(No Model.)

2 Sheets—Sheet 1.

O. A. MOSES.

INCANDESCENT ELECTRIC LAMP.

No. 310,145. Patented Dec. 30, 1884.

Fig. 1,

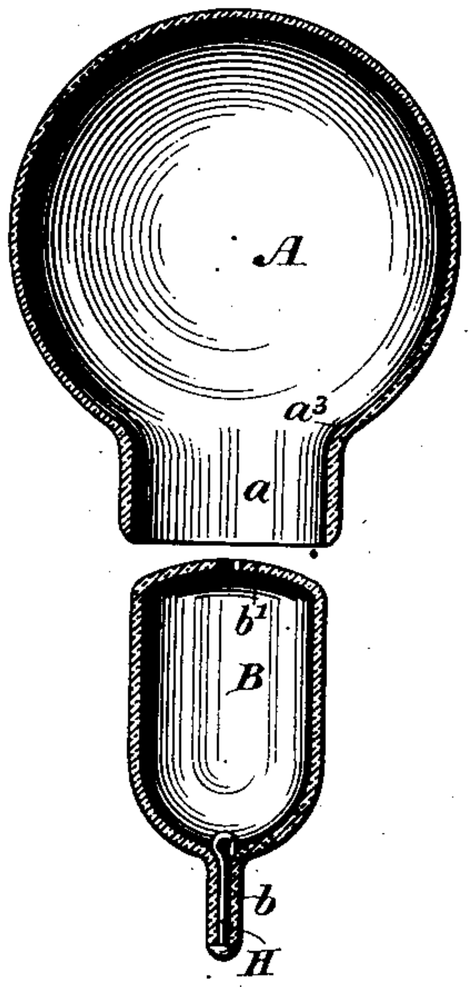


Fig. 2,

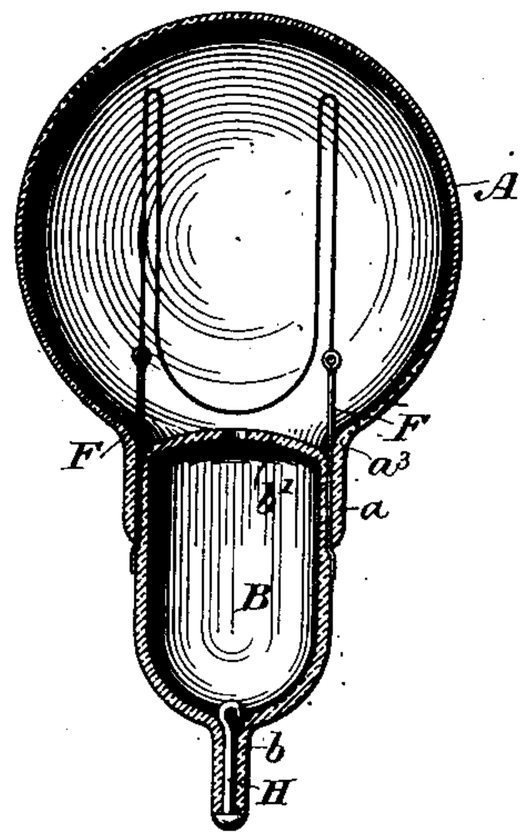


Fig. 3,

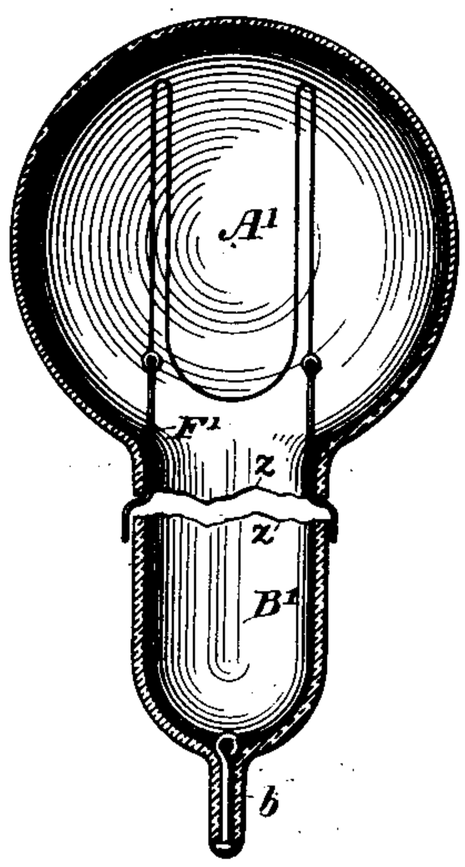
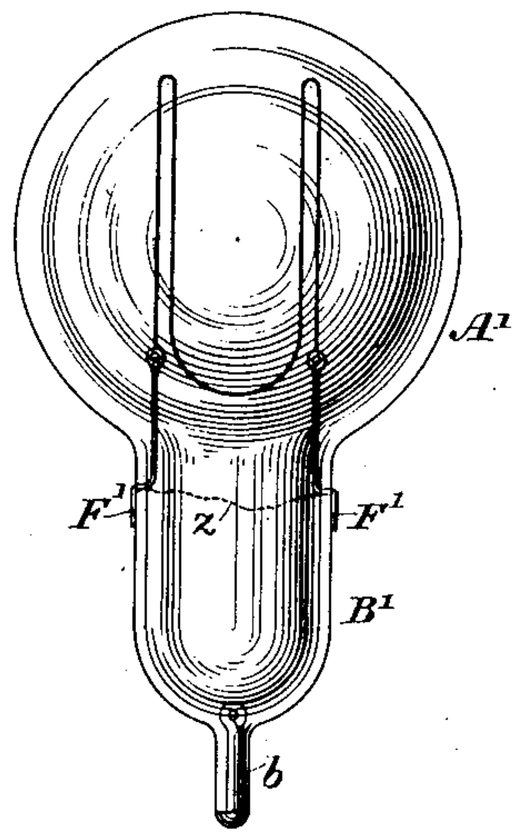


Fig. 4,



WITNESSES

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(No Model.) 2 Sheets—Sheet 2.

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INCANDESCENT ELECTRIC LAMP.

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Fig. 5,

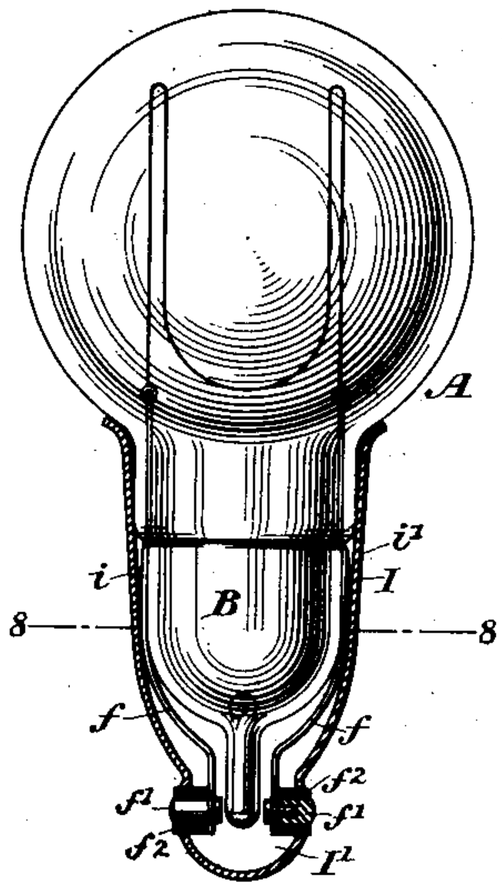


Fig. 6,

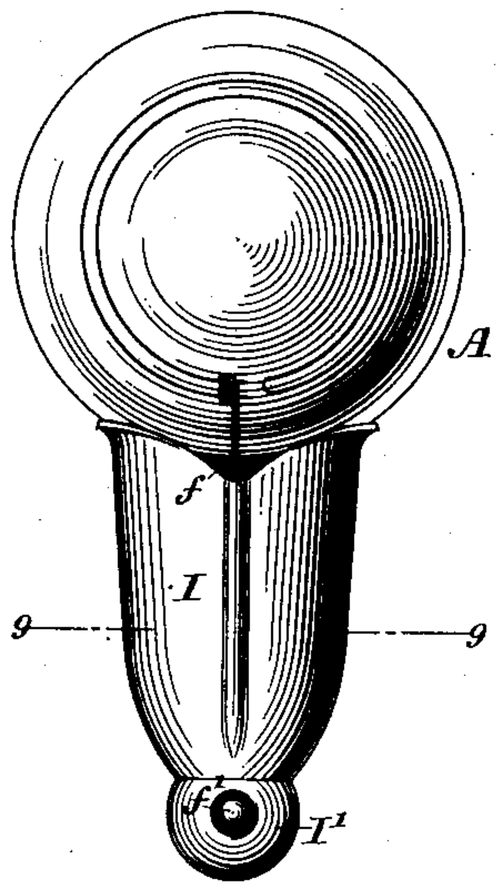


Fig. 8,

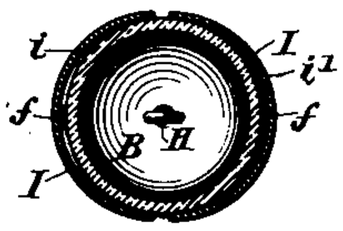


Fig. 7,

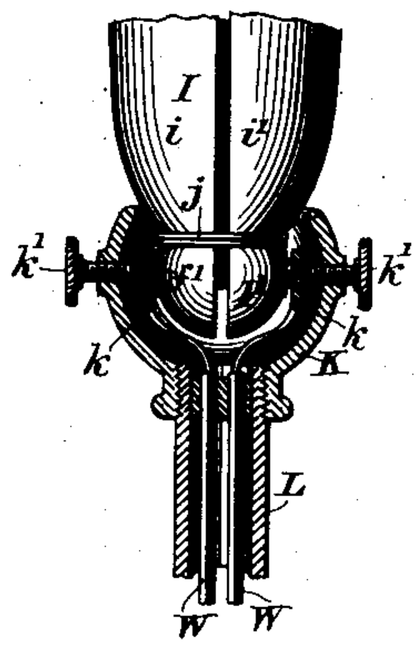
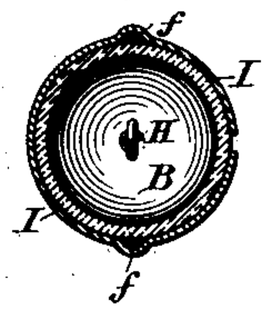


Fig. 9,



WITNESSES

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UNITED STATES PATENT OFFICE.

OTTO A. MOSES, OF NEW YORK, N. Y.

INCANDESCENT ELECTRIC LAMP.

SPECIFICATION forming part of Letters Patent No. 310,145, dated December 30, 1884.

Application filed October 18, 1883. (No model.)

To all whom it may concern:

Be it known that I, OTTO A. MOSES, a citizen of the United States, and a resident of the city, county, and State of New York, have invented certain new and useful Improvements in Incandescent Electric Lamps, of which the following is a specification.

My invention relates to that class of electric lamps in which a conducting strip, wire, or filament of carbon or other suitable refractory substance is mounted, by means of metallic supporting-conductors, within an exhausted air-tight globe or vacuum-chamber, or a chamber filled with non-oxidizing vapor or gas, which conductor is rendered incandescent when traversed by electric currents, thereby producing light.

My present invention consists particularly in improvements in the manner of inserting the filaments within the globe or vacuum-chamber, sealing the said supporting-conductors into the vacuum-chamber of the lamp, and in the manner of supporting the lamp, and at the same time establishing an electric connection between the terminals of the lamp-conductor and the conductors by which the electric current is conveyed thereto from a source of electric power.

In the accompanying drawings, which represent the application of my invention to incandescent lamps, Figure 1 is a sectional view of the two separate parts of which the vacuum-chamber is formed, and Fig. 2 shows the same after having been put together, the incandescing carbon and its attached conductors being inclosed within it. Figs. 3 and 4 illustrate a modification in the construction of the lamp. Fig. 5 is a sectional view showing the manner in which the complete lamp is mounted in its calyx or support. Fig. 6 is a side view of the same in elevation. Fig. 7 is a sectional view showing the joint by means of which the lamp and its support are attached to a stationary fixture; and Figs. 8 and 9 are transverse horizontal sections in the plane of the dotted lines 8 and 9, respectively, in Figs. 5 and 6.

The several steps of the process which is employed in the manufacture of my improved lamps will be particularly described in a separate application, and hence in the present specification I shall only make such reference to the process of manufacture as I deem necessary to enable the construction of the completed lamp to be properly understood.

In Fig. 1 the two parts of the vacuum-chamber are represented separately, A being a bulb of glass having a cylindrical neck, *a*, formed upon it, while B is a cylindrical tube or chamber, also of glass, the upper portion of which is adapted to fit closely the neck *a* of the bulb A.

The filament C is inserted within the globe A before the cylindrical tube B is applied thereto.

By referring to Fig. 6 it will be seen that the diameter of the curve described by the filament is greater than that of the opening through which it is inserted. The method of placing such a filament within the globe is to insert the loop end within the neck *a*, and to then bend it in such a manner as to allow the entire length of the filament to be pushed forward into the interior. The flexibility of the filament will permit this to be accomplished, although it would not be possible to bend the two sides of the curved filament toward each other sufficiently to permit the filament to be inserted in a flattened form. This method of insertion is also applicable to filaments of other general form than that shown in the drawings. After the filament is within the globe it will immediately resume its previous form. The lower end of the tube B has a contracted neck, *b*, through which passes a longitudinally small opening, situated in the axial line of the cylindrical portion B of the vacuum-chamber. Through this neck the necessary exhaustion of the air from the vacuum-chamber is effected, as hereinafter explained.

The parts A and B are put together to form the vacuum-chamber, as shown in Fig. 2, by inserting the tube B within the neck *a*, so as to form an overlapping or telescopic joint. Electric conductors F F, preferably of thin platinum wire, for supporting the incandescent conductor C, are made to pass through this joint at different points upon the exterior surface of the tube B, as shown in Fig. 2, and the parallel outer and inner surfaces at the joint are then fused together by the applica-

tion of a blow-pipe flame, so as to form a solid mass of glass, within which the conductors F F are embedded for a length of half an inch, (more or less,) thus forming a perfectly air-tight joint. When the tube B is thus inserted into the neck *a*, care is taken that its convex upper end is not placed precisely opposite to the upper end of the neck *a*. It is preferable to so place it as to leave a little shoulder, as seen at a^3 in Fig. 2. This construction avoids a certain liability to subsequent fracture, which would exist if the glass were fused and colored again at the precise point of junction between the bulb and its cylindrical neck. The tube B is closed at its upper end by a convex wall, *b'*, perforated by an aperture, as seen in Fig. 1. It follows, therefore, that when the parts of the vacuum-chamber have been put together and united by fusion, as hereinbefore described, the latter will consist of two communicating compartments, as in Fig. 2, consisting, respectively, of the bulb A, containing the incandescent conductor, and the tube B, with its contracted neck *b*, through which the air is to be exhausted, and which is technically termed a "seal." The annular wall or shield *b'* which separates the two compartments presents a convex surface, which serves to reflect the light thrown against it by the incandescent conductor when the lamp is in use, and thus materially increase the effective illumination. After the air has been exhausted from the vacuum-chamber through the contracted neck *b* the permanent sealing of the chamber is effected by means of a metallic stopper, H, preferably of platinum, which has previously been inserted therein, and around which the glass of the neck is compressed by atmospheric pressure, or by suitable instruments, after having been softened in the blow-pipe flame. The tip, after having been detached from the pump, is softened again, and then plunged into molten lead, or other suitable metal which under atmospheric pressure penetrates into the minute interstices which may exist between the platinum and the glass. The seal is now subjected alternately to the heat of an oxidizing and a reducing blow-pipe flame, by which the interposed lead or other metal is chemically united or alloyed both with the platinum and the glass. In case lead is employed, for example, the metal gradually passes into silicate of lead, and thence into glass on the one hand and into an alloy of platinum and lead on the other hand, thus forming an efficient and permanent metallic seal. By placing the seal at the same end of the vacuum-chamber at which the conductors enter, and preferably at the point hereinbefore described—that is to say, in the line of the longitudinal axis of the cylindrical portion of the vacuum-chamber—I am able to protect the seal from accidental breakage or injury by inclosing it, when the lamp is mounted, within the supporting-socket, through which the conductors also enter. In the construction of incandescent lamps prior to the date of my invention it has been usual to place the seal at the opposite end of the chamber or bulb from that at which the conductors enter, and hence the seal, being exposed and wholly unprotected after the chamber was mounted, has been very liable to be fractured, thus totally destroying the lamp. The lamp having been thus put together, as shown in Fig. 2, is then inserted within a cup or calyx, I, Figs. 5 and 6, which may with advantage be constructed in two parts, *i i''*, having a spherical extension at its lower end. Within this calyx extend conductors *f f*, of copper or brass, which are soldered to the platinum lamp-conductors F F at the point where they emerge from the exterior surface of the vacuum-chamber, and extend downward, as seen in Fig. 5, their lower extremities being attached to metallic terminals *f' f'*, surrounded by insulating-thimbles f^2 f^2. These thimbles, with their inclosed terminals, project through openings in the shell of the spherical portion I' of the calyx. The two parts of the calyx proper do not come quite in contact with each other, but are separated by a small space, as shown in Figs. 7 and 8, and the separate parts are preferably secured to cylindrical portion of the lamp by a suitable wrapping or clamp, *j*, which causes the two parts to bear against the conductors *f f*, and by means of these to securely grasp the lamp. The conductors *f f* are thus entirely inclosed within the calyx, and are protected by their position from injury during the handling which is necessary in transporting and mounting the lamps. Suitable insulating material is placed between the conductor and the calyx, in case the latter is formed of metal. In Figs. 6 and 9 the calyx is shown as divided on one side only, and having a recess formed within it on each side to admit the conductors. The spherical extension I of the calyx is adapted to fit within a socket, K, so as to form a ball-and-socket or universal joint, as seen in Fig. 7. The socket K has within it adjustable cheek-pieces *k k*, which form the terminals of conducting-wires W W, which are preferably led from the source of electrical supply through a tube, L, upon the end of which the socket K is mounted. Thus it will be understood that the lamp may be attached to its support and simultaneously connected with the electric circuit by the simple operation of inserting the spherical portion I' of the calyx within the stationary socket K, whereby the insulated terminals *f'* and *f'* of the lamp are brought into contact with the insulated cheeks *k k*.

In order to insure a firm contact, the conductors F F are preferably made of resilient metal, so that when the lamp is mounted in its socket the terminals *f' f'* will yield by the flexure of the conductors until their surfaces are flush with the surface of the inclosing-shell. The cheeks *k k* may be provided with adjusting-screws *k' k'*, by which they are made

to grasp the lamp with any required degree of firmness.

In Figs. 3 and 4 I have illustrated a modification of my improved lamp, in which the same general principles of construction are carried out in a simple and inexpensive form, but one which will, nevertheless, be found well adapted for use in cases where simplicity and economy are a desideratum.

The two parts of the vacuum-chamber are first blown from glass in a single piece, which is then broken apart near the neck, as shown at *z z*, Fig. 3. While the vacuum-chamber is thus in two parts or fragments, A′ and B′, the electric conductors F′ and F′ are fused into the broken edges of the glass, after which two parts are reunited along the line of the original fracture by softening and fusing the joint in a blow-pipe flame and at the same time pressing the parts together. When this operation is completed, the lamp will appear as in Fig. 4, the conductors F′ F′ being sealed into the walls of the lower portion of the vacuum-chamber B′. This form of lamp being similar in its other features to the form first described, and embodying substantially the same principles, does not require further detailed explanation.

I do not herein specifically claim an incandescent electric lamp having a filament formed in a curve of greater diameter than the diameter of the opening through which it was inserted, nor the method of inserting such a filament, which consists in placing one end of the filament, or a loop of the same, within the opening and bending the same as may be necessary to force the entire filament through the opening; but I propose to embody claims for such method and product in another application.

I claim as my invention—

1. In an incandescent electric lamp, the combination of a transparent vacuum-chamber formed of two parts united by a sealed joint, and metallic conductors entering the chamber at or within said joint.

2. In an incandescent electric lamp, the combination of a transparent vacuum-chamber formed of two parts united by a sealed overlapping or telescopic joint, and metallic conductors entering the chamber within said joint.

3. In an incandescent electric lamp, an air-tight joint formed by sealing or fusing together the parallel surfaces of an outer and an inner or an upper and lower cylinder with metallic conductors between them.

4. In an incandescent electric lamp, a vacuum-chamber formed in two communicating compartments, one containing the incandescent conductor and the other the seal, and metallic conductors entering the chamber within the joint between the two compartments.

5. In an incandescent electric lamp, the combination of a vacuum-chamber formed in two hollow communicating compartments united by a sealed overlapping or telescopic joint, one of which compartments contains the incandescent conductor and the other the seal, metallic conductors entering the chamber within said joint, and an annular wall or shield separating the two compartments and forming a reflecting surface.

6. In an incandescent electric lamp, the combination of a vacuum-chamber of glass with a stopper of platinum, and a seal of lead or other readily-fusible metal between the platinum and the glass.

7. In an incandescent electric lamp, the combination of a vacuum-chamber of glass with a stopper of platinum and a sealing of lead or other readily-fusible metal between the platinum and the glass, which sealing has been chemically united or alloyed with both by the action of heat.

8. In an incandescent electric lamp, the combination of the transparent vacuum-chamber, the supporting cup or calyx, the yielding elastic conductors inclosed between the calyx and the exterior of the vacuum-chamber and soldered to the terminals of the incandescent conductor, and the adjustable cheek-pieces for making electrical connection therewith.

9. In an incandescent electric lamp, the combination of the transparent vacuum-chamber, the longitudinally-divided supporting cup or calyx, the conductors inclosed between the calyx and the exterior of the vacuum-chamber, and the insulated metallic contacts forming the terminals of the lamp-conductors.

10. In an incandescent electric lamp, the combination of the transparent vacuum-chamber, the longitudinally-divided supporting cup or calyx and its longitudinally-divided spherical extension.

11. In an incandescent electric lamp, the combination of the transparent vacuum-chamber, the electric conductors extending through the walls of the same, and also along the exterior surface of said walls, and the cup or calyx supporting said vacuum-chamber and grasping the same by means of the conductors and its own resilience.

12. In an incandescent electric lamp, the combination of the transparent vacuum-chamber, the longitudinally-divided supporting cup or calyx, the conductors inclosed within the calyx, between it and the vacuum-chamber, and the contact-points surrounded by insulating material and mounted upon yielding supports, so that they may be flush with the exterior surface of the calyx when the lamp is in its place.

13. In an incandescent electric lamp, the combination of a transparent vacuum-chamber, a metallic supporting cup or calyx provided with a spherical extension, and a socket attached to a fixed support and adapted to grasp said spherical extension, thus forming a universal joint.

14. In an incandescent lamp, the combina-

tion of a transparent vacuum-chamber, a supporting cup or calyx provided with a spherical extension, a socket attached to a fixed support and adapted to receive and grasp said spherical extension, and insulated conducting terminals inclosed within said socket and adapted to bear against yielding insulated contacts protruding from the surface of the exterior of the calyx and to thus complete the electric circuit through the lamp.

In testimony whereof I have hereunto subscribed my name this 15th day of October, A. D. 1883.

OTTO A. MOSES.

Witnesses:
DANIEL W. EDGECOMB,
CHARLES A. TERRY.