No. 706,313. Patented Aug. 5, 1902.

H. GILMORE.

INCANDESCENT ELECTRIC LAMP.

(Application filed Apr. 7, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 2.

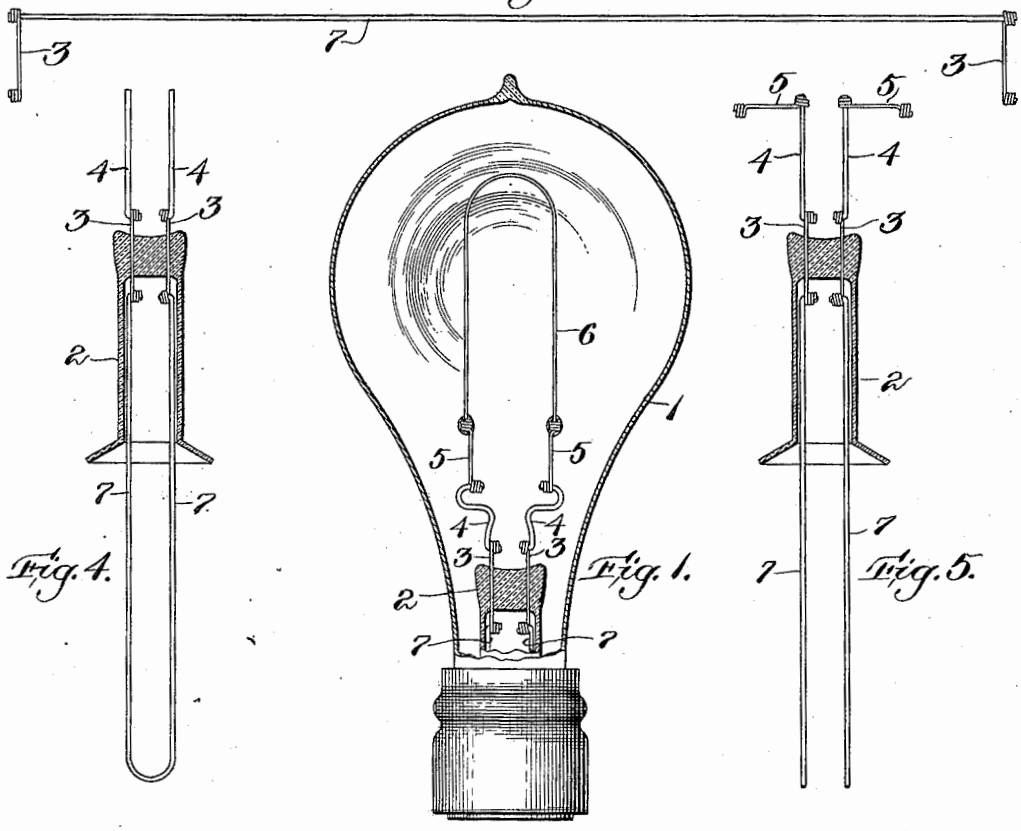

Fig. 4. Fig. 1. Fig. 5.

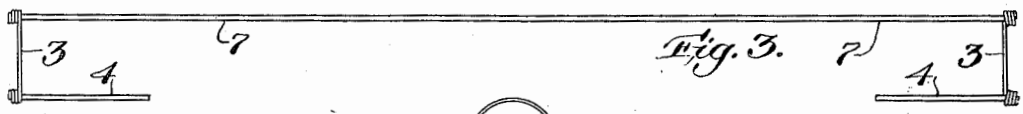

Fig. 3.

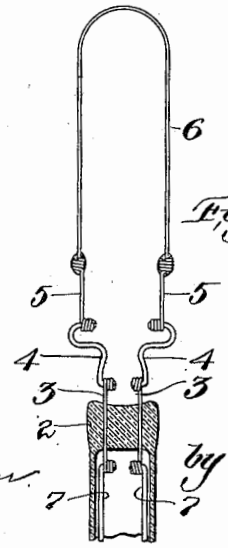

Fig. 6.

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Fig. 8.

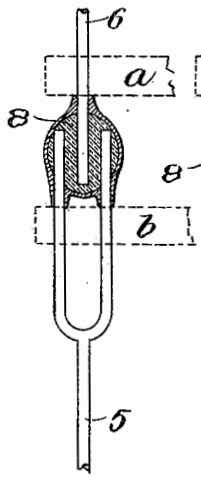


Fig. 9.

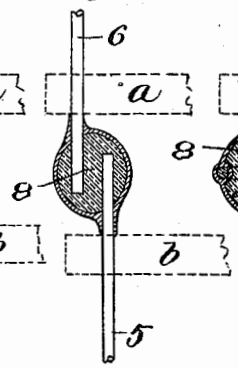


Fig. 10.

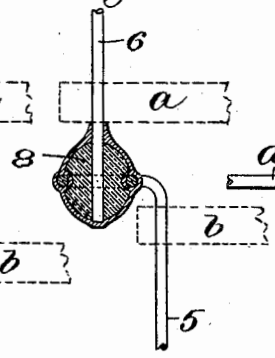


Fig. 11.

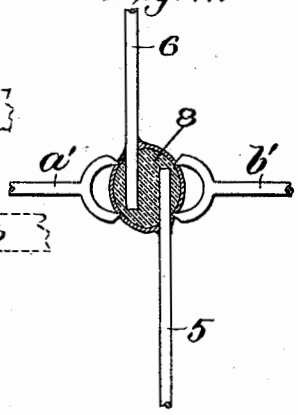


Fig. 12.

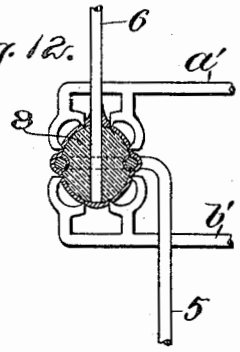


Fig. 13.

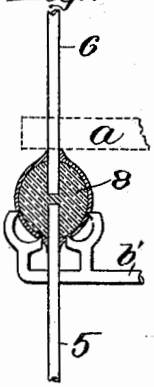


Fig. 14.

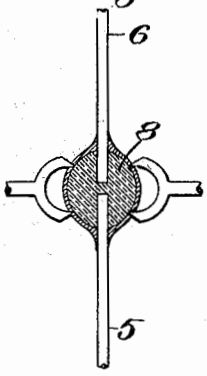


Fig. 15.

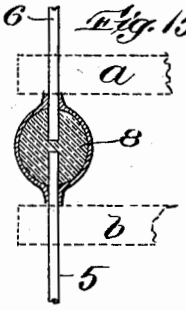
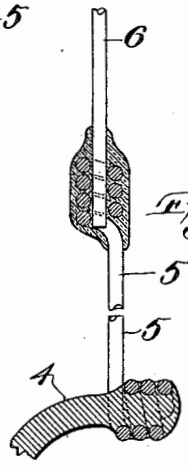


Fig. 7.



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UNITED STATES PATENT OFFICE.

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INCANDESCENT ELECTRIC LAMP.

SPECIFICATION forming part of Letters Patent No. 706,313, dated August 5, 1902.

Application filed April 7, 1900. Serial No. 11,967. (No model.)

To all whom it may concern:

Be it known that I, HOWARD GILMORE, of Boston, in the county of Suffolk and State of Massachusetts, have invented an Improved Incandescent Electric Lamp, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 is an elevation, partly in section, of an incandescent electric lamp embodying my invention. Figs. 2, 3, 4, 5, and 6 illustrate successive stages in the manufacture of the lamp shown in Fig. 1. Fig. 7 is an enlarged detail of a portion of the lamp shown in Fig. 1. Figs. 8, 9, 10, 11, 12, 13, 14, and 15 are enlarged details showing modifications of the joint which connects the filament with the leading-in wire.

My invention relates particularly to the joints of the leading-in wires and to the joints which connect the filament with the leading-in wires.

My invention is an improved incandescent electric lamp in which the leading-in wires are each made up of several pieces of wire united by a peculiar joint, which insures full conductivity as well as strength and in which the joint for connecting the ends of the leading-in wires with the filament is also peculiar and insures an admirable electrical contact as well as abundant strength.

In the drawings, 1 represents the glass bulb of my improved incandescent electric lamp, and into the bulb 1 projects the usual glass tube 2, the inner end of which is sealed, as usual, about the leading-in wires.

In my improved lamp each leading-in wire is made up of a number of pieces comprising a piece 3, preferably of platinum, which is sealed in the inner closed end of the glass tube 2 and connects pieces 4 and 7, preferably of copper, more fusible than platinum. Piece 5, preferably of nickel, connects piece 4 with one end of the filament 6.

The best way of making the lamp shown in Fig. 1 is to first attach piece 3 to each end of a piece of copper wire 7, as shown in Fig. 2, next to attach the ends of two short pieces of copper wire 4 4 to the free ends of the pieces 3 3, as shown in Fig. 3, next to bend each of the copper wires at or near the joints, so that all of the pieces are practically in one line, after which the long piece 7 of copper wire is bent at its middle, as shown in Fig. 4. Then seal the platinum pieces 3 in the inner end of the glass tube 2 and sever the long section of copper wire 7 at its bent middle portion, (see Fig. 5,) next attach pieces 5 5 to pieces 4 4, as shown in Fig. 5, next bend pieces 4 4 and attach the ends of the filament 6 to the free ends of the pieces 5 5, as shown in Fig. 6, after which the glass tube 2 is sealed at its outer end to the neck of the bulb 1 in the well-known manner.

Fig. 7 shows in detail and on an enlarged scale the construction of the joint which connects the nickel piece 5 with the copper piece 4 and also the construction of the joint which connects the nickel piece 5 with the filament 6.

Both ends of pieces 3 and 5 are coiled to form a socket or short sleeve, and the end of the copper wire 4 is inserted through the socket on piece 5, and the two pieces 4 and 5 (or 4 and 3 or 3 and 7) are heated and the copper wire fused at its end, the drop of fused copper entering the sleeve or coil. Another way in which the same result may be accomplished is to apply heat to both pieces 4 and 5, 3 and 7, or 3 and 4 at the joint until the parts at that joint have been raised to a red heat and then apply another copper wire and melt its end, the drop of fused metal entering the sleeve as before. An ordinary solder joint will not serve the same purpose, as the heat from the incandescent filament will destroy such a joint. It is also true that by making one piece with a sleeve or socket at one end for receiving the end of the next piece and connecting the two sections by a drop of fused metal, which serves as a bond of union, does not act to shorten the length of either section, as is the case with the ordinary and well-known joint, where the ends of the two pieces are simply brought together with the end of one section against the end of the other section and then heated at the joint until the two metals are united by a drop of fused metal.

The best way of connecting the filament with the leading-in wire consists in bringing the filament 6, wire 5, and body part 8 in proximity to each other and passing a current through the body part while the whole is in the presence of a carbon or metal depositing vapor or fluid. The body part 8 may

be made up separately to receive the filament and leading-in wire or may be made in the form of paste or cement and applied to the filament and leading-in wire. In either case I prefer to make the body part 8 of a specific resistance greater than the filament 6 or wire 5 in order that the depositing current may readily heat it.

I have shown the body 8 initially in contact with the other parts 5 and 6; but it is obvious that this is not essential, for the socket in the body part 8 for the filament 6 and leading-in wire will be practically out of contact with 8, and in Fig. 12 the socket on the end of leading-wire 5 may be so large that body part 8 will be practically out of contact with that socket. In this case the deposit on body part 8 enlarges body 8 and not only makes full electrical contact between 8 and 5 and 6, but also makes a joint which is mechanically strong.

In Fig. 8 the end of the leading-in wire is forked, and the end of the filament is initially held between the forks by the body part 8, which is roughly represented by the interior hatching, while the outer portion of the deposit is represented by the surrounding hatching; but this is of course conventional and simply means that the body part 8 initially connects one end of the wire with one end of the filament, so that the current applied through clips a and b (which hold the wire and filament in proper relation with the body part) flows through the body part and heats it to such a degree that the deposit permeates the body part and also covers it with a deposited layer which extends along the filament and the leading-in wire between the body part and the clips a and b, as illustrated in Figs. 8, 9, 10, and 15 and also in Fig. 7, each of which illustrates the leading-in wire and one end of the filament connected initially by the body part 8, but with the current applied through those portions of the leading-in wire and of the filament which lie between the clips a and b. The clips a and b are electrodes, and I commonly use an alternating current.

In Figs. 11, 12, and 14 clips a' and b' are applied directly to the body part 8, and in such cases the deposit is almost wholly upon and through the body part 8, so that the deposit upon those portions of the leading-in wire and of the filament close to the body part is slight.

In Fig. 13 clip a is applied to the filament and clip b' directly to the body part 8, another clip (not shown) being used of course to support the wire in Fig. 13 and also in Figs. 11, 12, and 14, this extra clip being out of circuit.

The body part 8 I prefer to make porous, so that the deposit will enter more deeply into it, and while a variety of cements will answer for the body part the only essential is that the cement used shall be of sufficient specific resistance to become highly heated—say to a red heat—by the current passing through it in order that the deposit may be sufficient to fill all the spaces between the filament, the leading-in wire, and the body part. In fact, the carbon deposit when the body part is formed of the usual graphite cement familiar to all skilled in this art not only covers all parts of the body part, but also permeates the body part. In fact, much of the body part is detached by the current and falls into the oil or other depositing medium; but the space occupied by the detached parts is filled up by the deposit.

The main function of the body part 8 is that of a conductor of the current between the clip electrodes a and b or a' and b', and its specific resistance must be so high that the body part will be raised to about a red or white heat.

What I claim as my invention is—

1. The improved electric lamp above described comprising a filament and a short piece of wire 5 coiled at both ends, with one end of the filament connected and secured to one coil of wire 5, and a second short piece of wire 4, connected and secured to the other coil of wire 5.

2. In an incandescent electric lamp a leading-in wire comprising a piece of wire (such as platinum or nickel) coiled at one end and another piece of more fusible wire such as copper with its end in that coil and held therein by a melted portion of the more fusible metal flowing into the coil and cooling between the spires of the coil and the wire within the coil.

3. In an incandescent lamp a filament with one end connected by a body part 8 and carbon deposited on that body part to a coil on one end of a short piece of wire 5, and with a coil on the other end of that wire 5, connected and secured to another short piece of wire 4.

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