No. 621,291. Patented Mar. 14, 1899.

F. M. F. CAZIN.

ELECTRIC INCANDESCENT LAMP.

(Application filed Oct. 29, 1895.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

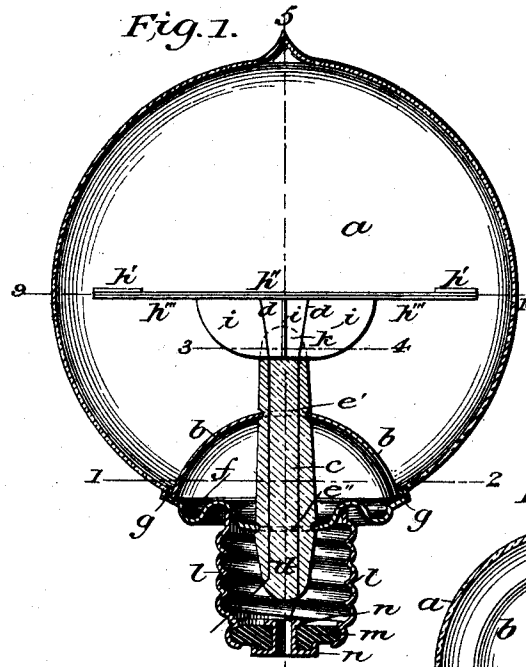


Fig. 2.

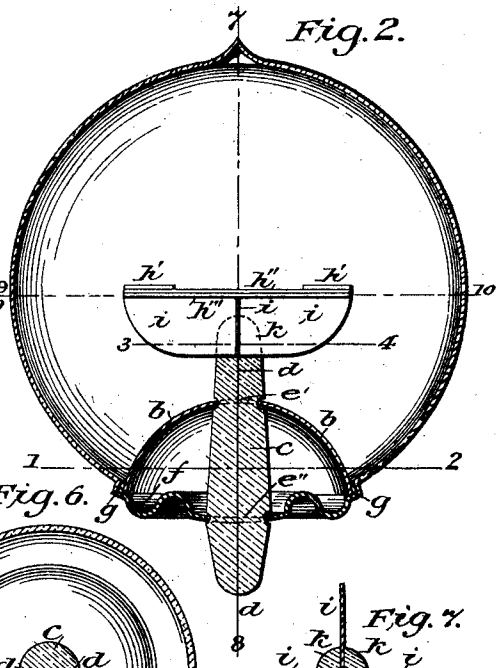
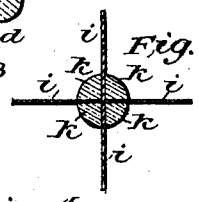


Fig. 6.

Fig. 7.



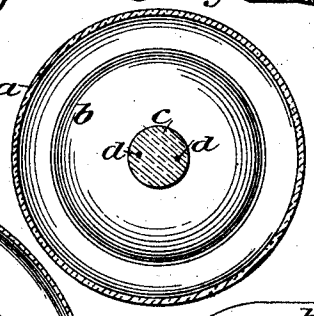
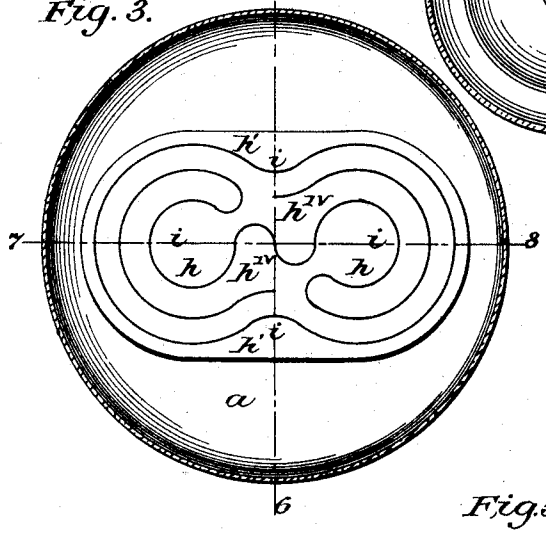


Fig. 4.

Fig. 3.



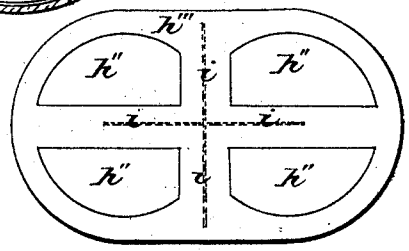
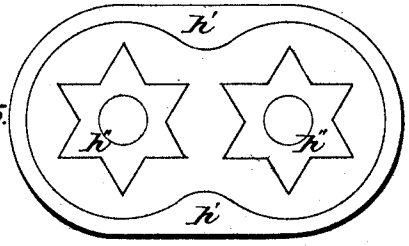


Fig. 5.



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No. 621,291. Patented Mar. 14, 1899.

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ELECTRIC INCANDESCENT LAMP.

(Application filed Oct. 29, 1895.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 8.

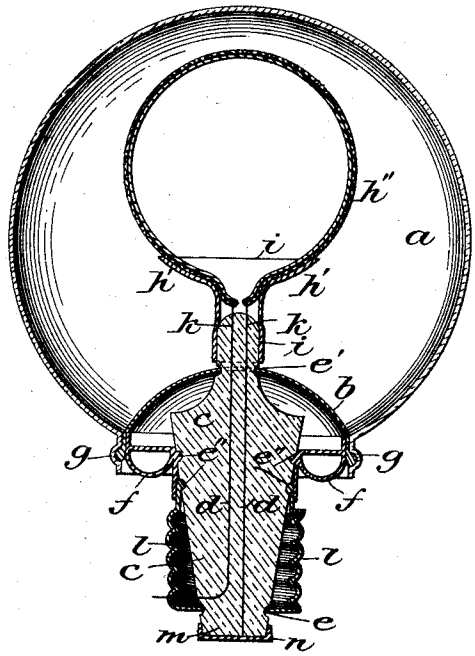
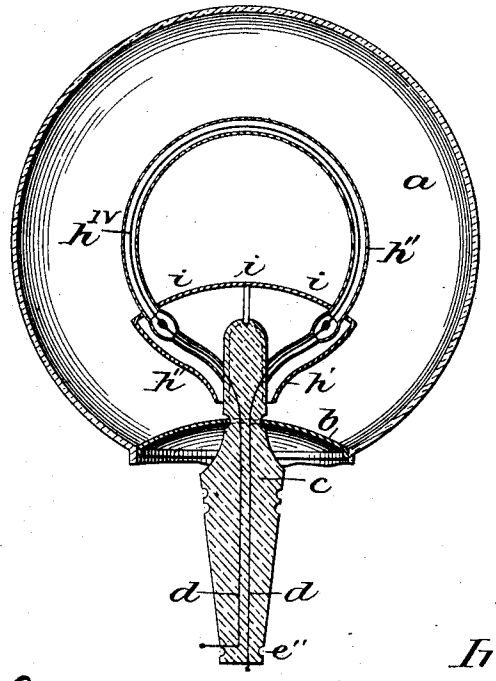


Fig. 9.



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UNITED STATES PATENT OFFICE.

FRANCIS M. F. CAZIN, OF HOBOKEN, NEW JERSEY.

ELECTRIC INCANDESCENT LAMP.

SPECIFICATION forming part of Letters Patent No. 621,291, dated March 14, 1899.

Application filed October 29, 1895. Serial No. 567,332. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS M. F. CAZIN, a citizen of the United States, residing at 1108 Bloomfield street, city of Hoboken, Hudson county, State of New Jersey, have invented new and useful Improvements in Electric Incandescent Lamps, of which the following is a specification.

In the United States Patent No. 523,460 issued to me on the 24th day of July, 1894, I disclosed an all-solid electric incandescent lamp in which carbonaceous or other semiconductive matter in linear form constitutes the incandescing element and is embedded between two solid bodies, and thereby protected against the deteriorating influence of the atmosphere. In another patent, No. 523,461, issued to me on the same day, I disclosed a similar structure, in which, however, the solid body inclosing the incandescent linear matter is itself protected by an air-space inclosed by a transparent solid sheet, the material of the solid body being selected with a view of utilizing the dark rays emanating from a filament under current for the purpose of increasing the light effect of the lamp. In a third patent, No. 566,285, issued to me on the 18th day of August, 1896, I disclosed a lamp in which the linear incandescing matter is integrally connected with a solid body in or on the face thereof and is protected, together with the said solid body, against deterioration by an exhausted glass bulb or a vacuum, the solid body in this instance being itself adapted to become luminous under the influence of the dark heat rays produced by the electric current through the resisting linear matter.

In an application filed by me on the 11th of September, 1896, bearing the Serial No. 562,189, I disclosed a lamp in which there is a luminous part distinct of the base part and the nature and composition of such distinct luminous part.

In my present application I contemplate an improved method or process of manufacturing my improved electric incandescent lamps mainly of the character as disclosed in my application Serial No. 562,189, and in special a novel process of sealing and the use of partial covers or pseudo fabrics of rare-metal oxids, with or without the use of an insulating middle stratum, such as disclosed in my application Serial No. 562,189.

I have in all of my preceding applications qualified the current passing and resisting filament by function and not by material; but as far as the improvements in the manufacture of the luminous body disclosed in special in this application are concerned I have selected carbon as the material of which the filament is made. The result is a cohesive luminous body, the core or filament part of which becomes both luminous and heat-emanating under electric current, and the outer or inclosing part of which consists of matter peculiarly adapted to become incandescent by heat and not by the passing current directly, such outer or inclosing part when of tubular form leaving the filament uncovered in spots, to the effect that both the filament and the cover contribute to the production of light effect, and with such filament and with such coating I may or may not use an intermediate film that insulates the filament from the coat both electrically and chemically or to one of these two purposes, as such insulation has been disclosed in my application Serial No. 562,189.

In my new and improved lamp the part or stratum or strata consisting of an oxygen compound with a metal adapted to become luminous by heat emanating from a carbon filament under electric current are prepared as follows: Some fabric or gauze filled with an adequate quantity of gelatinous matter when dried is impregnated and coated with the appropriate metallic oxid by immersing it in a liquid containing such oxid in suspension or solution, the immersion being repeated intermediately with drying until the adequate quantity of oxygenated metal be adhering to the fabric. The fabric is then subjected to carbonization, and the carbon nucleus, the result remaining of the fabric proper and consisting of soft charcoal-like carbon as against the hard retort carbon-like character of the filament proper, is destroyed when the pseudo fabric is in place in the lamp and while the bulb is being exhausted, the current being sufficient for burning out so much of the remaining substance of the fabric as is not intended to act as accessory filament, if any, and the residue of the fabric when in a car-

bonized state may be used as a filament proper or as accessory filament, and such filament may be made by using a ribbon-shaped fabric and by coating the same, as described, with oxids, the coating of oxids favoring the use of a tender ramified filament.

Different forms of ramified filaments and of ramified and oxid-coated filaments may be of more or less luminous effect; but not their specified total form constitutes my invention mainly, while the ramification and the coating each as such and both jointly constitute an important and new improvement.

That I propose to use in the manufacture of my improved lamps mainly a cylindrical form of luminous body is in no wise intended to indicate that I shall not use also other or accessory parts in making up such luminous body in my lamps, and I have endeavored in consequence to illustrate by my adjoined drawings different shapes that the two main elements in such luminous body—namely, the semiconductive current-passing filament and the thereto adhesive oxids—may have, and I have done so also for the purpose of illustrating the artistic effect that may be produced by filaments when filaments of great length and minute section are embedded between sheets, webs, perforated plates, or pseudo fabrics of any suitable form and are supported by plates and brackets or in a trough, and I have shown a form of glass bulb and of the contact-providing base part that permits facile insertion of the perfected luminous body into the glass bulb, though such body be inserted as a whole and of rigid or unbending character; but it is not my intention to use the luminous bodies invented by me with any such frames, brackets, troughs, base parts, &c., as by me shown exclusively, but I may use them with other forms of accessory parts and with only one or the other of the accessories, as the case may be.

The novel process for hermetically sealing hereinabove mentioned I will now describe as follows:

It is not necessary that the inleading wires consist for their entire length of platinum; but it is necessary that the ends leading immediately into the bulb-space consist of platinum. Such ends are soldered to copper or other base-metal wire of adequate section, and the whole wires are bent into proper lines. The base-metal part is then coated with a sulfur or oxygen compound of the same metal by means of a paint, in which such base-metal sulfid or oxid is suspended in a volatile oil, and which paint is thoroughly dried out, and the so-coated base-metal parts of the inleading wires are then heated in an oxidizing-flame, and the platinum ends are heated in a non-oxidizing flame, which deposits carbon on the platinum, whereby an intermediate carbon-platinum compound is formed, which enhances the peculiar virtues of platinum wire, such as high point of fusion and non-affinity to oxygen, and adapts its surface to adhesive fusion with molten glass and for a stable joint therewith after cooling. The so heated and coated wires are then introduced into a mold, and liquid or molten glass is then poured into the mold around the wires. Thereby the silica of the molten glass forms a minute coat of slag or silicate with the base metal and by means thereof a hermetical joint between the glass and the base metal, while along the platinum part of the inleading wires the silica of the glass forms in presence of carbon a compound with both or with either, producing a hermetical seal and joint between the platinum wire and the glass.

That glass is mentioned as the material for casting a sealing-body around the inleading wires is not intended to exclude viterous slag, which, though glass in fact, is not usually so called.

The drawings which form part of this application are as follows:

Figure 1 is a central longitudinal or vertical section of one variety of my improved lamp, showing the luminous body supported by brackets, plates, and frames. Fig. 2 is a central longitudinal section of the same lamp on the line 5 6 of Figs. 1 and 3, the contact-making base parts being omitted. Fig. 3 is a central transverse section of the same lamp, showing the design, in which the linear filament is embedded in this particular modification in a sheet or web or pseudo fabric of rare-metal oxid, the view being taken on the line 9 10 as marked in Figs. 1 and 2, the shape of the plate, sheet, web, or pseudo fabric h'' being indicated by the outer edge only and the shape of the supporting-frame h', which covers such edge, being also indicated, leaving the cover h'', within which the filament h^{iv} is embedded and within which it spreads and forms the design, visible except where covered by the frame h', the visible part being marked h. Fig. 4 is a view from below of the under frame h''', of part of the plate resting thereon, sheet, web, or pseudo fabric of oxids h'', and shows in dotted lines the contact-lines between the frame h''' and the brackets $i\ i\ i\ i$. Fig. 5 is a view from above of the upper frame h', of the plate, sheet, web, or pseudo fabric h'', and of a different design in which the filament h^{iv} may be stretched within the body h'', the points of diversion of filaments from said body being left unmarked. Fig. 6 is a section on lines 1 2, marked in Figs. 1 and 2. Fig. 7 is a similar section on the line 3 4. Fig. 8 is the central longitudinal section of a differently-designed, but essentially similar, lamp. Fig. 9 is the central longitudinal section of a differently-designed, but essentially similar, lamp distinct only from Fig. 8 in this that the oxids h'' are not, as shown in Fig. 8, in the form of pseudo fabrics, but forming a solid, though not complete, cover to the filament, leaving parts of the filament uncovered and free to radiate light.

It is evident from all that which I have dis-

closed in this and in my preceding applications, as heretofore mentioned, that these drawings cannot be intended by me to show forms or dimensions of parts as the result of a definite selection. The essential of my invention is not concerned therein, but is concerned in the function of parts, in the material selected in consequence for parts, and in the relative position of parts, and in some feature of form only as conditional to function, such as the form of the embedding oxids, permitting the core or filament to partake in the emanation of light directly as well as indirectly.

The different parts of the lamps are uniformly designated by letters, namely:

a designates a glass bulb, preferably of spherical form.

g designates a neck around the main aperture of the glass bulb *a*, which neck is shown in conical form in Figs. 1 and 2 and is shown cylindrical, with a ring-shaped indenture on its inside, in Fig. 8.

c designates a conical body of cast glass within which the inleading wires are hermetically sealed, the seal stretching over an unusually large portion of the inleading wires and covering eventual joints in these wires between the platinum ends that enter the glass bulb and the base-metal ends that make the contacts.

d d' designate the inleading wires mentioned hereinabove, of which the contact-making ends join—one to the cap-terminal *n* and the other to the corrugated ring-terminal.

e' e'' designate annular indentures in the glass body *c*, which indentures are intended to furnish a stable seat and a firm hold for the metal parts composing the contact-making and bulb-seal-providing base of the lamp, it being intended in this variety of my lamp, as shown, to make use of the process of soldering metal to glass, to which soldering the annular indentures are one of the suitable provisions for making a hermetical and stable seal by such soldering.

b designates a convex reflector of polished metal, though it may also be made of some other suitable material. In the drawings it is assumed to be of metal, with a central circular aperture, by which the glass body *c* is passed with its upper end to the line where the upper annular ring *e'* provides a seat for the edge of the aperture.

f designates a corrugated metal ring soldered with its outer edge directly or indirectly to the neck *g* of the glass bulb *a* and soldered and sealed with its inner circular edge to and within an annular indenture of the glass body *c*.

m' designates in Fig. 1 a special insulating-button, and *m''* in Fig. 8 the lowest extreme end of the glass body *c*, the function of these parts being the same—namely, to preserve the insulation of inleading wires from one another until each reaches the contact specially provided for the same.

l designates a contact-ring, which is shown as having a threaded surface, but which may as well have some other shape suitable to fit into any of the commercial lamp-sockets.

n designates the contact-cap of the ordinary form.

n' designates in Figs. 1, 2, and 3 a frame of glass or mica, which is mainly intended to strengthen the plate *h'''*, space being left between the two for the outer part of the luminous body *h''*, consisting mainly of rare-metal oxids, and in which the inner part or the linear semiconductive and current-passing filament is embedded, forming such designs as are shown in Figs. 3 and 5.

i designates brackets supporting the plate *h'''*.

h^{iv} designates the linear continuous filament of uniform cross-section, consisting of semiconductive current-passing material of any suitable class and consisting in the lamp, which is the special subject-matter of this present application, of carbon with or without an insulating-coat.

k indicates incisions in the upper end of the cast-glass body *c*, which incisions have the function of holding the brackets *i i i i*.

In using the designation "rare-metal oxids" I intend to designate all those earths or oxids which combine with a high point of fusion the peculiar qualities of more readily becoming incandescent or luminous under the influence of heat than other matter and without confining myself to the use of single earths or of definite mixtures thereof.

I do not intend to confine the use of the luminous body such as disclosed in this application to accessory parts, such as shown in the drawings, but may use such luminous bodies in connection with any other form of base part or of glass bulb. I further say that I have no intention to confine the making of the luminous bodies invented by me to those forms as are shown in my drawings, the essential conditions for practical light-increasing use being that between these oxids or earths and the current-passing semiconductive filament there be intercohesiveness and that where there is immediate contact between them the filament and oxids be so insulated as not to deteriorate one another, provided there be affinity between the material that they are made of.

In using the expression "pseudo fabrics" I desire to express not only the fibrous character in the product, so called, but essentially also the quality of the outer stratum of rare-metal oxids of leaving interstices or openings or spots where the core or filament is not covered and where light directly emanating from the core may penetrate the partial cover, and in so far as the cover complies with this condition it need not necessarily be a pseudo fabric.

Having described my invention, I now claim—

1. In an electric incandescent lamp a lumi-

nous body, which consists of two cohesive parts, of which a linear, uniformly-sectioned, continuous filament of suitable material and section is the one, or inner part, and sheets or webs or pseudo fabrics, made of rare-metal oxid, as their main substance, form the other or outer part, which two parts are adhering to one another, as and for the purpose set forth.

2. In an electric incandescent lamp a luminous body, which consists of two main parts, forming a cohesive whole, namely an inner or filament part, which consists of a uniformly-sectioned, continuous linear body of such material and dimensions, as will cause the same to produce light and heat by means of current resistance, as the one part, and a partial cover or covering pseudo fabric, mainly consisting of rare-metal oxid and leaving the filament exposed in part or spots, as the other part, as and for the purpose set forth.

3. The process of sealing inleading wires in a solid body of glass, which process consists in successively coating the wire with carbon material, heating the same, casting molten glass around the wires, when placed in proper position, as and for the purpose set forth.

4. The process of hermetically sealing the inleading wires of an electric incandescent vacuum-lamp, when these wires consist in part of platinum and in part of base metal, within a body of glass, which process consists in joining the wire parts, then coating the platinum part with carbon matter and the base-metal part with a compound of base metal, then heating the thus-prepared wires, and putting them in proper position at a distance from one another, within a mold, and finally casting glass into the said mold and around the said wires, as and for the purpose set forth.

5. In an electric incandescent lamp a luminous body, which consists of two or more cohesive parts, namely an inner or filament part and an outer part or parts, which mainly consist of refractory rare-metal oxid, such outer part or parts covering the inner part in part only, as and for the purpose set forth.

6. In an electric incandescent lamp a luminous body, which consists of two or more cohesive parts, namely an inner or filament part, in the shape of a uniformly-sectioned, continuous linear body of suitable material and dimensions, producing heat and light in current resistance, and an outer part or parts, which mainly consist of refractory rare-metal oxid, which outer part or parts coat or cover the inner part in part only, leaving light-radiating lines or spots on the filament and on the cover, as and for the purpose set forth.

7. In an electric incandescent lamp a luminous body, which consists of two main cohesive parts, a linear, uniformly-sectioned core or filament of suitable material and dimensions, to produce heat and light by means of resistance to a passing current, is the one or inner part, and a body of rare-metal oxid mainly is the other part, which has the form of a pseudo fabric surrounding the said core and adhering thereto by means of partial fusion under temporary excessive current, as and for the purpose set forth.

8. In an electric incandescent lamp a three-part luminous body, consisting of an inner core and filament, of an insulating stratum on such core and of an outer partial cover or pseudo fabric of rare-metal oxid, as and for the purpose set forth.

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Witnesses:
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