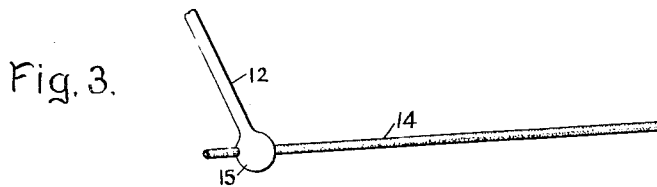
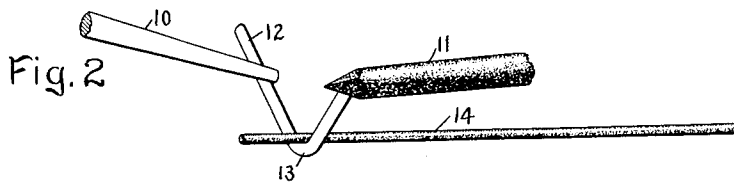
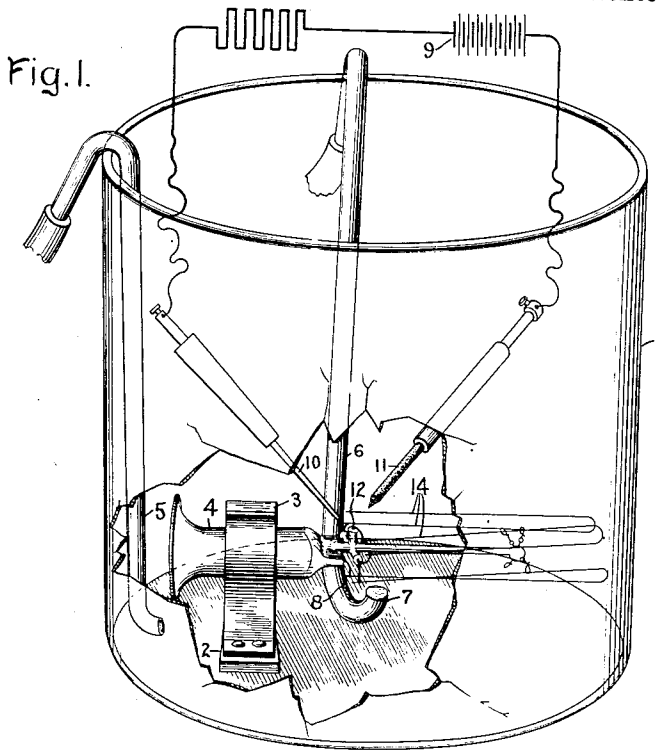


J. W. HOWELL.
 INCANDESCENT LAMP.
 APPLICATION FILED OCT. 23, 1907.

904,482.

Patented Nov. 17, 1908.



Witnesses:

Irving Esters.
J. Ellis Allen

Inventor
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 Att'y.

UNITED STATES PATENT OFFICE.

JOHN W. HOWELL, OF NEWARK, NEW JERSEY, ASSIGNOR TO GENERAL ELECTRIC COMPANY,
A CORPORATION OF NEW YORK.

INCANDESCENT LAMP.

No. 904,482.

Specification of Letters Patent.

Patented Nov. 17, 1908.

Original application filed November 17, 1906, Serial No. 343,832. Divided and this application filed October 23, 1907. Serial No. 398,736.

To all whom it may concern:

Be it known that I, JOHN W. HOWELL, a citizen of the United States, residing at Newark, county of Essex, State of New Jersey, have invented certain new and useful Improvements in Incandescent Lamps, (division of my application Serial No. 343,832, filed November 17, 1906,) of which the following is a specification.

This invention relates to incandescent electric lamps and processes for their manufacture, and comprises a new method of sealing the lamp filaments to the leading-in wires.

Incandescent lamp filaments of tungsten, tantalum, niobium, titanium and other refractory metals, alloys and compounds have operating temperatures considerably higher than that of the ordinary type of carbon filament, and the methods of securing filaments to the leading-in wires in lamps of the carbon type are not generally applicable to these more refractory materials.

According to my invention, the filament, say of tungsten, is welded directly to the lead wire. The joint so formed is entirely free from any paste or binding material which might contain moisture, carbon or other components possibly injurious to the filament at its exceedingly high running temperature.

The welded joint between the lead wire and the filament, is produced by melting down the end of the lead-wire into a compact globule or bead within which the lamp filament is embraced. The fusing or welding operation is performed electrically and in a protective atmosphere, as hereinafter described in detail.

Figure 1 is a diagrammatic representation of the apparatus used for producing the welded joint; Fig. 2 is an enlarged view of one of the leading-in wires, showing the position of a filament end with respect to the leading-in wire before the welding operation is performed; Fig. 3 is an enlarged view of the completed joint.

The apparatus shown in Fig. 1 consists of a glass jar 1, to the bottom of which is secured an upright standard 2 provided with a clip 3 for engagement with the stem 4 of a lamp so that the stem is held rigidly in a horizontal position. A small tube 5 extends downward to the bottom of the glass jar and serves as a means for conducting carbon

dioxid or other inert gas into the jar, where it acts as a protective medium during the sealing operation. A second tube 6, of copper or other suitable material extends downward into the jar and then bends up in a semi-circle 7 and is provided with small openings 8 so disposed that when the gas is supplied to the tube it will escape through these openings and impinge on the ends of the leading-in wires. The gas so supplied may be hydrogen or other reducing gas, but I prefer to use illuminating gas, as I have found this to be well adapted for the purpose.

Carbon dioxid is much heavier than air, and consequently the jar or vessel 1 remains constantly full, much as if a liquid were supplied through the tube 5. The illuminating gas, jetting upward through the heavy carbon dioxid, forms a reducing atmosphere in the immediate vicinity of the lead-wires, and is protected from oxidation by the carbon dioxid, through which it escapes to the outer air.

The electrical fusion or welding is effected by means of a source of current 9 and two portable electrodes 10 and 11, the former of copper or other metal, and the latter of carbon or graphite. Each of the lead-wires 12, is bent up at its end to form a hook 13 as clearly shown in Fig. 2. Within this hook is placed one end of the tungsten or other metal filament 14 and the operator then touches terminal 10 to the lead wire, and terminal 11 to the end of the hook to establish a flow of current through the hook. This flow may be sufficient to fuse down the hook and form a globule by the direct heating action of the current flowing through the hook, but I prefer to melt down the hook by the heat of an arc produced between the hook and the carbon electrode 11. This arc may be readily established by first touching the carbon to the hook and then removing it. The current necessary to produce the weld depends on the size of the leading-in wire, but two or three amperes will give good results for lead wires of usual diameter.

Fig. 3 shows the completed joint and illustrates the bead or globule 15 built on the end of the leading-in wire and securely welded to the end of the refractory filament.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. The combination with a vessel contain-

ing carbon dioxid, means for projecting a jet of reducing gas into said vessel, means for supporting a lamp filament with an end in proximity to said jet; a fusible conductor 5 in proximity to said filament, and means for fusing down said conductor to form a tight joint with said filament.

2. The combination with a vessel containing a heavy fluid, means for projecting 10 illuminating gas into said vessel, means for supporting a filament and a wire in said vessel, and means for drawing an arc in said illuminating gas to fuse the wire to the filament.

15 3. The combination with a lamp filament and a wire to be joined thereto, of means for projecting a jet of reducing gas against said wire, means for maintaining a protective envelop about said jet; and means for fusing 20 the wire about the filament under protection of said jet.

4. The combination with a lamp filament

and a conductor to be joined thereto, means for projecting a jet of reducing gas against said conductor, means for maintaining a 25 non-combustible gaseous envelop about said reducing gas, and means for drawing an arc in said reducing gas to fuse the conductor to the filament.

5. The combination with a vessel open at 30 the top, means for continuously supplying carbon dioxid thereto, means for maintaining a jet of illuminating gas under cover of said carbon dioxid, means for supporting a filament and a wire in said vessel, and means 35 for drawing an arc in said illuminating gas to fuse the wire about said filament.

In witness whereof, I have hereunto set my hand this twenty-first day of October, 1907.

JOHN W. HOWELL.

Witnesses:

S. N. WHITEHEAD,
J. HARRY ELKINS.